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Source Sampling Fine Particulate Matter: A Kraft Process Hogged Fuel Boiler at a Pulp and Paper Facility: Volume 2, Appendices

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Source Sampling Fine Particulate Matter: A Kraft Process Hogged Fuel Boiler at a Pulp and Paper Facility: Volume 2, Appendices

by

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Office of Research and Development
Washington, DC 20460

Abstract

Fine particulate matter of aerodynamic diameter 2.5 μm or less ($PM_{2.5}$) has been implicated in adverse health effects, and a National Ambient Air Quality Standard for $PM_{2.5}$ was promulgated in July 1977 by the U.S. Environmental Protection Agency. A national network of ambient monitoring stations has been established to assist states in determining areas which do not meet the ambient standard for $PM_{2.5}$. For such areas, it is important to determine the major sources of the $PM_{2.5}$ so states can devise and institute a control strategy to attain the ambient concentrations set by the standard.

One of the tools often used by states in apportioning ambient $PM_{2.5}$ to the sources is a source-receptor model. Such a model requires a knowledge of the $PM_{2.5}$ chemical composition emitted from each of the major sources contributing to the ambient $PM_{2.5}$ as well as the chemical composition of the $PM_{2.5}$ collected at the receptor (ambient monitoring) sites. This report provides a chemical composition profile for the $PM_{2.5}$ emitted from an auxiliary boiler fired with a mixture of wood bark (hogged wood waste) and bituminous coal at a pulp and paper mill utilizing the Kraft process. The boiler was rated to generate a maximum of 889 Mbtu/hour and was equipped with a control system which included a multicyclone-electroscrubber system installed on the flue gas duct and bag filters installed on the vents of the coal bins, scrubber ash silo, and boiler ash silo. Along with the $PM_{2.5}$ emission profile, data are also provided for gas-phase emissions of several organic compounds. Gaseous reduced sulfur compound emissions, however, were not included in this study. Data are presented both as mass emission factors (mass of emitted species per unit mass of fuel consumed) and as mass fraction compositions (e.g., mass fraction of individual components comprising the $PM_{2.5}$). Data are provided in a format suitable for inclusion in the EPA source profile database, SPECIATE.

Foreword

The U.S. Environmental Protection Agency (EPA) is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The National Risk Management Research Laboratory (NRMRL) is the Agency's center for investigation of technological and management approaches for preventing and reducing risks from pollution that threaten human health and the environment. The focus of the Laboratory's research program is on methods and their cost-effectiveness for prevention and control of pollution to air, land, water, and subsurface resources; protection of water quality in public water systems; remediation of contaminated sites, sediments and ground water; prevention and control of indoor air pollution; and restoration of ecosystems. NRMRL collaborates with both public and private sector partners to foster technologies that reduce the cost of compliance and to anticipate emerging problems. NRMRL's research provides solutions to environmental problems by: developing and promoting technologies that protect and improve the environment; advancing scientific and engineering information to support regulatory and policy decisions; and providing the technical support and information transfer to ensure implementation of environmental regulations and strategies at the national, state, and community levels.

This publication has been produced as part of the Laboratory's strategic long-term research plan. It is published and made available by EPA's Office of Research and Development to assist the user community and to link researchers with their clients.

Lawrence W. Reiter, Acting Director.
National Risk Management Research Laboratory

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Volume 2, Appendices

Nomenclature

Term	Definition
CMB	chemical mass balance
DNPH	2,4-dinitrophenylhydrazine
EC/OC	elemental carbon and organic carbon
ELPI	electrical low pressure impactor
EPA	U.S. Environmental Protection Agency
ERG	Eastern Research Group
FID	flame ionization detector
GC	gas chromatography analytical technique
GRAV	gravimetric analytical technique
HEPA	high efficiency particulate arresting
HPLC	high performance liquid chromatography analytical technique
HVLC	high volume, low concentration
IC	ion chromatography analytical technique
MDLs	method detection limits
MOPs	method operating procedures
MS	mass spectrometry analytical technique
MSD	mass selective detector
NH_3	ammonia
NMOCs	nonmethane organic compounds
NO_X	nitrogen oxides
PM	particulate matter
$PM_{2.5}$	particulate matter of aerodynamic diameter 2.5 μm or less
PM_{10}	particulate matter of aerodynamic diameter 10 μm or less
PUF	polyurethane foam
QAPPs	quality assurance project plans
SIPs	State Implementation Plans
SNMOCs	speciated nonmethane organic compounds
SOPs	standard operating procedures
SO_X	sulfur oxides
TMS	trimethylsilyl
TOE	thermal-optical evolution
VOCs	volatile organic compounds
XRF	X-ray fluorescence analytical technique

Appendix A

Table of Unit Conversions

Contents

Table A-1. Unit Conversion Table

Multiply	By	To Obtain
atmospheres	101.3	kilopascals
atmospheres	29.92	inches of mercury
atmospheres	760	mm of mercury
atmospheres	33.94	feet of water
atmospheres	14.70	$lb/in.^2$ (psi)
Btu	1054	joules
Btu	2.982×10^{-4}	kilowatt-hours
centimeters	0.3937	inches
cm/sec	1.969	ft/min
cm/sec	0.03281	ft/sec
cm/sec	0.036	km/hr
cm/sec	0.6	m/min
cm^3	3.53×10^{-2}	ft^3
cm^3	10^{-3}	liters
ft^3	0.02832	m^3
ft^3/min	0.4720	liters per second
$in.^3$	16.39	cm^3
m^3	35.31	ft^3
ft	12	in.
ft	0.3048	m
ft of water	0.8826	in. mercury
grams	0.03527	ounces
inches	2.540	cm
inches of water	0.07355	inches of mercury
kg	2.20462	lb
km	3280.84	ft
km	0.6214	miles
kilowatts	56.92	Btu per min.
liters	0.03531	ft^3
liters	61.02	$in.^3$
liters	10^{-3}	m^3
liters per minute	5.855×10^{-4}	ft^3 per second
m	3.28084	ft
m	39.37	in.
m^3	0.02832	ft^3
miles	5280	feet
miles	1.6093	km
ounces	28.35	grams

continued

Table A-1. (concluded)

Multiply	By	To Obtain
pounds	453.6	grams
pounds per square inch	703.1	kg/m^2
cm^2	0.1550	$in.^2$
ft^2	929.0	cm^2
ft^2	0.09290	m^2
temperature (°C + 273)	1	absolute temperature (K)
temperature (°C + 17.8)	1.8	temperature (°F)
temperature (°F + 460)	1	temperature (°Rankin)
temperature (°F-32)	5/9	temperature (°C)
watts	0.05692	Btu per min.
watts	44.26	foot-pounds per min.

Appendix B

Hogged Fuel Boiler No. 2 Sample Log with Sample IDs and Chain of Custody Documentation

Contents

Table B-1. Sample Log, Hogged Fuel Boiler

					Test Date		
					11/27/01	11/28/01	11/29/01
Chamber	Port#	Position	Substrate	Holder#	Substrate ID	Substrate ID	Substrate ID
0	2	A1	TF	614	T100201T	T102201A	T102201F
		B1	TF	618	T100201U	T102201B	T102201G
	3	M1	DNPH		IB112701HR1M1	IB112801HR1M1	IB112901HR1M1
		M2	DNPH		IB112701HR1M2	IB112801HR1M2	IB112901HR1M2
	4	A1	QF	622	Q052901N[a]	Q060401U[a]	Q101501E[a]
		A2	PUF	A	P101801G	P101901J	P102201L
		A3	PUF	A	P101801H	P101901K	P102301A
		A4	PUF	B	P101801I	P101901L	P102301B
		A5	PUF	B	P101801J	P102201A	P102301C
		B1	QF	640	Q053001A[a]	Q060401V[a]	Q101501D[a]
	5	M2	SUMMA		IB112701H-SR5M2	IB112801H-SR5M2	IB112901H-SR5M2
	6	A1	TF	633	T100201V	T100201Y	T102201D
		B1	TF	642	T100201W	T100201Z	T102201E
	7	M1	ELPI		run time = 478.7 min	run time = 480.2 min	run time = 480.5 min
	8	A1	QF	564	Q060401J[a]	Q060401S[a]	Q101501A[a]
		A2	PUF	C	P101901K	P102201B	P102301D
		A3	PUF	C	P101901A	P102201C	P102301E
		A4	PUF	D	P101901B	P102201D	P102301F
		A5	PUF	D	P101901C	P102201E	P102301G
		B1	QF	641	Q060401K[a]	Q060401T[a]	Q101501B[a]
	10	M1	D		see denuder log	see denuder log	see denuder log
		M2	D				
		A3	QF	610	Q060401M[b]	Q060401P[b]	Q060401X[b]
		A4	PUF	G	P101901D	P102201F	P102301H

continued

					Test Date		
					11/27/01	11/28/01	11/29/01
Chamber	Port#	Position	Substrate	Holder#	Substrate ID	Substrate ID	Substrate ID
		A5	PUF	G	P101901E	P102201G	P102301I
		A6	PUF	H	P101901F	P102201H	P102301J
		A7	PUF	H	P101901G	P102201I	P102301K
		B3	QF	613	Q060401N[b]	Q060401Q[b]	Q060401Y[b]
	1	A1	QF	481	Q052901M[c]	Q060401W[c]	Q101501F[c]
		A2	PUF	E	P101901H	P102201J	P102301L
		A3	PUF	E	P101901I	P102201K	P102401A
		B1	TF	564	T100201S	T102201C	T102201H
	2	M2	SUMMA		IB112701H-SD2M2	IB112801H-SD2M2	IB112901H-SD2M2
	3	M1	DNPH		IB112701HD3M1	IB112801HD3M1	IB112901HD3M1
		M2	DNPH		IB112701HD3M2	IB112801HD3M2	IB112901HD3M2
			QF		Q060401O	IB1128001H-SUMA-FB	IB112901H-SUMA-FB
			TF		T100201X	IB112801H-DNPH-FB	IB112901H-DNPH-FB
			PUF	Field	P102401B		
			PUF	Field	P102401C		
			SUMMA		IB112701H-SUMMA-FB	IB1128001H-SUMMA-FB	IB112901H-SUMMA-FB
			DNPH		IB112701H-DNPH-FB	IB112801H-DNPH-FB	IB112901H-DNPH-FB

[a] All quartz filter samples in Ports #4 and #8 of the residence chamber for three days of hogged fuel boiler tests were composited for analysis.

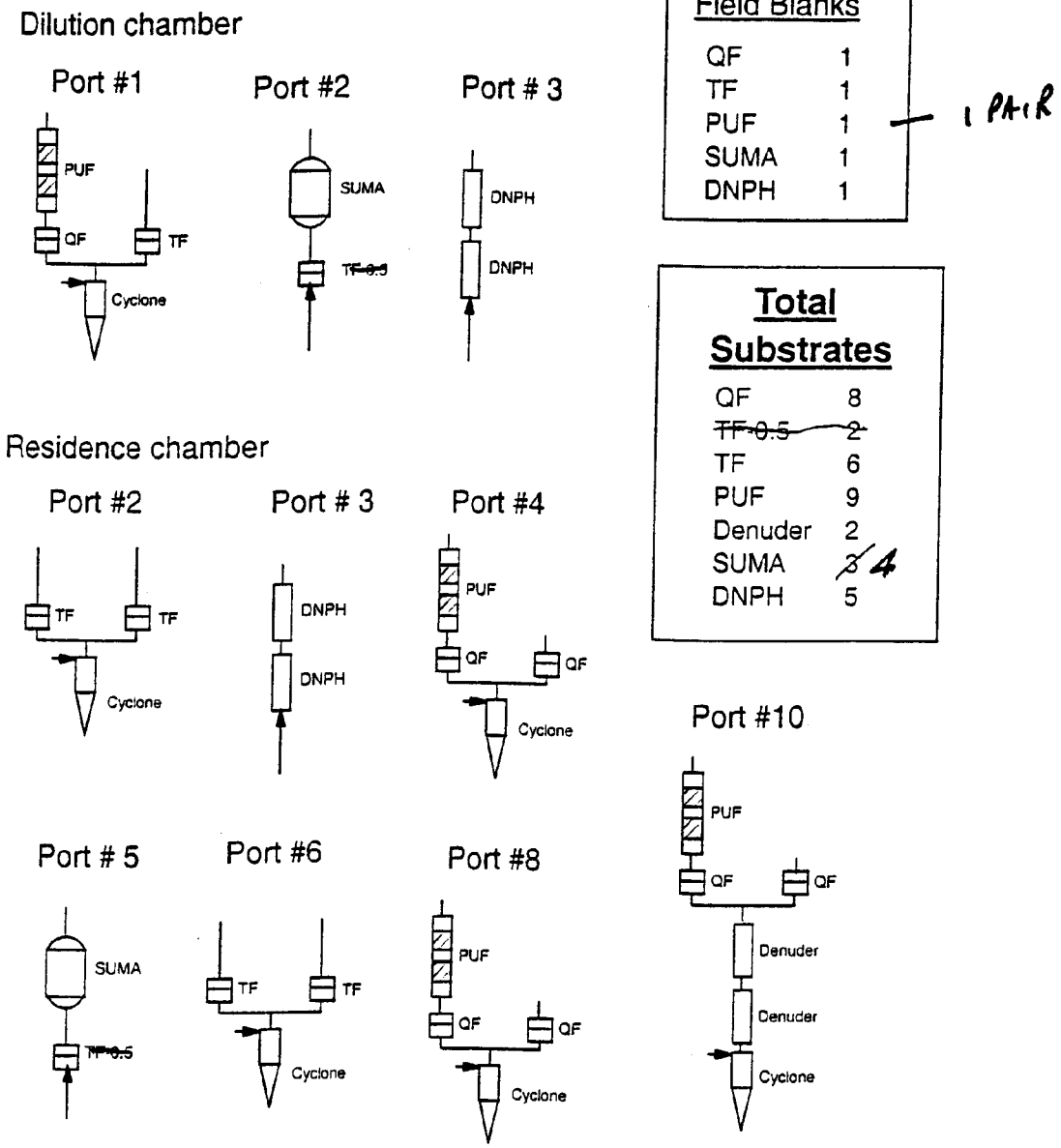
[b] All quartz filter samples in Port #10 of the residence chamber for three days of hogged fuel boiler tests were composited for analysis.

[c] All quartz filter samples from dilution chamber for three days of tests were composited for analysis.

Table B-2. Denuder Sample Log, Hogged Boiler

		11/27/01				11/28/01				11/29/01			
		Sample Collection				Sample Collection				Sample Collection			
Pair #	Position	Start	End	min	Denuder #	Start	End	min	Denuder #	Start	End	min	Denuder #
1	M1	8:35	9:10	35	D060501-1013-3	8:18	8:48	30	D010901-1261-9	8:00	8:30	30	D010901-1259-10
	M2				D071900-995-4				D060501-1049-7				D042601-1551-8
2	M1	9:11	9:41	30	D042601-1551-3	8:50	9:50	60	D010901-1259-9	8:32	9:32	60	D060501-1013-9
	M2				D010901-1259-5				D042601-1551-7				D071900-995-10
3	M1	9:45	10:15	30	D060501-1049-3	9:52	11:52	120	D060501-1013-8	9:34	11:34	120	D010901-1261-11
	M2				D010901-1261-5				D071900-995-9				D060501-1049-9
4	M1	10:18	10:48	30	D060501-1013-4	11:53	15:53	240	D010901-1261-10	11:36	15:36	240	D010901-1259-11
	M2				D071900-995-5				D060501-1049-8				D042601-1551-9
5	M1	10:50	11:20	30	D042601-1551-4								
	M2				D010901-1259-6								
6	M1	11:23	11:53	30	D060501-1049-4								
	M2				D010901-1261-6								
7	M1	11:56	12:26	30	D060501-1013-5								
	M2				D071900-995-6								
8	M1	12:29	12:59	30	D042601-1551-5								
	M2				D010901-1259-7								
9	M1	13:02	13:29	27	D060501-1049-5								
	M2				D010901-1261-7								
10	M1	13:32	14:02	30	D060501-1013-6								
	M2				D071900-995-7								
11	M1	14:05	14:35	30	D042601-1551-6								
	M2				D010901-1259-8								
12	M1	14:38	15:08	30	D060501-1049-6								
	M2				D010901-1261-8								
13	M1	15:12	15:42	30	D060501-1013-7								
	M2				D071900-995-8								

EKG 1C-1



Sample Collection Arrays

CLEAN SUBSTRATES

Date Substrate Distributed 10/25/01
To Whom Substrate Distributed Tom
FPMCC Lab Personnel Yuanji

No	Type	Substrate ID	Test ID	Sampling Position				
				Chamber	Port	Position	Holder	
1	QF	Q051601I	IB102901H	d	1	A1	622	
2	QF	Q051601N	IB102901H	r	4	A1	618	
3	QF	Q052301C	IB102901H	r	4	B1	641	
4	QF	Q052301J	IB102901H	r	8	A1	564	
5	QF	Q052301V	IB102901H	r	8	B1	610	
6	QF	Q052401X	IB102901H	r	10	A3	481	
7	QF	Q052501E	IB102901H	r	10	B3	640	
8	QF	Q052501G	IB102901H				FB	
9	QF	Q052501J	RB 103101H	r	10	B1	640	
10	QF	Q052501R	RB 103101H	r	10	A1	481	
11	QF	Q052501T	RB 103101H	r	8	B1	610	
12	QF	Q052501V	RB 103101H	r	8	A1	564	
13	QF	Q052501X	RB 103101H	r	4	A1	618	
14	QF	Q052901A	RB 103101H	r	4	B1	641	
15	QF	Q052901B	RB103101H	d	1	A1	622	
16	QF	Q052901C	RB 110101H	r	10	A1	481	
17	QF	Q052901D	RB 110101H	r	10	B1	640	
18	QF	Q052901E	RB 110101H	r	8	B1	610	
19	QF	Q052901F	RB 110101H	r	8	A1	564	
20	QF	Q052901G	RB 110101H	r	4	A1	618	
21	QF	Q052901H	RB 110101H	r	4	B1	641	
22	QF	Q052901K	RB 110101H	d	1	A1	622	
23	QF	Q052901L	BT 111301H	r	8	B1	642	HOG BOILER
24	QF	Q052901M	HB 112701H	d	1	A1	481	
25	QF	Q052901N	HB 112701H	r	4	A1	622	
26	QF	Q053001A	HB 112701H	r	4	B1	640	
27	QF	Q060401J	HB 112701H	r	8	A1	585	TEST 1
28	QF	Q060401K	HB 112701H	r	8	B1	641	
29	QF	Q060401M	HB 112701H	r	10	A3	610	
30	QF	Q060401N	HB 112701H	r	10	B3	613	
31	QF	Q060401O	HB 112701H	FB	0		FB	
32	QF	Q060401P	HB 112801H	r	10	A1	610	TEST 2
33	QF	Q060401Q	HB 112801H	r	10	B1	613	
34	QF	Q060401S		r	8	A1	585	
35	QF	Q060401T		r	8	B1	641	
36	QF	Q060401U		r	4	A1	622	
37	QF	Q060401V		r	4	B1	640	
38	QF	Q060401W		d	1	A1	481	
39	QF	Q060401X	HB 112901H	r	10	A1	610	T3
40	QF	Q060401Y						

CLEAN SUBSTRATES

Date Substrate Distributed	10/25/2001
To Whom Substrate Distributed	Tom
FPMCC Lab Personnel	Yuanji

No	Type	Substrate ID	Test ID	Sampling Position			
				Chamber	Port	Position	Holder
41	QF	Q101501A	HB 112901 H	r	8	A1	585
42	QF	Q101501B		r	8	B1	641
~~43~~	~~QF~~	~~Q101501C~~		~~r~~	~~4~~	~~A1~~	~~622~~
44	QF	Q101501D		r	4	B1	640
45	QF	Q101501E		r	4	A1	622
46	QF	Q101501F		d	1	A1	481
47	QF	Q101501G					
48	QF	Q101501H					
49	QF	Q101501I					
50	QF	Q101501J					
51	QF	Q101501K					
52	QF	Q101501L					
53	QF	Q101501M					
54	QF	Q101501N					
55	QF	Q101501O					
56	QF	Q101501P					
57	QF	Q101501Q					
58	QF	Q101501R					
59	QF	Q101501S					
60	QF	Q101501T					
61	QF	Q101501U					
62	QF	Q101501V					
63	QF	Q101501W					
64	QF	Q101501X					
65	QF	Q101501Y					
66	QF	Q101501Z					
67	QF	Q101601A					
68	QF	Q101601B					
69	QF	Q101601C					
70	QF	Q101601D					
71	QF	Q101601E					
72	QF	Q101601F					
73	QF	Q101601G					
74	QF	Q101601H					
75	QF	Q101601I					
76	QF	Q101601J					
77	QF	Q101601K					
78	QF	Q101601L					
79	QF	Q101601M					
80	QF	Q101601N					

TEST 3

VOID RIPPED

CLEAN SUBSTRATES

Date Substrate Distributed	10/25/2001
To Whom Substrate Distributed	Tom
FPMCC Lab Personnel	Yuanji

No	Type	Substrate ID	Test ID	Sampling Position				
				Chamber	Port	Position	Holder	
1	TF	T100201A	IB102901H	d	1	B1	642	
2	TF	T100201B	IB102901H	r	2	A1	585	
3	TF	T100201C	IB102901H	r	2	B1	614	
4	TF	T100201D	IB102901H	r	6	A1	613	
5	TF	T100201E	IB102901H	r	6	B1	633	
6	TF	T100201F	IB102901H				FB	
7	TF	T100201G	RB103101H	r	6	B1	633	
8	TF	T100201H	RB103101H	r	6	A1	613	
9	TF	T100201I	RB103101H	r	2	B1	614	
10	TF	T100201J	RB103101H	r	2	A1	585	
11	TF	T100201K	RB103101H	d	1	B1	642	
12	TF	T100201L	RB110101H	r	6	B1	633	
13	TF	T100201M	RB110101H	r	6	A1	613	
14	TF	T100201N	RB110101H	r	2	B1	614	
15	TF	T100201O	RB110101H	r	2	A1	585	
16	TF	T100201P	RB110101H	d	1	B1	642	
17	TF	T100201R	BT111301H	r	8	A1	633	HOG BOILER
18	TF	T100201S	HB112701H	d	1	B1	564	
19	TF	T100201T	HB112701H	r	2	A1	614	
20	TF	T100201U	HB112701H	r	2	B1	618	TEST 1
21	TF	T100201V	HB112701H	r	6	A1	633	
22	TF	T100201W	HB112701H	r	6	B1	642	
23	TF	T100201X	HB112701H	FB	Φ		FB	
24	TF	T100201Y	HB112801H	r	6	A1	633	
25	TF	T100201Z		r	6	B1	642	TEST 2
26	TF	T102201A		r	2	A1	614	
27	TF	T102201B		r	2	B1	618	
28	TF	T102201C	V	d	1	B1	564	
29	TF	T102201D	HB112901H	r	6	A1	633	
30	TF	T102201E		r	6	B1	642	TEST 3
31	TF	T102201F		r	2	A1	614	
32	TF	T102201G		r	2	B1	618	
33	TF	T102201H		d	1	B1	564	
34	TF	T102201I						
35	TF	T102201J						
36	TF	T102201K						
37	TF	T102201L						
38	TF	T102201M						
39	TF	T102201N						
40	TF	T102201O						

CLEAN SUBSTRATES

Date Substrate Distributed 10/25/2001
To Whom Substrate Distributed Tom
FPMCC Lab Personnel Yuanji

No	Type	Substrate ID	Test ID	Sampling Position			
				Chamber	Port	Position	Holder
41	TF	T102201Q					
42	TF	T102201R					
43	TF	T102201S					
44	TF	T102201T					
45	TF	T102201U					
46	TF	T102201V					
47	TF	T102201W					
48	TF	T102201X					
49	TF	T102201T					
50	TF	T102201Z					
51	TF	T082101M					
52	TF	T082101N					
53	TF	T100301A					
54	TF	T100301C					
55	TF	T100301D					
56	TF	T040401H					
57	TF	T040401I					
58	TF	T040401J					
59	TF	T020901H					
60	TF	T020901I					
61	TF	T020901J					
62	TF	T020901K					

CLEAN SUBSTRATES

Date Substrate Distributed 10/25/2001
To Whom Substrate Distributed Tom
FPMCC Lab Personnel Yuanji

	No	Type	Substrate ID	Test ID	Sampling Position			
					Chamber	Port	Position	Holder
PAIR	1	Denuder	D071900-995-5	HB112701H	r	10	A1	610/613
	2	Denuder	D060501-1013-2		r	10	A1	
PAIR	3	Denuder	D010901-1261-3		r	10	A1	
	4	Denuder	D042601-1551-2		r	10	A1	
PAIR	5	Denuder	D060501-1049-3		r	10	A1	
	6	Denuder	D-10901-1259-4		r	10	A1	
				AND SO ON FOR TEST 2				
				HB112801H AND TEST 3				
				HB112901H				

CLEAN SUBSTRATES

Date Substrate Distributed: 10/25/2001
To Whom Substrate Distributed: Tom
FPMCC Lab Personnel: Yuanji

No	Type	Substrate ID	Test ID	Sampling Position			
				Chamber	Port	Position	Holder
1	PUF	P101701A	102901H			1	A
2	PUF	P101701B	102901H			2	
3	PUF	P101701C	103001H			1	B
4	PUF	P101701D	103001H			2	
5	PUF	P101701E	103001H			1	C
6	PUF	P101701F	103001H			2	
7	PUF	P101701G	103001H			1	D
8	PUF	P101701H	103001H			2	
9	PUF	P101701I	103001H			1	E
10	PUF	P101701J	103001H			2	
11	PUF	P101701K	103001H			1	F
12	PUF	P101701L	103001H			2	
13	PUF	P101701M	103001H			FIELD BLANK	
14	PUF	P101701N	103001H			FIELD BLANK	
15	PUF	P101701O	103101H			1	A
16	PUF	P101701P				2	
17	PUF	P101701Q				1	B
18	PUF	P101701R				2	
19	PUF	P101701S				1	C
20	PUF	P101701T				2	
21	PUF	P101701U				1	D
22	PUF	P101701V	103101H			2	
23	PUF	P101701W	110101H			1	A
24	PUF	P101701X				2	
25	PUF	P101801A				1	B
26	PUF	P101801B				2	
27	PUF	P101801C				1	C
28	PUF	P101801D				2	
29	PUF	P101801E				1	D
30	PUF	P101801F	110101H			2	
31	PUF	P101801G	112701H	SPIKED		1	A
32	PUF	P101801H				2	
33	PUF	P101801I				1	B
34	PUF	P101801J				2	
35	PUF	P101801K		SPIKED		1	C
~~36~~	~~PUF~~	~~P101801L~~				~~2~~	
37	PUF	P101901A				2	C
38	PUF	P101901B				1	D
39	PUF	P101901C				2	
40	PUF	P101901D		SPIKED		1	G

NOT AVAILABLE

TEST 1

CLEAN SUBSTRATES

Date Substrate Distributed: 10/25/2001
To Whom Substrate Distributed: Tom
FPMCC Lab Personnel: Yuanji

No	Type	Substrate ID	Test ID	Sampling Position			
				Chamber	Port	Position	Holder
41	PUF	P101901E	112701 H			2	G
42	PUF	P101901F	CONTINUED	NOT	SPIKED	1	H
43	PUF	P101901G				2	
44	PUF	P101901H			SPIKED	1	E
45	PUF	P101901I				2	
46	PUF	P101901J	112801 H	SPIKED		1	A
47	PUF	P101901K				2	
48	PUF	P101901L				1	B
49	PUF	P102201A				2	
50	PUF	P102201B		SPIKED		1	C
51	PUF	P102201C				2	
52	PUF	P102201D				1	D
53	PUF	P102201E				2	
54	PUF	P102201F		SPIKED		1	G
55	PUF	P102201G				2	
56	PUF	P102201H				1	H
57	PUF	P102201I				2	
58	PUF	P102201J		SPIKED		1	E
59	PUF	P102201K				2	
60	PUF	P102201L	112901 H			1	A
61	PUF	P102301A				2	
62	PUF	P102301B				1	B
63	PUF	P102301C				2	
64	PUF	P102301D				1	C
65	PUF	P102301E				2	
66	PUF	P102301F				1	D
67	PUF	P102301G				2	
68	PUF	P102301H				1	G
69	PUF	P102301I				2	
70	PUF	P102301J				1	H
71	PUF	P102301K				2	
72	PUF	P102301L				1	E
73	PUF	P102401A				2	
74	PUF	P102401B				A1	FBLK
75	PUF	P102401C				A2	FBLK
76	PUF	P102401D					
77	PUF	P102401E					
78	PUF	P102401F					
79	PUF	P102501A					
80	PUF	P102501B					

TEST 1

TEST 2

TEST 3

CLEAN SUBSTRATES

Date Substrate Distributed 10/25/2001
To Whom Substrate Distributed Tom
FPMCC Lab Personnel Yuanji

No	Type	Substrate ID	Test ID	Sampling Position			
				Chamber	Port	Position	Holder
81	PUF	P102501C					
82	PUF	P102501D					
83	PUF	P102501E					
84	PUF	P102501F					
85	PUF	P102501G					
86	PUF	P102501H					
87	PUF	P102501I					
88	PUF	P102501J					
89	PUF	P102501K					
90	PUF	P102501L	102901H				FB

CLEAN SUBSTRATES

Page 9

Date Substrate Distributed 10/25/2001
To Whom Substrate Distributed Tom
FPMCC Lab Personnel Yuanji

No	Type	Substrate ID	Test ID	Sampling Position				
				Chamber	Port	Position	Holder	
1	Al foil	A101701A	RB 110101 H	C	7	A1	N/A	RECOVERY BOILER
2	Al foil	A101701B	VOID					
3	Al foil	A101701C	RB 110101 H	C	7	A1		TESTS 1,2,3
4	Al foil	A101701D		C	7			
5	Al foil	A101701E		C	7			
6	Al foil	A101701F		C	7			
7	Al foil	A101701G		C	7			
8	Al foil	A101701H		C	7			
9	Al foil	A101701I		C	7			
10	Al foil	A101701J		C	7			
11	Al foil	A101701K		C	7			
12	Al foil	A101701L		C	7			
13	Al foil	A101701M		C	7			
14	Al foil	A101701N		C	7	A1		
15	Al foil	A101701O	RB 110101 H				FB	BLANK
16	Al foil	A101701P	HB 112701 H					
17	Al foil	A101701Q						
18	Al foil	A101701R						
19	Al foil	A101701S						
20	Al foil	A101701T						HOG BOILER TESTS 1,2,3
21	Al foil	A101701U						
22	Al foil	A101701V						
23	Al foil	A101701W						
24	Al foil	A101701X						
25	Al foil	A101701Y						
26	Al foil	A101601A						
27	Al foil	A101601B						
28	Al foil	A101601C						
29	Al foil	A101601D						
30	Al foil	A101601E						
31	Al foil	A101601F						
32	Al foil	A101601G						
33	Al foil	A101601H						
34	Al foil	A101601I						
35	Al foil	A101601J						
36	Al foil	A101601K						
37	Al foil	A101601L						
38	Al foil	A101601M						
39	Al foil	A101601N						
40	Al foil	A101601O						

CLEAN SUBSTRATES

Date Substrate Distributed 10/25/2001
To Whom Substrate Distributed Tom
FPMCC Lab Personnel Yuanji

No	Type	Substrate ID	Test ID	Sampling Position			
				Chamber	Port	Position	Holder
41	Al foil	A101601P					
42	Al foil	A101601Q					
43	Al foil	A101601R					
44	Al foil	A101601S					
45	Al foil	A101601T					
46	Al foil	A101601U					
47	Al foil	A101601V					
48	Al foil	A101601W					
49	Al foil	A101601X					
50	Al foil	A101601Y					
51	Al foil	A101801A					
52	Al foil	A101801B					
53	Al foil	A101801C					
54	Al foil	A101801D					
55	Al foil	A101801E					
56	Al foil	A101801F					
57	Al foil	A101801G					
58	Al foil	A101801H					
59	Al foil	A101801I					
60	Al foil	A101801J					
61	Al foil	A101801K					
62	Al foil	A101801L					
63	Al foil	A101801M					
64	Al foil	A101801N					
65	Al foil	A101801O					
66	Al foil	A101801P					
67	Al foil	A101801Q					
68	Al foil	A101801R					
69	Al foil	A101801S					
70	Al foil	A101801T					
71	Al foil	A101801U					
72	Al foil	A101801V					
73	Al foil	A101801W					
74	Al foil	A101801X					
75	Al foil	A101801Y					
76	Al foil	A101901A					
77	Al foil	A101901B					
78	Al foil	A101901C					
79	Al foil	A101901D					
80	Al foil	A101901E					

CLEAN SUBSTRATES

Date Substrate Distributed 10/25/2001
To Whom Substrate Distributed Tom
FPMCC Lab Personnel Yuanji

No	Type	Substrate ID	Test ID	Sampling Position			
				Chamber	Port	Position	Holder
81	Al foil	A101901F					
82	Al foil	A101901G					
83	Al foil	A101901H					
84	Al foil	A101901I					
85	Al foil	A101901J					
86	Al foil	A101901K					
87	Al foil	A101901L					
88	Al foil	A101901M					
89	Al foil	A101901N					
90	Al foil	A101901O					
91	Al foil	A101901P					
92	Al foil	A101901Q					
93	Al foil	A101901R					
94	Al foil	A101901S					
95	Al foil	A101901T					
96	Al foil	A101901U					
97	Al foil	A101901V					
98	Al foil	A101901W					
99	Al foil	A101901X					
100	Al foil	A101901Y					
101	Al foil	A102001A					
102	Al foil	A102001B					
103	Al foil	A102001C					
104	Al foil	A102001D					
105	Al foil	A102001E					
106	Al foil	A102001F					
107	Al foil	A102001G					
108	Al foil	A102001H					
109	Al foil	A102001I					
110	Al foil	A102001J					
111	Al foil	A102001K					
112	Al foil	A102001L					
113	Al foil	A102001M					
114	Al foil	A102001N					
115	Al foil	A102001O					
116	Al foil	A102001P					
117	Al foil	A102001Q					
118	Al foil	A102001R					
119	Al foil	A102001S					
120	Al foil	A102001T					

CLEAN SUBSTRATES

Date Substrate Distributed 10/25/2001
To Whom Substrate Distributed Tom
FPMCC Lab Personnel Yuanji

No	Type	Substrate ID	Test ID	Sampling Position			
				Chamber	Port	Position	Holder
121	Al foil	A102001U					
122	Al foil	A102001V					
123	Al foil	A102001W					
124	Al foil	A102001X					
125	Al foil	A102001Y					
126	Al foil	A102101A					
127	Al foil	A102101B					
128	Al foil	A102101C					
129	Al foil	A102101D					
130	Al foil	A102101E					
131	Al foil	A102101F					
132	Al foil	A102101G					
133	Al foil	A102101H					
134	Al foil	A102101I					
135	Al foil	A102101J					

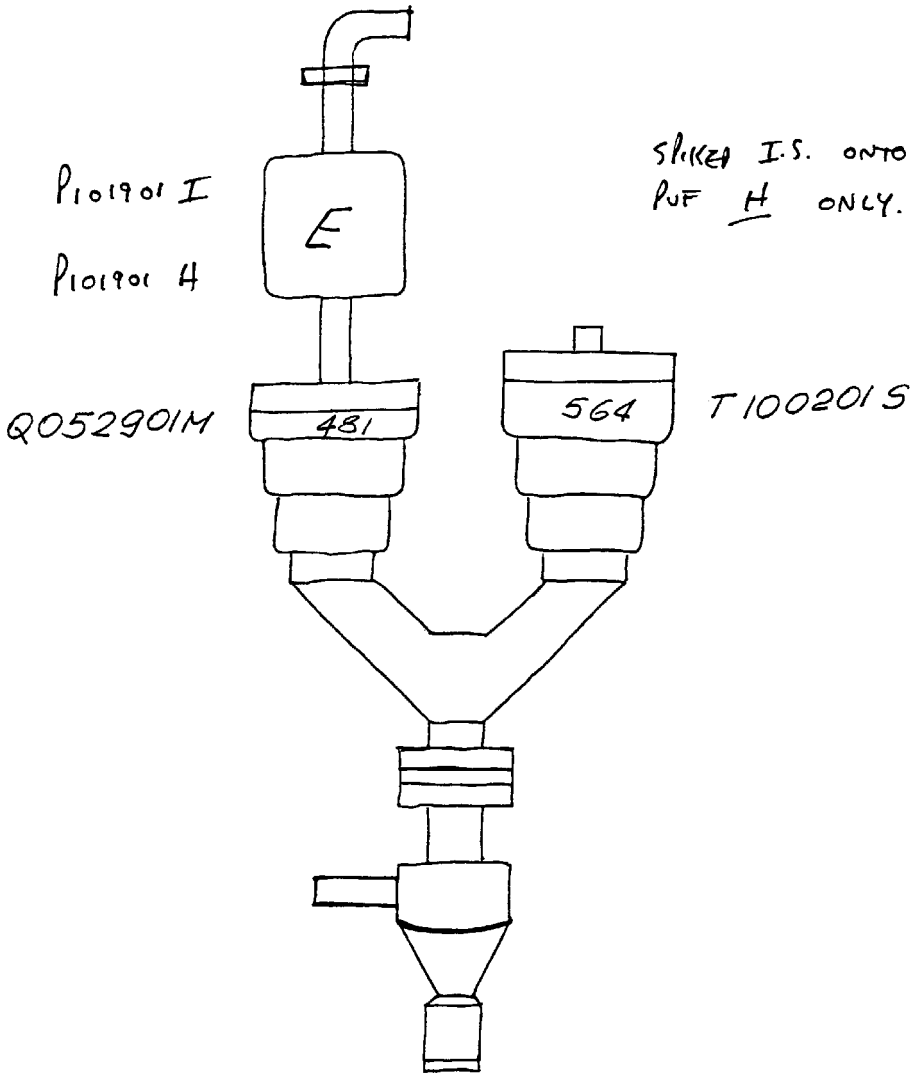
ARCADIS
GERAGHTY & MILLER

SUBJECT: WEYERHAEUSER
TEST 1
JOB NO: HB 112701H

BY: B DATE: 11/20
CHKD: DATE:

PAGE
SHEET 1

#1 Dilution



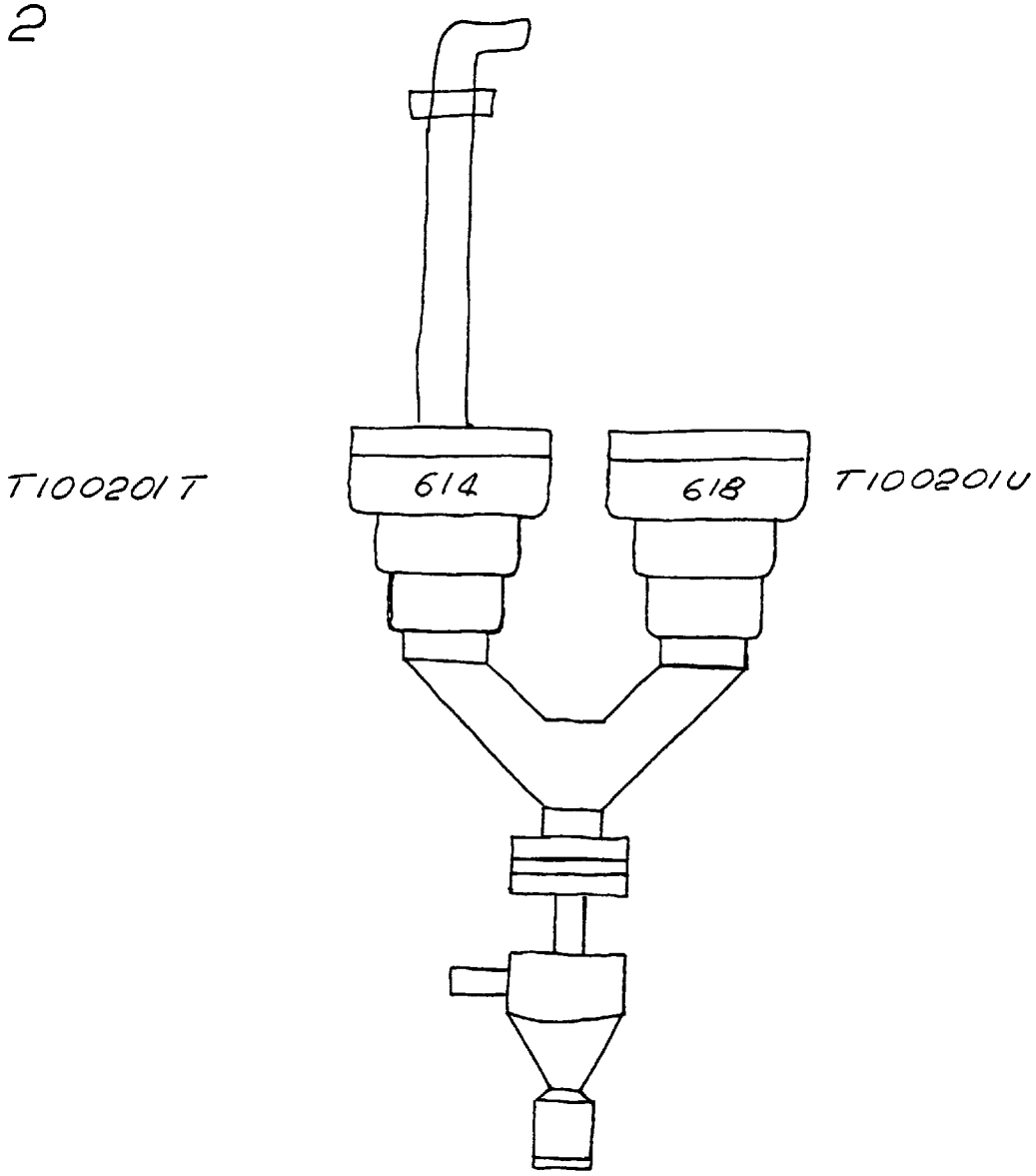
ARCADIS
GERAGHTY & MILLER

SUBJECT: WEYERHAEUSER
TEST 1
JOB NO: HB102701 H

BY: J DATE:
CHKD: DATE:

PAGE
SHEET 1

#2

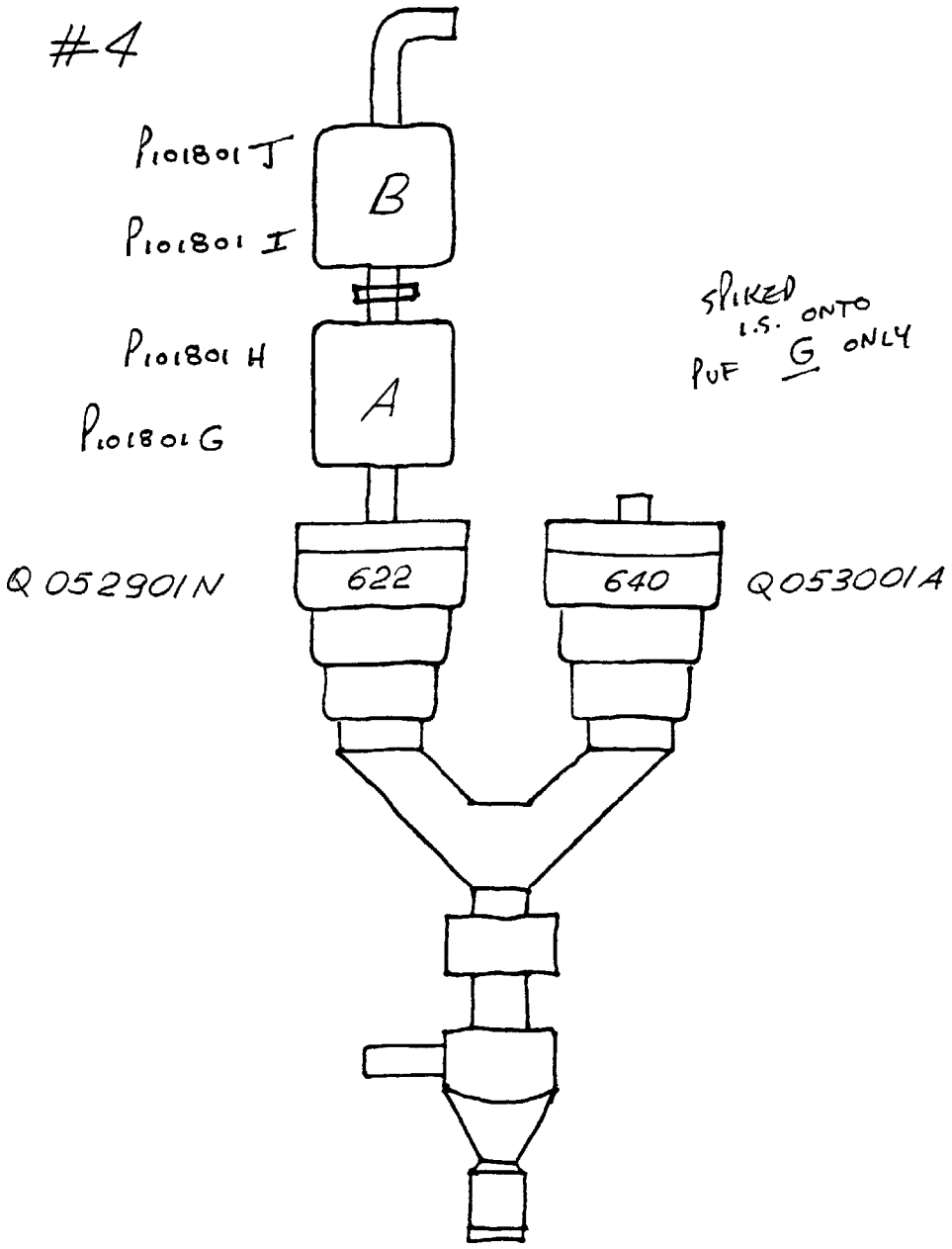


ARCADIS
GERAGHTY & MILLER

SUBJECT: WEYERHAEUSER
TEST 1
JOB NO: HB102701H

BY: JB DATE:
CHKD: DATE:

PAGE
SHEET 1



ARCADIS
GERAGHTY & MILLER

SUBJECT: WEYERHAEUSER
TEST 1

JOB NO: HB 112701 H

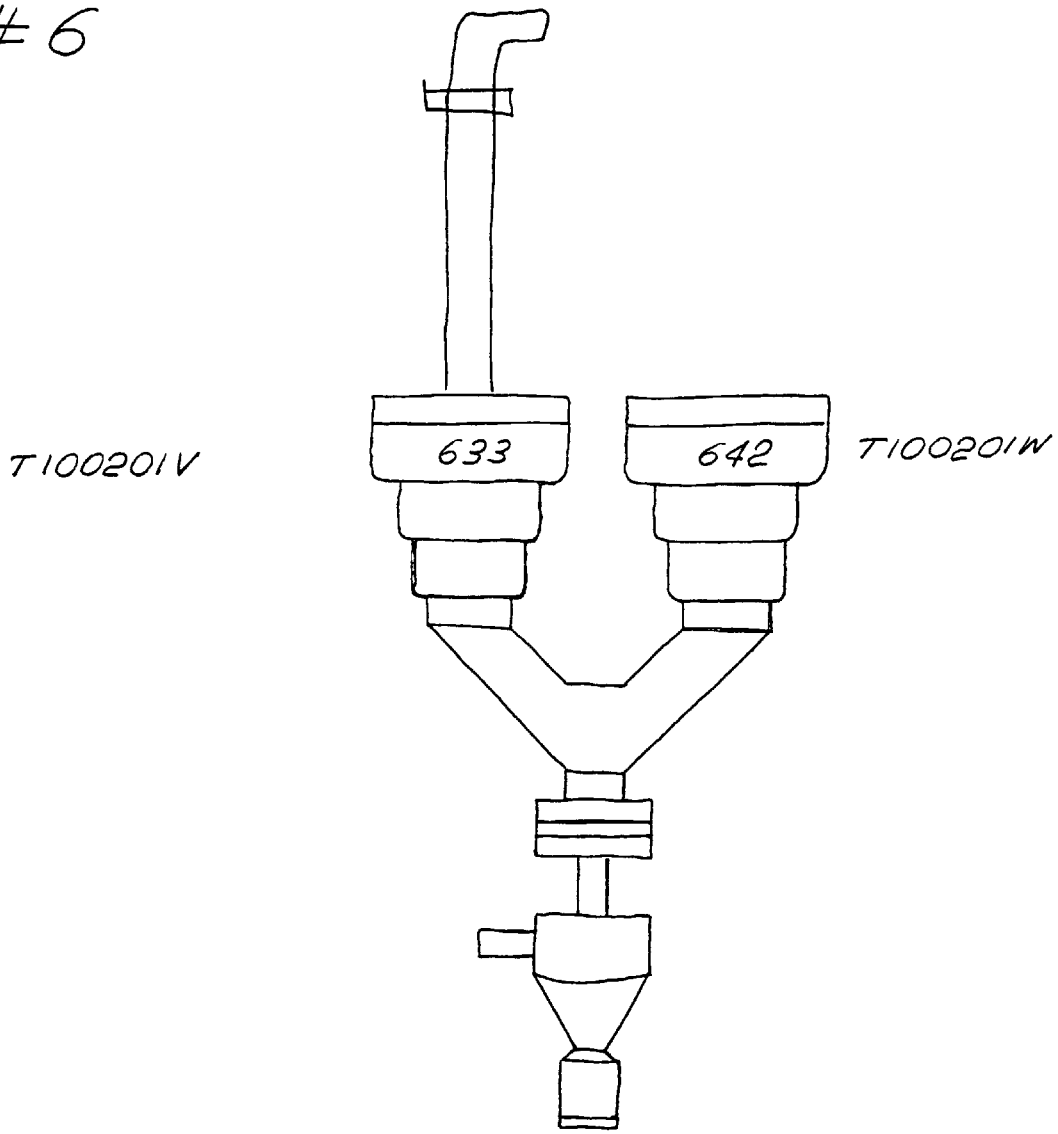
BY: JS DATE:

CHKD: DATE:

PAGE

SHEET 1

#6

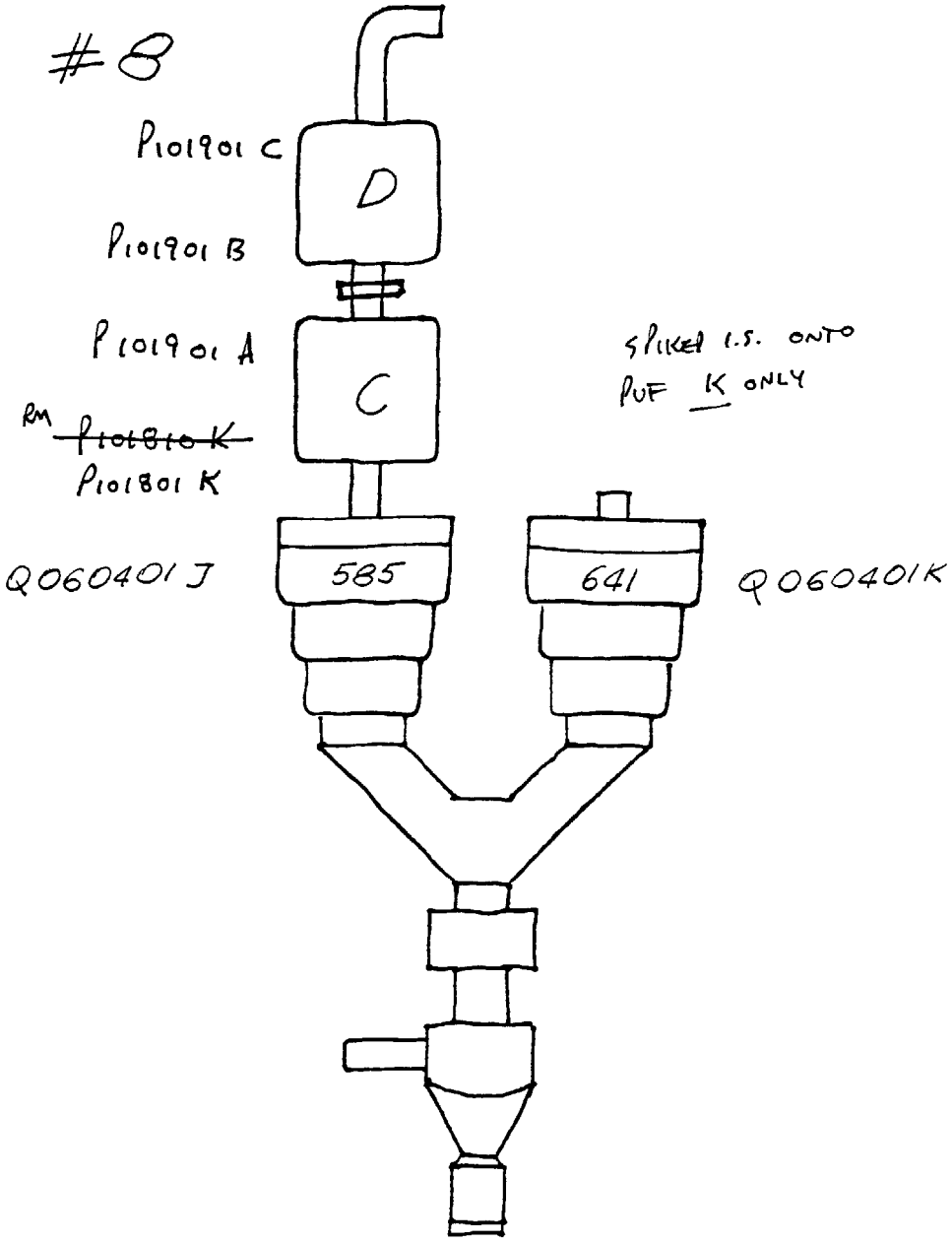


ARCADIS
GERAGHTY & MILLER

SUBJECT: WEYERHAEUSER
TEST 1
JOB NO: HB 11 2701 H

BY: JB DATE:
CHKD: DATE:

PAGE
SHEET 1



ARCADIS GERAGHTY & MILLER

SUBJECT: WEYERHAEUSER TEST 1

JOB NO: HB 112701 H

BY: JB DATE:

CHKD: DATE:

PAGE

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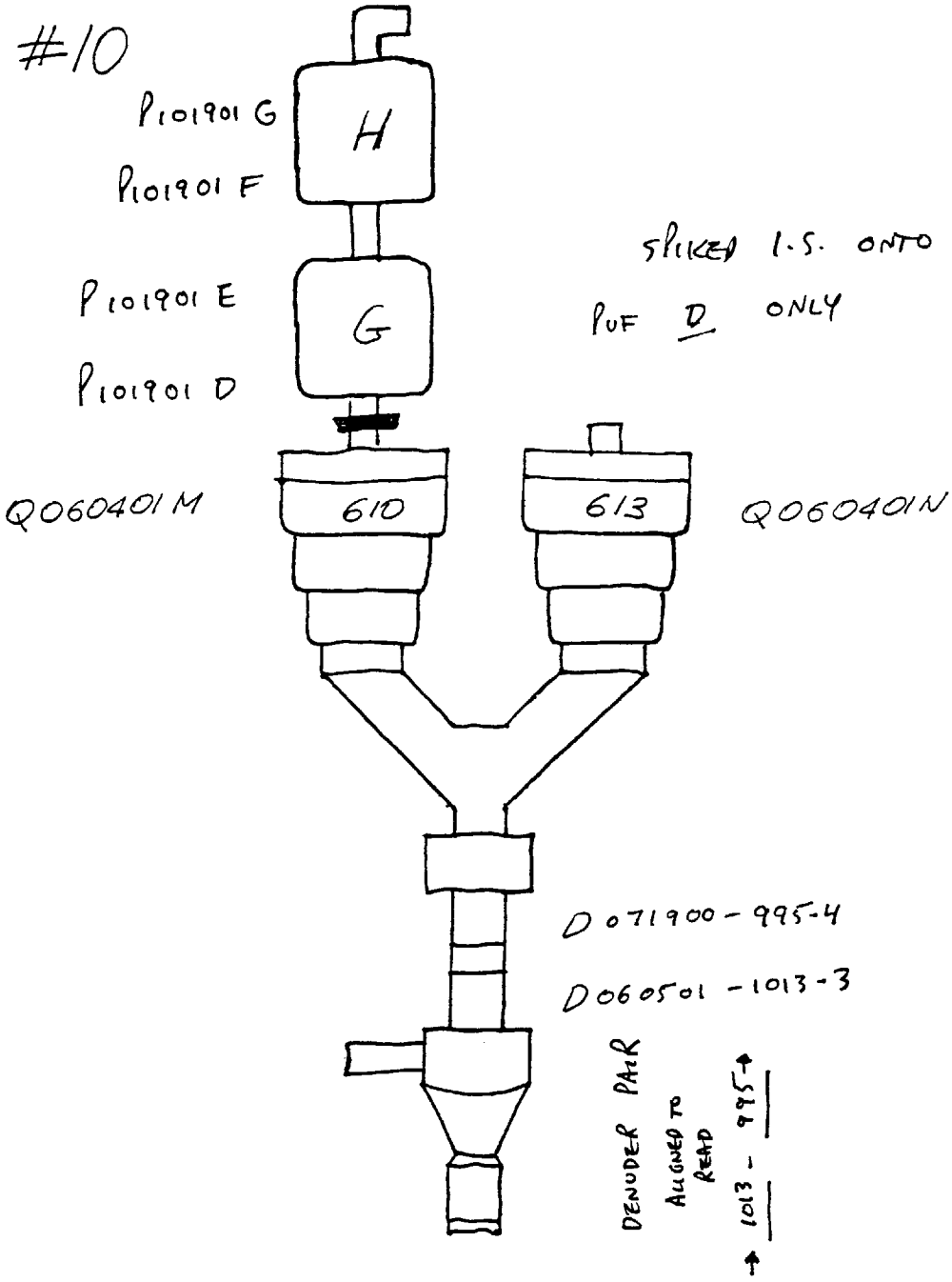

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

Page 1 of _____

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mentz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYL			REMARKS	SAM ID NO (For lab use only)
HB112701H	Pd 1A1 E	11/27/01		✓									P101901H	
	Pd 1A2 E			✓									P101901I	
	Qd 1A1 481				✓								Q052901M	
	Td 1B1 564					✓							T100201S	
	Tn2 A1 614					✓							T100201T	
	Tn2 B1 618					✓							T100201U	
	Qn4 A1 622				✓								Q052901N	
	Qn4 B1 640				✓								Q053001A	
	Pn4 A1 A			✓									P101801G	
	Pn4 A2 A			✓									P101801H	

REMARKS: TEST #1 TUESDAY 11/27/01

RELINQUISHED BY: Rob Mentz — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

Page 2 of _____

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Bob Mantz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYL			REMARKS	SAM ID NO. (For lab use only)
HB112701H	Pr 4 A3 B	11/27/01		✓									P101801I	
	Pr 4 A4 B			✓									P101801J	
	Tr 6 A1 633					✓							T100201V	
	Tr 6 B1 642					✓							T100201W	
	Pr 8 A1 C			✓									P101801K	
	Pr 8 A2 C			✓									P101901A	
	Pr 8 A3 D			✓									P101901B	
	Pr 8 A4 D			✓									P101901C	
	QA 8 A1 585				✓								Q060401J	
	QA 8 B1 641				✓								Q060401K	

REMARKS: TEST # 1 TUESDAY 11/27/01

RELINQUISHED BY:	DATE	TIME
Bob Mantz		

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

Page 3 of _____

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mantz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYL			REMARKS	SAM ID NO. (For lab use only)
HB 112701 H	Sd2 A1 S T1	11/27/01							✓				# 4004	
	Hd3 A1 H1 T1									✓			CARB 1 FR	(T1 IS TEST
	Hd3 A2 H2 T1									✓			CARB 2	ONE FOR
	Hd3 A3 H3 T1									✓			CARB 3 BACK	CARBS)
	Sn5 A1 S T1								✓				# 1478	
	Hn3 A1 H1 T1									✓			CARB 1 FR	
	Hn3 A2 H2 T1									✓			CARB 2	
	Hn3 A3 H3 T1									✓			CARB 3 BACK	
	BLANK CARB TUBE									✓				
	BLANK SUMMA CAN								✓				# 1482	

REMARKS: T1 = TEST 1 TEST #1 TUESDAY 11/27/01

RELINQUISHED BY:	DATE	TIME
Rob Mantz		

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

Page 4 of ____

PROJECT: WEYERHAEUSER HOG Boiler

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mentz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYL			REMARKS	SAM ID NO. (For lab use only)
HB 112701 H	S Φ A1 S T1	11/27/01							✓				# 4005	AMBIENT SUMMA
	Qd Φ A1 8X10				✓								ERG # 0004	CAN
	Pr Φ A1 FBK			✓									P102401 B	FBLANK PUF
	Pr Φ A2 FBK			✓									P102401 C	FBLANK PUF
	Qr Φ A1 FB				✓								Q0604010	QUARTZ FB
	Tr Φ A1 FB					✓							T100201 X	TEFLON FB
	Pr 10 A1 G			✓									P101901 D	"
	Pr 10 A2 G			✓									P101901 E	
	Pr 10 A3 H			✓									P101901 F	
	Pr 10 A4 H			✓									P101901 G	

REMARKS: TEST # 1 TUESDAY 11/27/01

RELINQUISHED BY:	DATE	TIME
Rob Mentz		

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

Page 5 of _____

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mangum

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYL			REMARKS	SAM ID NO. (For lab use only)
HB 112701 H	QA 10 A1 610	11/27/01			✓								Q 060401M	
	QA 10 B1 613				✓								Q 060401N	
	DA 10 A1 1013-3					"	✓						D060501-1013-3	PAIR 1
	DA 10 A2 995-4					"	✓						D071900-995-4	
	DA 10 A1 1551-3					"	✓						D042601-1551-3	PAIR 2
	DA 10 A2 1259-5					"	✓						D010901-1259-5	
	DA 10 A1 1049-3					"	✓						D060501-1049-3	PAIR 3
	DA 10 A2 1261-5					"	✓						D010901-1261-5	
	DA 10 A1 1013-4					"	✓						D060501-1013-4	PAIR 4
	DA 10 A2 995-5					"	✓						D071900-995-4	

REMARKS: TEST #1 TUESDAY 11/27/01

RELINQUISHED BY: Rob Mangum — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS: 1/2 HOUR DENUDER CHANGE OUTS - EACH PAIR WAS RUN FOR 1/2 HOUR, REPLACED BY NEXT PAIR & EXTRACTED FOR USE LATER

ERG
EASTERN RESEARCH GROUP, INC

Chain of Custody Record

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mantz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: POF	QF	TF	DENUDER		SUMMA	CARBONYL			REMARKS	SAM ID NO. (For lab use only)	
HB 112701 H	DA10A1 1551-4	11/27/01				11	✓						D042601-155	1-4	PAIR 5
	DA10A2 1259-6					11	✓						D010901-125	9-6	
	DA10A1 1049-4					11	✓						D060501-10	49-4	PAIR 6
	DA10A2 1261-6					11	✓						D010901-12	61-6	
	DA10A1 1013-5					11	✓						D060501-101	3-5	PAIR 7
	DA10A2 995-6					11	✓						D071900-995	-6	
	DA10A1 1551-5					11	✓						D042601-1551	-5	PAIR 8
	DA10A2 1259-7					11	✓						D010901-1259	-7	
	DA10A1 1049-5					11	✓						D060501-1049	-5	PAIR 9
	DA10A2 1261-7					11	✓						D010901-1261	-7	

REMARKS: TEST 1 TUESDAY 11/27/01

RELINQUISHED BY: Rob Mantz — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS: 1/2 DENUDER RUNS & EXTRACTIONS (CONTINUED)

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

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PROJECT: WEYERHAEUSER NCG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mosley

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYL			REMARKS	SAM ID NO. (For lab use only)
HB 112701 H	Dn 10 A1 1013-6	11/27/01				1	1						D060501-1013-6	PAIR 10
	Dn 10 A2 995-7					1	1						D071900-995-7	
	Dn 10 A1 1551-6					1	1						D042601-1551-6	PAIR 11
	Dn 10 A2 1259-8					1	1						D010901-1259-8	
	Dn 10 A1 1049-6					1	1						D060501-1049-6	PAIR 12
	Dn 10 A2 1261-8					1	1						D010901-1261-8	
	Dn 10 A1 1013-7					1	1						D060501-1013-7	PAIR 13
	Dn 10 A2 995-8					1	1						D071900-995-8	

REMARKS: TUESDAY 11/27/01 TEST #1

RELINQUISHED BY: Rob Mosley — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS: 1/2 HOUR DENUDER RUNS & EXTRACTIONS (CONTINUED)

ARCADIS
GERAGHTY & MILLER

SUBJECT: WEYERHAEUSER HOG BOILER TEST 2

JOB NO: HB 112801H

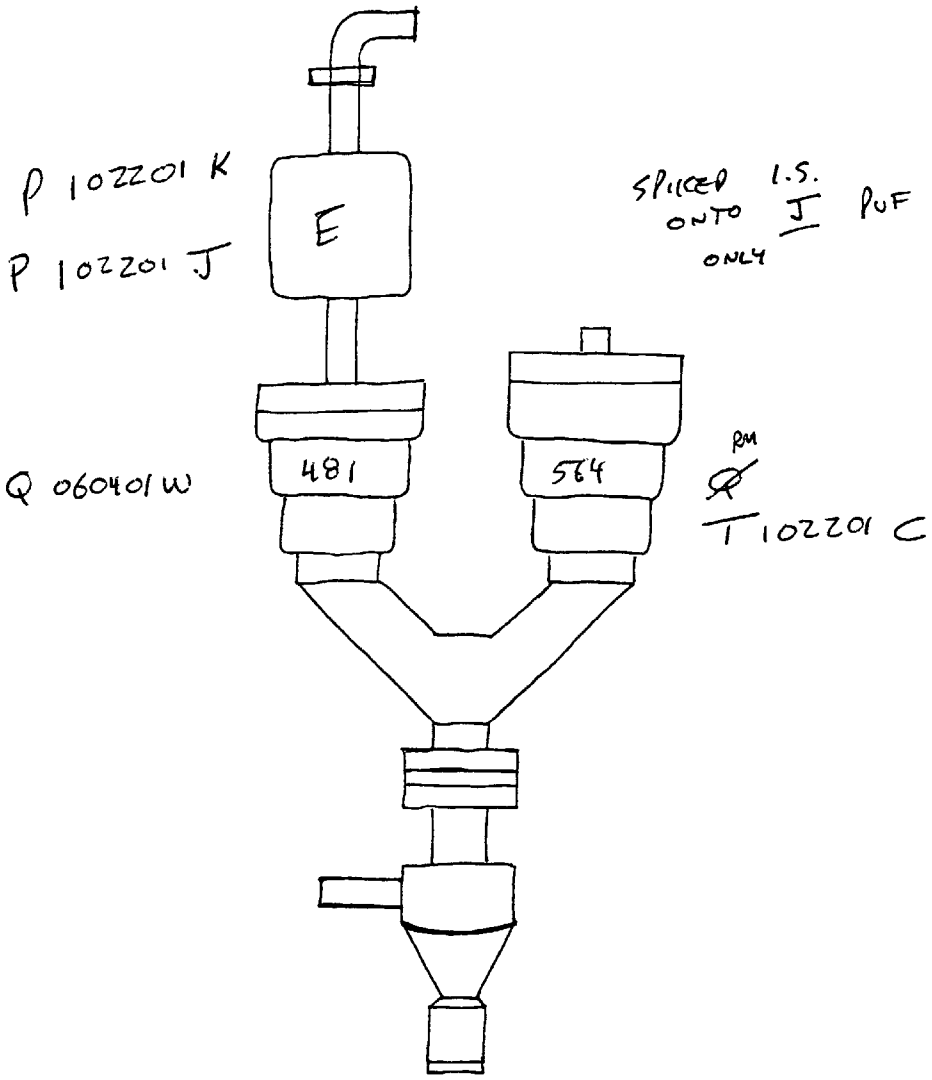
BY: DATE: WEDNESDAY

CHKD: DATE: 11/28/01

PAGE 1

SHEET 1

#1 DILUTION



ARCADIS
GERAGHTY & MILLER

SUBJECT: TEST 2

JOB NO: HB 112801 H

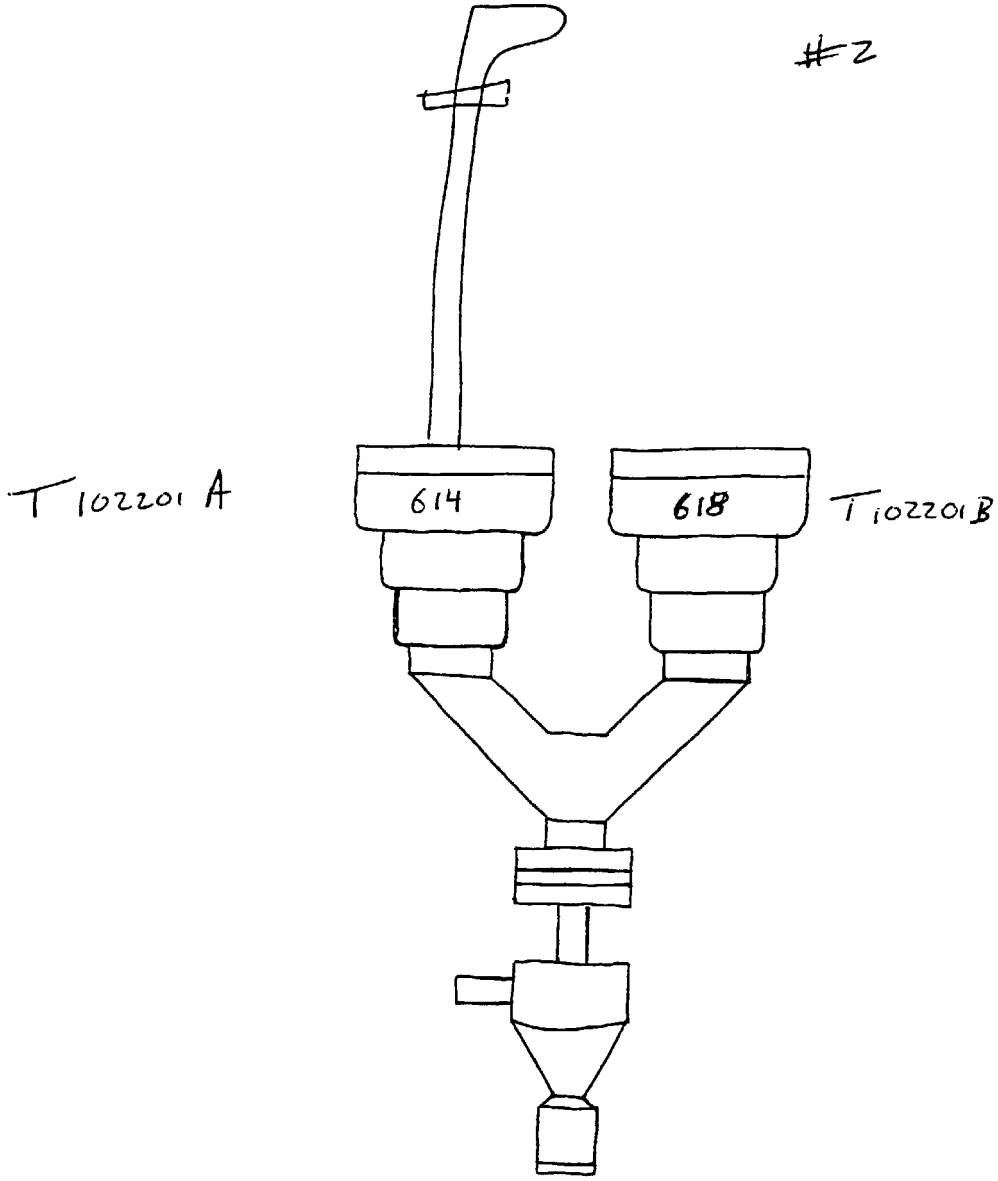
BY: [illegible] DATE:

CHKD: DATE: 11/28

PAGE 2

SHEET 1

#2



ARCADIS
GERAGHTY & MILLER

SUBJECT: TEST 2

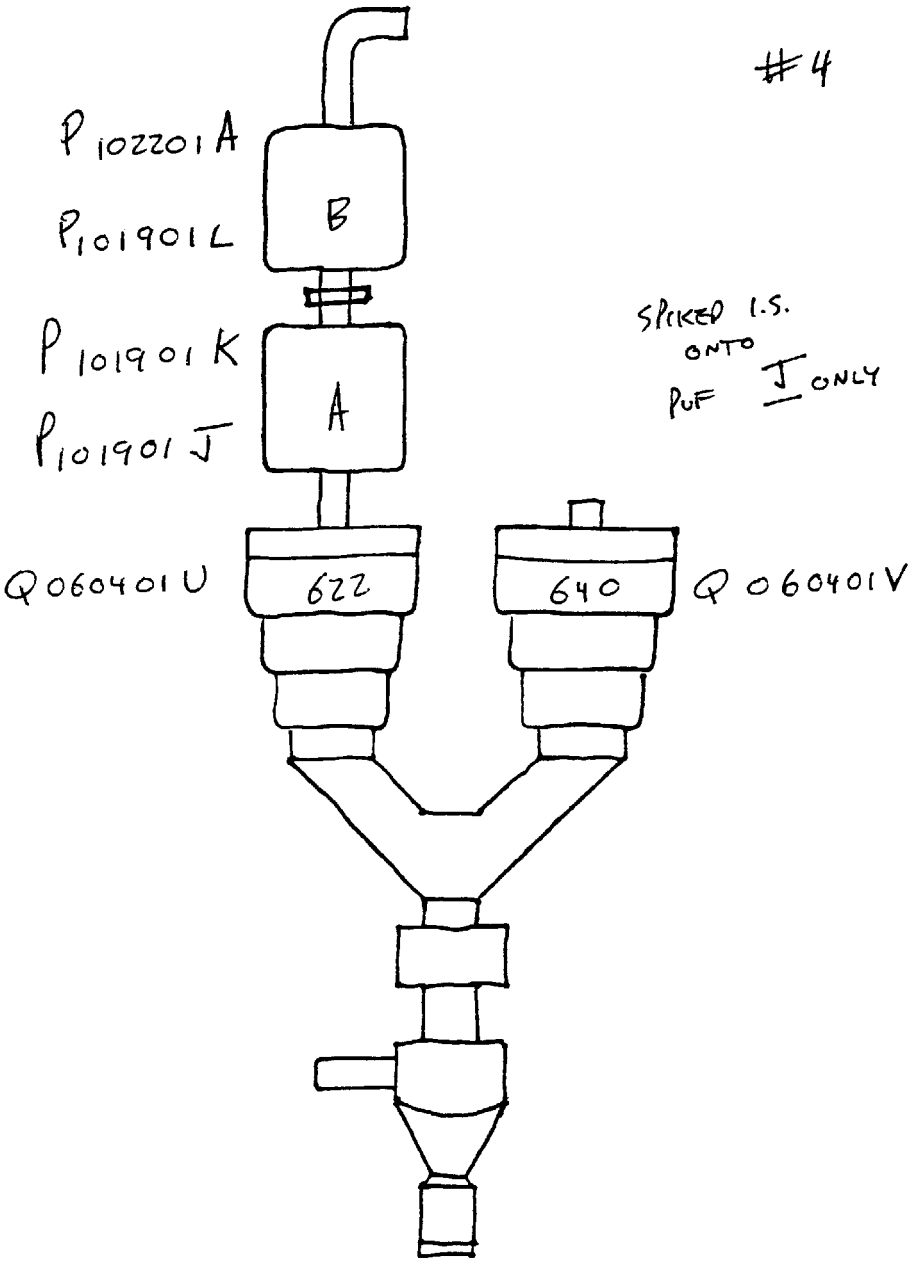
JOB NO: HB 112801 H

BY: JT DATE:

CHKD: DATE: 11/28

PAGE 3

SHEET 1



ARCADIS
GERAGHTY & MILLER

SUBJECT: TEST 2

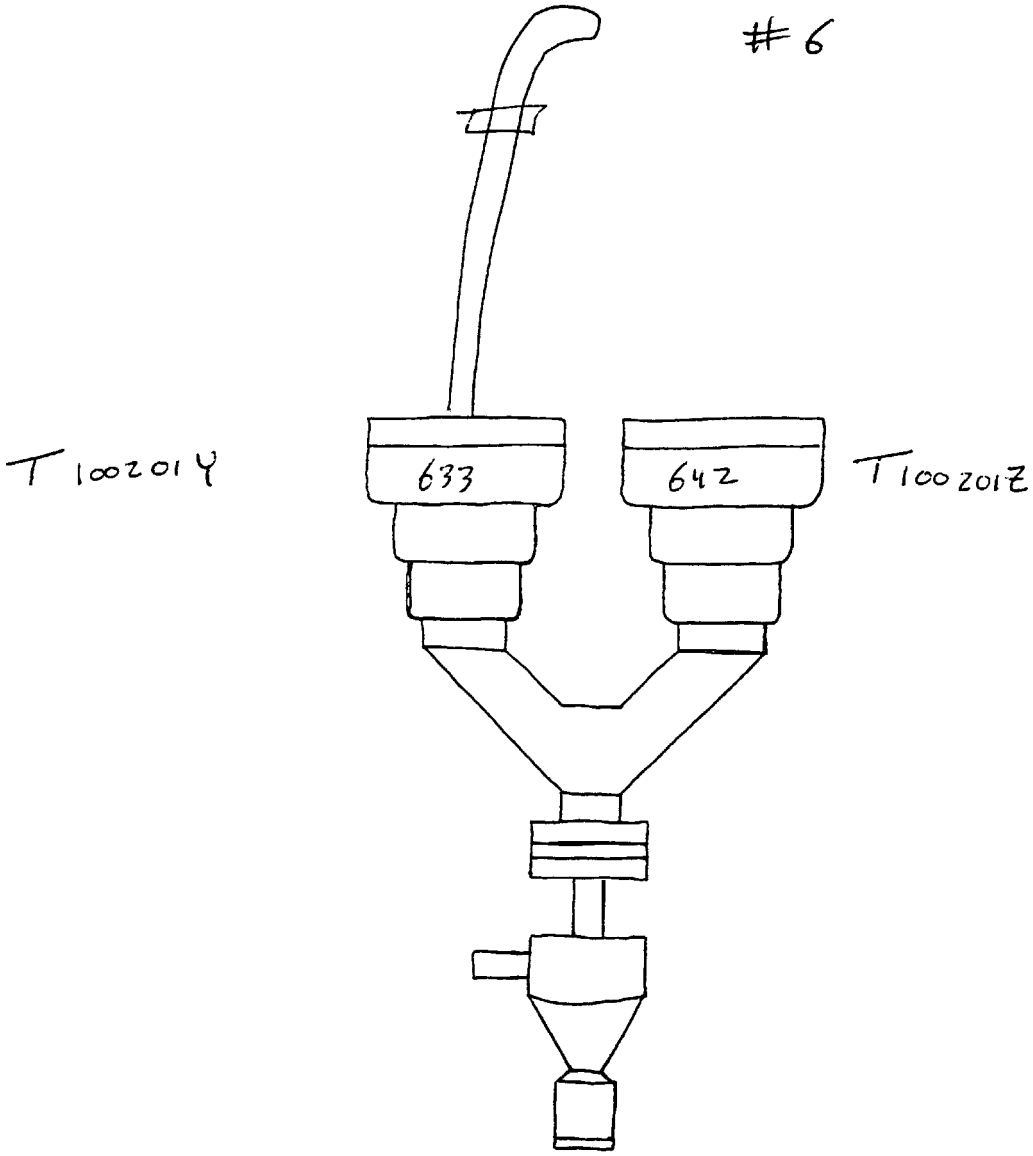
JOB NO: HB 112801 H

BY: [illegible] DATE:

CHKD: DATE: 11/28/01

PAGE 4

SHEET 1



ARCADIS
GERAGHTY & MILLER

SUBJECT: TEST 2

JOB NO: HB 112801 H

BY: DATE:

CHKD: DATE: 11/28

PAGE 5

SHEET 1

#8

P 102201 E

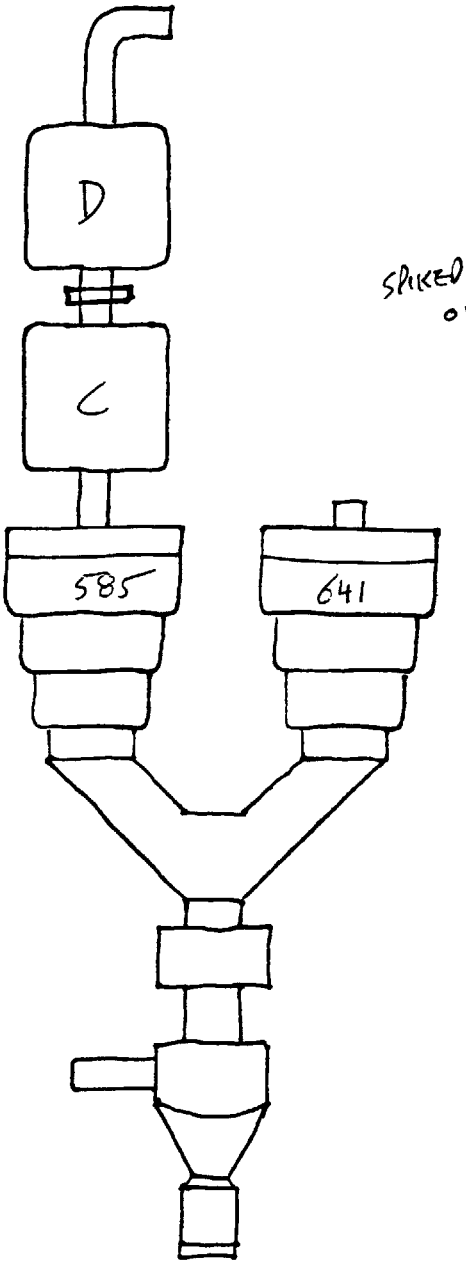
P 102201 D

P 102201 C

P 102201 B

Q 060401 S

Q 060401 T



SPIKED I.S. ONTO PUF B ONLY

ARCADIS
GERAGHTY & MILLER

SUBJECT: TEST 2

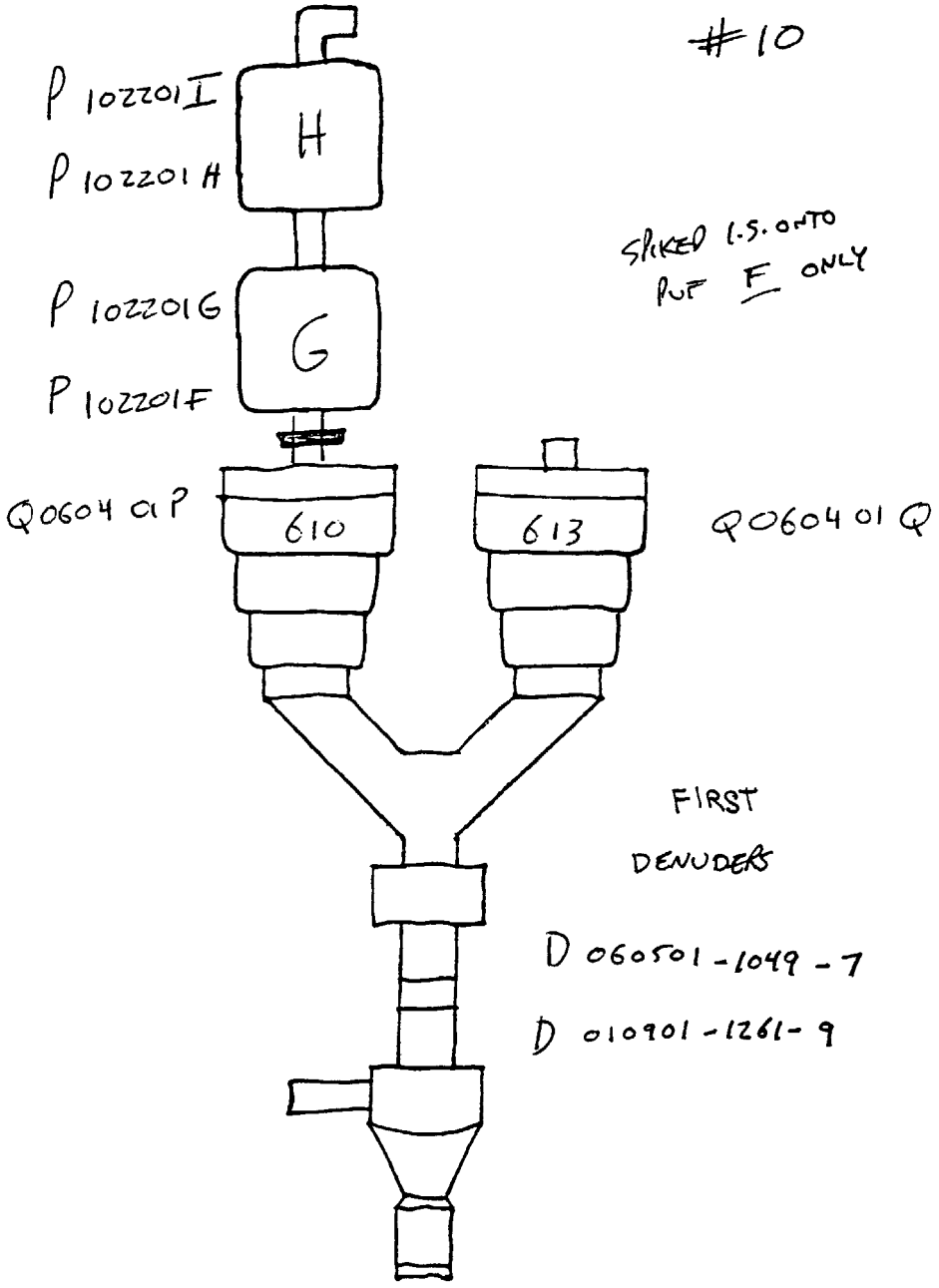
JOB NO: HB112801 H

BY: JB DATE:

CHKD: DATE: 11/28

PAGE 6

SHEET 1



ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

Page 1 of 5

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (*Signature*): Rob Mentz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYL			REMARKS	SAM ID NO. (*For lab use only*)
HB 112801 H	Pd 1 A 1 E	11/28/01		✓									P102201 J	
	Pd 1 A 2 E			✓									P102201 K	
	Qd 1 A 1 481				✓								Q 060401 W	
	Td 1 B 1 584					✓							T102201 C	
	Tn 2 A 1 614					✓							T102201 A	
	Tn 2 B 1 618					✓							T102201 B	
	Qn 4 A 1 622				✓								Q 060401 U	
	Qn 4 B 1 640				✓								Q 060401 V	
	Pn 4 A 1 A			✓									P101901 J	
	Pn 4 A 2 A			✓									P101901 K	

REMARKS: TEST #2 WEDNESDAY 11/28/01

RELINQUISHED BY: Rob Mentz — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mantz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYL			REMARKS	SAM ID NO. (For lab use only)
HB112801H	Pr4 A3B	11/28/01		✓									P101901 L	
	Pr4 A4B			✓									P102201 A	
	Tr6 A1633					✓							T100201 Y	
	Tr6 B1642					✓							T100201 Z	
	Pr8 A1C			✓									P102201 B	
	Pr8 A2C			✓									P102201 C	
	Pr8 A3D			✓									P102201 D	
	Pr8 A4D			✓									P102201 E	
	Qr8 A1585				✓								Q060401 S	
	Qr8 B1641				✓								Q060401 T	

REMARKS: TEST #2 WEDNESDAY 11/28/01

RELINQUISHED BY:	DATE	TIME
Rob Mantz		

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

Page 3 of 5

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mons

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYL			REMARKS	SAM ID NO. (For lab use only)
HB 112801 H	Sd 2 A1 S T2	11/28/01							✓				# 4037	
	Hd 3 A1 H1 T2									✓			CARB 1 FR	(T2
	Hd 3 A2 H2 T2									✓			CARB 2	IS
	Hd 3 A3 H3 T2									✓			CARB 3 BACK	TEST
	Sn 5 A1 S T2								✓				# 4044	2)
	Hn 3 A1 H1 T2									✓			CARB 1 FR	
	Hn 3 A2 H2 T2									✓			CARB 2	
	Hn 3 A3 H3 T2									✓			CARB 3 BACK	
	Qd ϕ A1 8x10				✓								ERG # 003	

REMARKS: T2 = TEST 2 — TEST # 2 WEDNESDAY 11/28/01

RELINQUISHED BY:	DATE	TIME
Rob Mons		

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mantz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYL			REMARKS	SAM ID NO. (For lab use only)
HB 112801 H	Pr 10 A1 G	11/28/01		✓									P102201 F	
	Pr 10 A2 G			✓									P102201 G	
	Pr 10 A3 H			✓									P102201 H	
	Pr 10 A4 H			✓									P102201 I	
	Qr 10 A1 610				✓								Q060401 P	
	Qr 10 B1 613				✓								Q060401 Q	
	Dr 10 A1 1261-9					1(	✓						D010901-12	61-9 PAIR
	Dr 10 A2 1049-7						✓						D060501-10	49-7 1
	Dr 10 A1 1259-9					1(	✓						D010901-12	59-9 PAIR
	Dr 10 A2 1551-7						✓						D042601-15	51-7 2

REMARKS: 11/28/01 TEST # 2 WEDNESDAY

RELINQUISHED BY: Rob Mantz — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mantz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER	OTHER	SUMMA	CARBONYL			REMARKS	SAM ID NO. (For lab use only)	
H8 112801 H	D-10 A1-1013-8	11/28/01				1	✓						D060501-101	3-8	PAIR
	D-10 A2 995-9					1	✓						D071900-99	5-9	3
	D-10 A1 1261-10					1	✓						D010901-126	1-10	PAIR
	D-10 A2 1049-8					1	✓						D060501-104	9-8	4
	#2 HOG BOILER COAL							✓					ZIPLOCK BAG		
	#2 HOG FUEL (WOOD)							✓					ZIPLOCK BAG		
	CONDENSIBLE GASES HOG B. FUEL							✓					#1185-1966-07		

REMARKS: 11/28/01 TEST #2 WEDNESDAY

RELINQUISHED BY: Rob Mantz — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS: DENUDER COLLECTION ON TEST 2 DAY WAS: 1/2 hr, 1 hr, 2 hr, 4 hr. samples

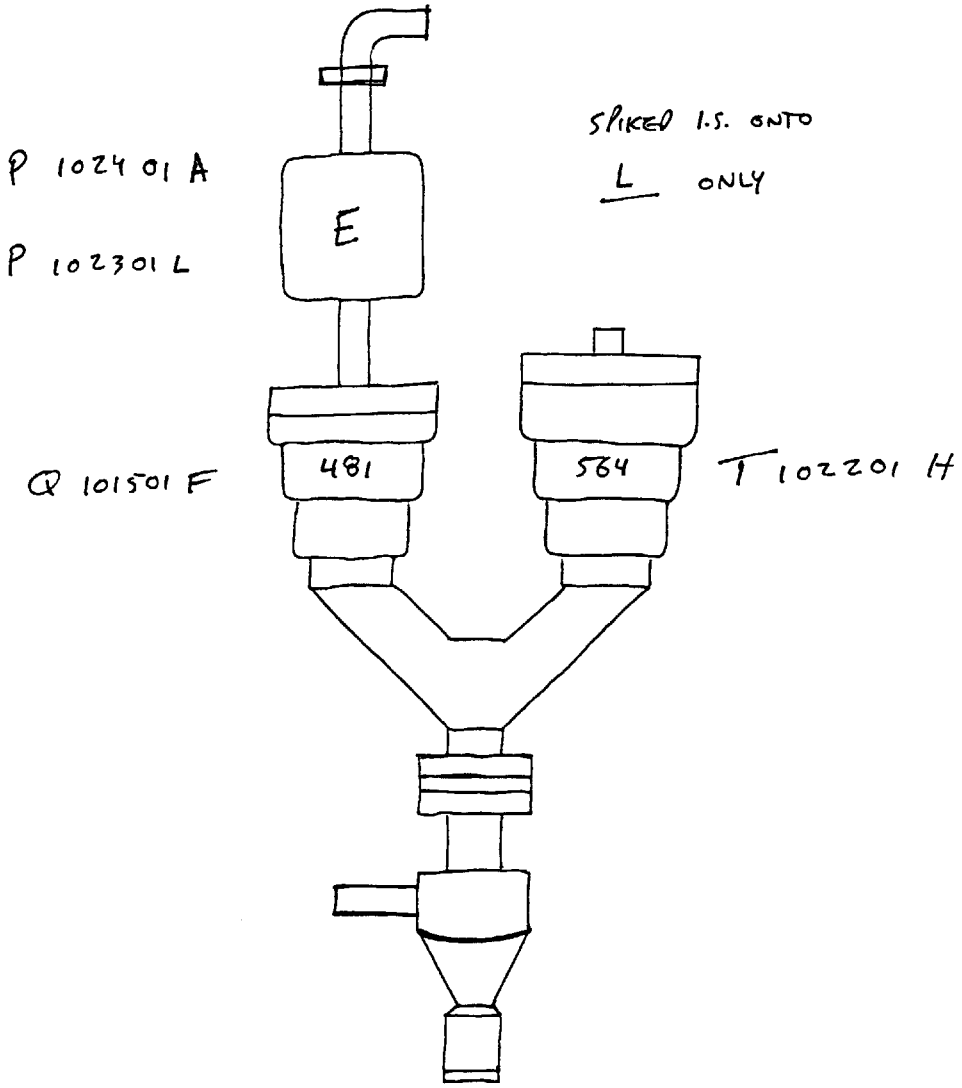
ARCADIS
GERAGHTY & MILLER

SUBJECT: WEYERHAEUSER HOG BOILER
TEST 3
JOB NO: HB 112901H

BY: DATE:
CHKD: THURSDAY DATE: 11/29/01

PAGE 1
SHEET 1

~~#~~ 1
DILUTION



ARCADIS
GERAGHTY & MILLER

SUBJECT: WEYERHAEUSER TEST 3

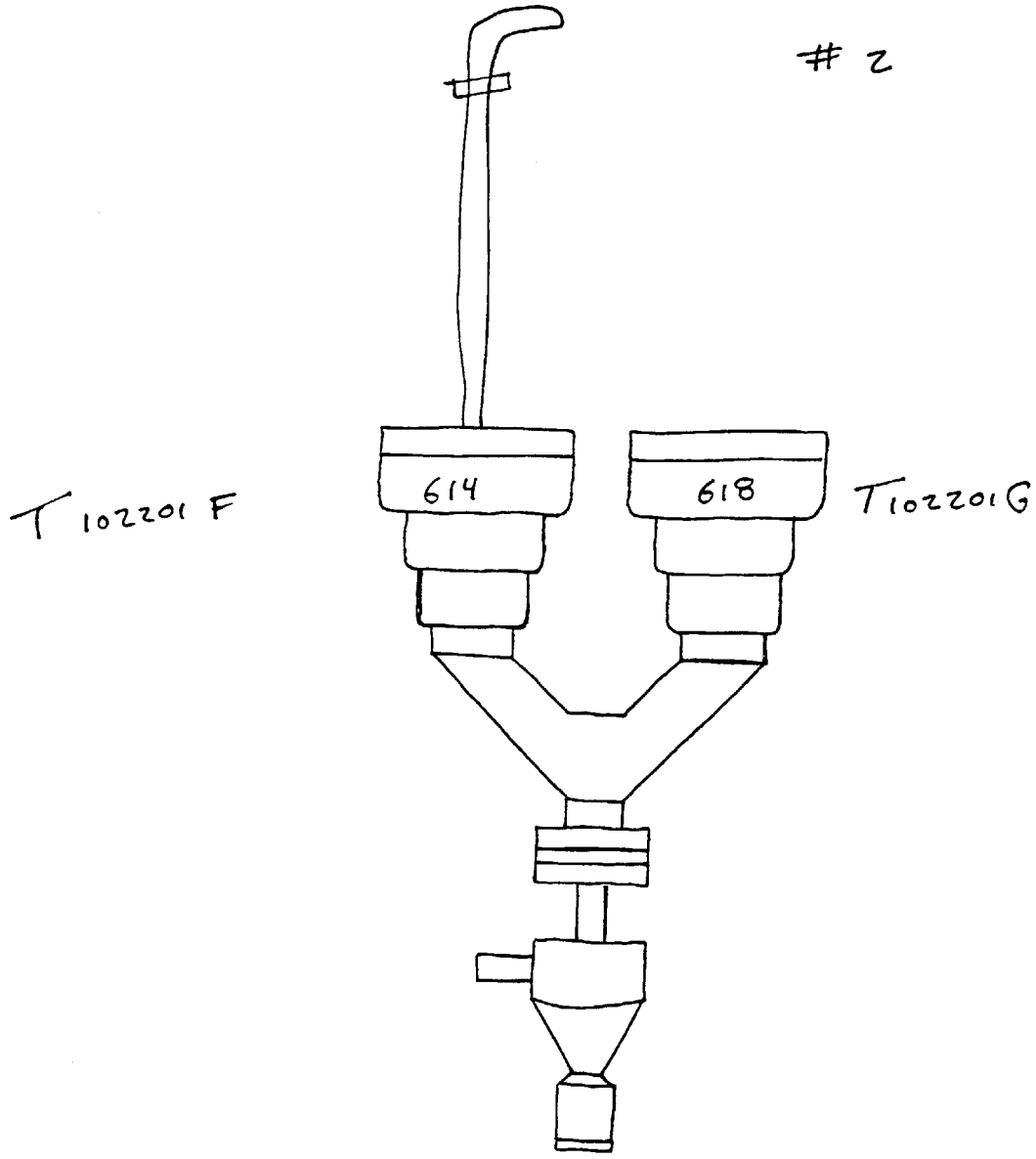
JOB NO: HB 112901 H

BY: DATE:

CHKD: DATE: 11/29

PAGE 2

SHEET 1



ARCADIS GERAGHTY & MILLER

SUBJECT: TEST 3

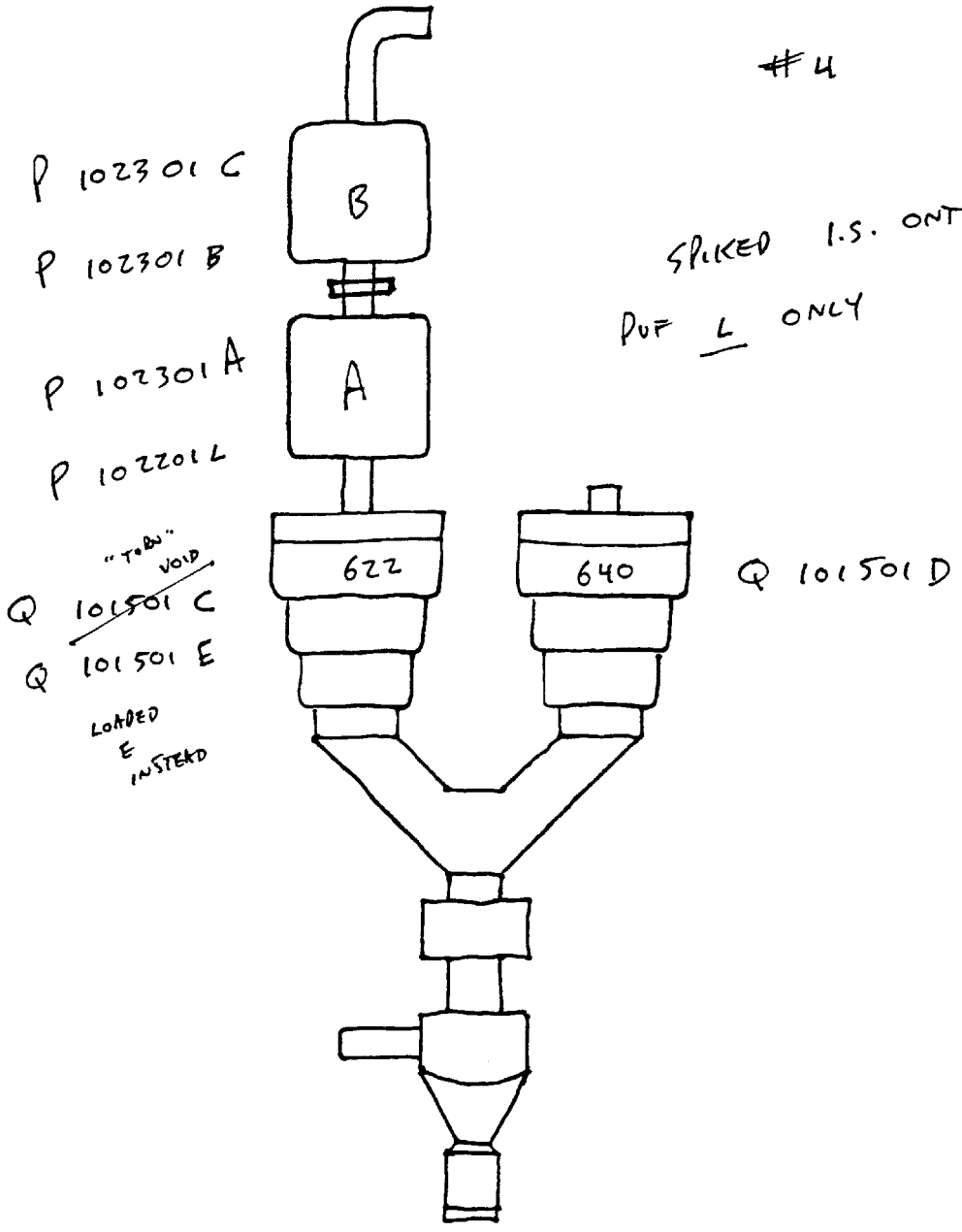
JOB NO: HB 112901 H

BY: DATE:

CHKD: DATE: 11/29

PAGE 3

SHEET 1



ARCADIS
GERAGHTY & MILLER

SUBJECT: TEST 3

JOB NO: HB 112901 H

BY: DATE:

CHKD: DATE: 11/29

PAGE 4

SHEET 1

#6

T102201 D

633

642

T102201 E

ARCADIS GERAGHTY & MILLER

SUBJECT: TEST 3

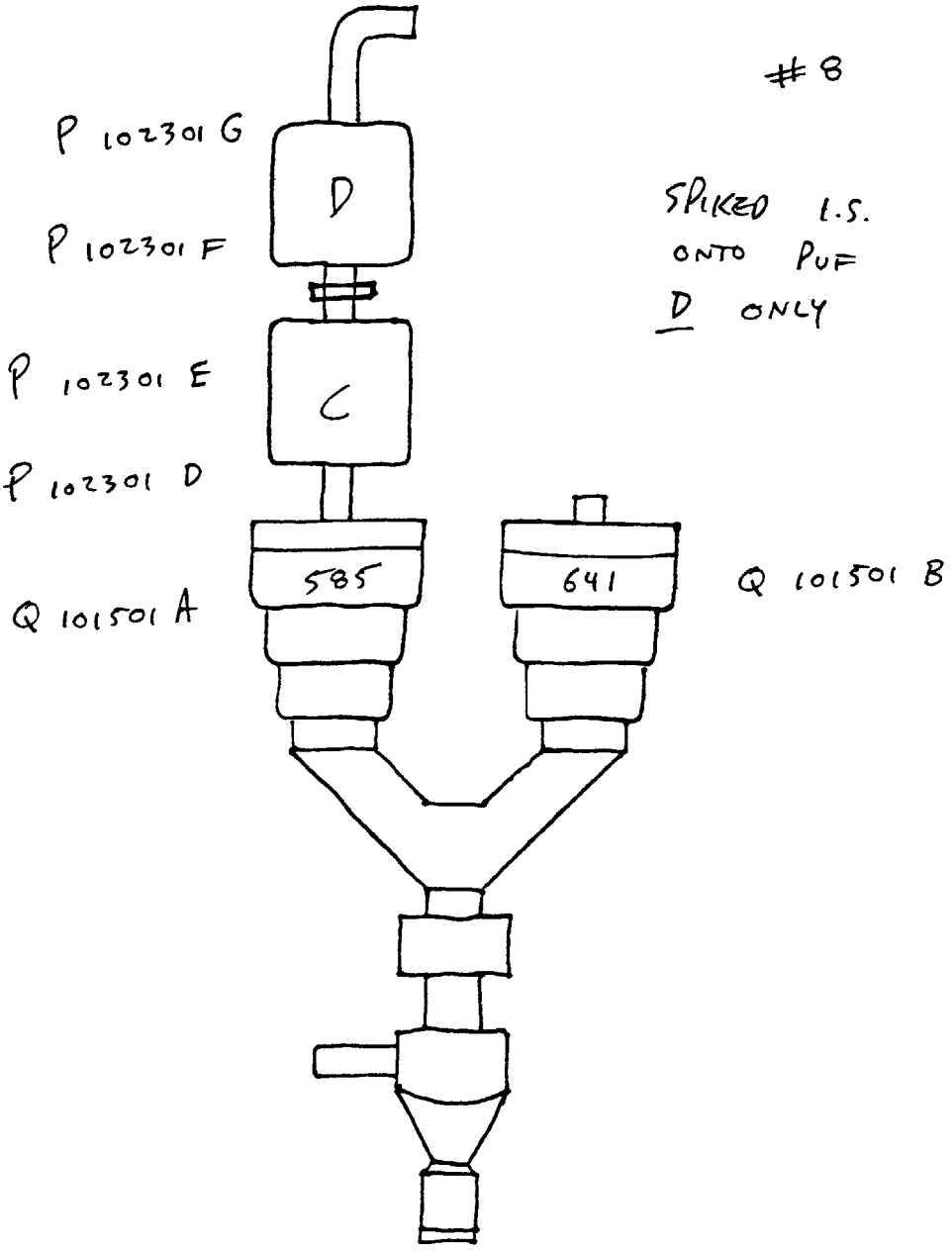
JOB NO: HB 112901 H

BY: JT DATE:

CHKD: DATE: 11/29

PAGE 5

SHEET 1



ARCADIS GERAGHTY & MILLER

SUBJECT: TEST 3

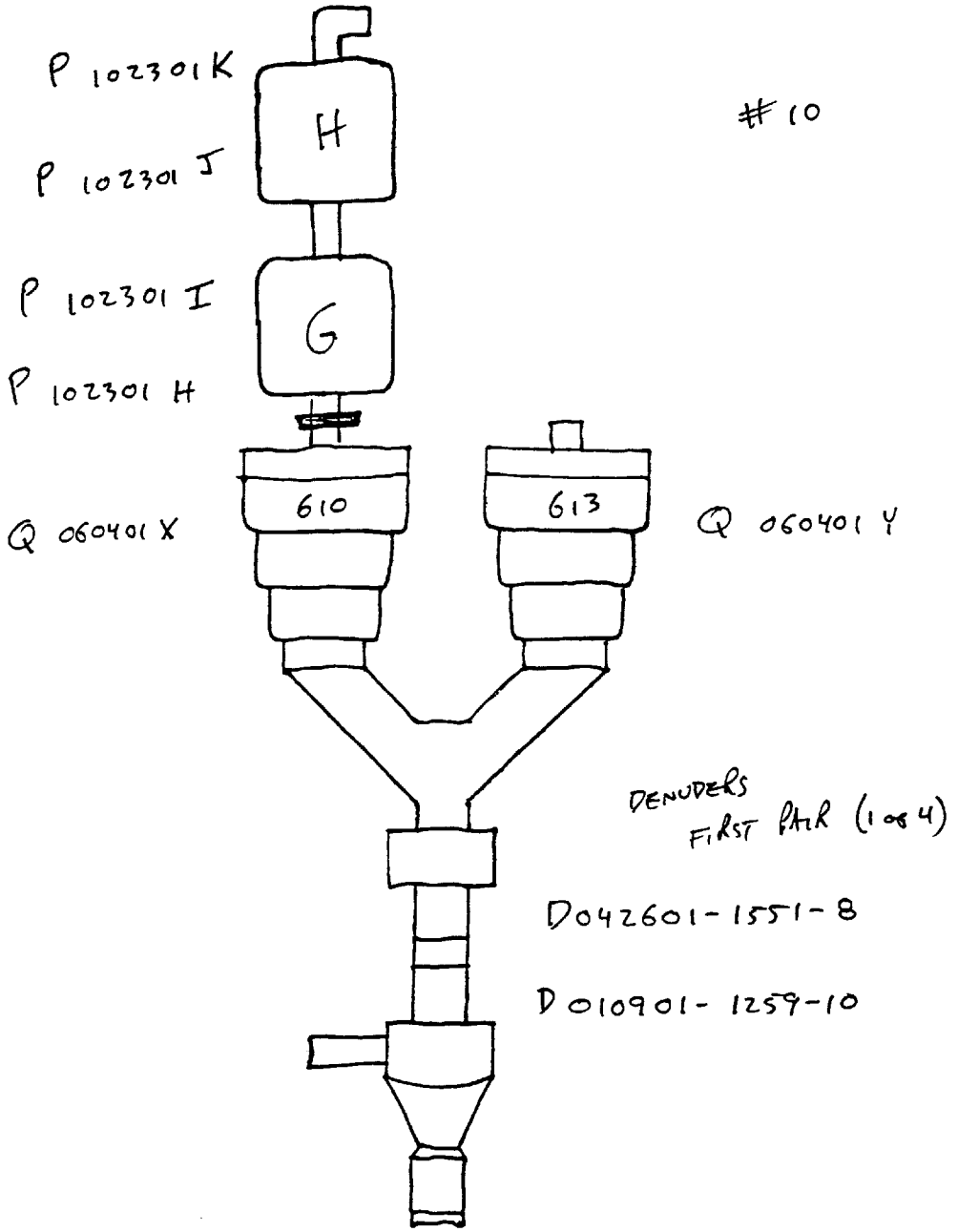
JOB NO: HB 112901 H

BY: JB DATE:

CHKD: DATE: 11/29

PAGE 6

SHEET 1



ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mangt

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYLS			REMARKS	SAM ID NO. (For lab use only)
HB112901H	Pd1A1E	11/29/01		✓									P102301L	
	Pd1A2E			✓									P102401A	
	Qd1A1481				✓								Q101501F	
	Td1B1564					✓							T102201H	
	Tn2A1614					✓							T102201F	
	Tn2B1618					✓							T102201G	
	Qn4A1622				✓								Q101501E	
	Qn4B1640				✓								Q101501D	
	Pn4A1A			✓									P102201L	
	Pn4A2A			✓									P102301A	

REMARKS: TEST # 3 THURSDAY 11/29/01

RELINQUISHED BY: Rob Mangt — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mentz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYLS			REMARKS	SAM ID NO. (For lab use only)
HB 112901 H	Pr 4 A3 B	11/29/01		✓									P102301 B	
	Pr 4 A4 B			✓									P102301 C	
	Tr 6A1 633					✓							T102201 D	
	Tr 6 B1 642					✓							T102201 E	
	Pr 8 A1 C			✓									P102301 D	
	Pr 8 A2 C			✓									P102301 E	
	Pr 8 A3 D			✓									P102301 F	
	Pr 8 A4 D			✓									P102301 G	
	Qr 8 A1 585				✓								Q101501 A	
	Qr 8 B1 641				✓								Q101501 B	

REMARKS: TEST #3 THURSDAY 11/29/01

RELINQUISHED BY: Rob Mentz — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

PROJECT: WEYERHAEUSER HOG Boiler

SITE: Plymouth, NC

COLLECTED BY (Signature): Rob Mantz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	PUF	QF	TF	DENUDER		SUMMA	CARBONYLS		REMARKS	SAM ID NO. (For lab use only)
HB 112901 H	Sd 2 A1 S T3	11/29/01							✓			# 3552	
	Hd 3 A1 H1 T3									✓		CARB 1 FR	(T3
	Hd 3 A2 H2 T3									✓		CARB 2	15
	Hd 3 A3 H3 T3									✓		CARB 3 BACK	TEST 3)
	Sn 5 A1 S T3								✓			# 1484	
	Hn 3 A1 H1 T3									✓		CARB 1 FR	
	Hn 3 A2 H2 T3									✓		CARB 2	
	Hn 3 A3 H3 T3									✓		CARB 3 BACK	
	Qd ϕ A1 8x10				✓							ERG # 002	

REMARKS: TEST #3 THURSDAY 11/29/01

RELINQUISHED BY: Rob Mantz — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mentz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER		SUMMA	CARBONYLS			REMARKS	SAM ID NO. (For lab use only)
HB112901H	Pr10 A1 G	11/29/01		✓									P102301H	
	Pr10 A2 G			✓									P102301I	
	Pr10 A3 H			✓									P102301J	
	Pr10 A4 H			✓									P102301K	
	Qr10 A1 610				✓								Q060401X	
	Qr10 B1 613				✓								Q060401Y	
	Dr10 A1 1259-10					1(	✓						D010901-1259-10	PAIR
	Dr10 A2 1551-8					1(	✓						D042601-1551-8	1
	Dr10 A1 1013-9					1(	✓						D060501-1013-9	PAIR
	Dr10 A2 995-10					1(	✓						D071900-995-10	2

REMARKS: TEST # 3 THURSDAY 11/29/01

RELINQUISHED BY: Rob Mentz — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS:

ERG
EASTERN RESEARCH GROUP, INC.

Chain of Custody Record

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mentz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER	ELPI - FOILS	SUMMA	CARBONYLS	REMARKS	SAM ID NO. (For lab use only)
HB112901H	D010A1 1261-11	11/29/01				1	✓				D010901-1261-1	1 PAIR
	D010A2 1049-9					1	✓				D060501-1049-9	3
	D010A1 1259-11					1	✓				D010901-125 9-11	PAIR
	D010A2 1551-9					1	✓				D042601-155 1-9	4
	FnTA1 Foil 13							✓			A101601 P	
	FnTA1 Foil 12							✓			A101601 Q	
	FnTA1 Foil 11							✓			A101601 R	
	FnTA1 Foil 10							✓			A101601 S	
	FnTA1 Foil 9							✓			A101601 T	

REMARKS: TEST # 3 THURSDAY 11/29/01

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
									Rob Mentz		

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY	DATE	TIME	TEMP°C	SEAL #	CONDITION

REMARKS: ELPI FOILS RECOVERED FROM A 3-DAY ACCUMULATION IN ELPI IMPACTOR UNIT

ERG
EASTERN RESEARCH GROUP, INC

Chain of Custody Record

PROJECT: WEYERHAEUSER HOG BOILER

SITE: PLYMOUTH, NC

COLLECTED BY (Signature): Rob Mentz

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	NO. OF CONTAINERS	ANALYSES: PUF	QF	TF	DENUDER	SUMMA	CARBONYLS	EPI-FOILS			REMARKS	SAM ID NO. (For lab use only)
HB 112901 H	FNT A1 FOIL 8	11/29/01								✓			A101601 U	
	FNT A1 FOIL 7									✓			A101601 V	
	FNT A1 FOIL 6									✓			A101601 W	
	FNT A1 FOIL 5									✓			A101601 X	
	FNT A1 FOIL 4									✓			A101601 Y	
	FNT A1 FOIL 3									✓			A101701 A	
	FNT A1 FOIL 2									✓			A101701 B	
	FNT A1 FOIL 1									✓			A101701 C	
	FNT A1 FOIL FB									✓			A101701 D	FIELD BLANK

REMARKS: TEST # 3 THURSDAY 11/29/01

RELINQUISHED BY: Rob Mentz — DATE — TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

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REMARKS:

Appendix C

Example Calculations: NMOC, Carbonyl, and $PM_{2.5}$ Mass Emission Factors

Contents

Table C-1. Calculation of Mass Emission Rates: Speciated NMOC (SNMOC), Hogged Fuel Boiler (11/27/01)

Parameters Required		Value	Units
Mass of Analyte in Total Combustion Air		0.1757	µg
Mass Fuel Consumed		378,529	kg
Combustion Airflow Rate (Average)		164418.761	sft^3/min[a]
Run Time		478.67	min
Venturi Flow Rate (Average)		18.75	sL/min[b]
Dilution Airflow Rate (Average)		843.92	sL/min
Flow Rate at Sample Collection Unit		0.0081	L/min
Calculations			
Total Volume of Air Sampled		2228602026	L
Volume of Combustion Air Sampled		8975.0625	L
Volume of Dilution Air		403959.1864	L
Dilution Ratio		46.0091	
Mass Flow Rate of SNMOC in Diluted Sample		0.0452	µg/L
Mass Flow Rate of SNMOC in Undiluted Sample		2.0782	µg/L
Total Mass of SNMOC in Sampled Air		18652.2526	µg
SNMOC in Total Combustion Air		4631549685	µg
Mass Emission Rate of SNMOC		12235.6567	µg/kg
		12.2357	mg/kg
Mass SNMOC Collected			
Volume Canister = Flow Rate into Canister×Test Duration			
Test Duration	478.67 min	*Volume:*	
Flow Rate, Dilution Air Canister	0.008125 L/min	3.8892	L
Flow Rate, Residence Chamber Canister	0.008125 L/min	3.8892	L
Mass SNMOC Collected = [SNMOC Conc.]×Volume Canister			
SNMOC RC[c] = 68.61 µg/m^3 = 68.61 ng/L = 0.06861 µg/L		0.2668	µg
SNMOC DA[d] = 23.44 µg/m^3 = 23.44 ng/L = 0.2344 µg/L		0.0912	µg
Mass SNMOC Collected		0.1757	µg
Residence Chamber	68.61 µg/m^3		
Dilution Air	23.44 µg/m^3		

[a] sft^3/min = cubic feet per minute at standard temperature and pressure.
[b] sL/min = liters per minute at standard temperature and pressure.
[c] RC = residence chamber.
[d] DA = dilution air.

Table C-2. Calculation of Mass Emission Rates: Speciated NMOC (SNMOC), Hogged Fuel Boiler (11/28/01)[a]

Parameters Required		Value	Units
Mass of Analyte in Total Combustion Air		0.3890	µg
Mass Fuel Consumed		405,633	kg
Combustion Airflow Rate (Average)		164418.761	sft^3/min[b]
Run Time		480.17	min
Venturi Flow Rate (Average)		18.72	sL/min[c]
Dilution Airflow Rate (Average)		843.82	sL/min
Flow Rate at Sample Collection Unit		0.0081	L/min
Calculations			
Total Volume of Combustion Air		2235585758	L
Volume of Combustion Air Sampled		8988.7824	L
Volume of Dilution Air		405177.0494	L
Dilution Ratio		46.0759	
Mass Flow Rate of SNMOC in Diluted Sample		0.0997	µg/L
Mass Flow Rate of SNMOC in Undiluted Sample		4.5946	µg/L
Total Mass of SNMOC in Sampled Air		41300.2026	µg
SNMOC in Total Combustion Air		10271707622	µg
Mass Emission Rate of SNMOC		25322.6377	µg/kg
		25.3226	mg/kg
Mass SNMOC Collected			
Volume Canister = Flow Rate into Canister×Test Duration			
Test Duration	480.17 min	*Volume:*	
Flow Rate, Dilution Air Canister	0.008125 L/min	3.9014	L
Flow Rate, Residence Chamber Canister	0.008125 L/min	3.9014	L
Mass SNMOC Collected = [SNMOC Conc.]×Volume Canister			
SNMOC RC[d] = 123.13 µg/m^3 = 123.13 ng/L = 0.12313 µg/L		0.4804	µg
SNMOC DA[e] = 23.42 µg/m^3 = 23.42 ng/L = 0.2342 µg/L		0.0912	µg
Mass SNMOC Collected		0.3890	µg
Residence Chamber	123.13 µg/m^3		
Dilution Air	23.42 µg/m^3		

[a] n-hexane deleted from 11/28/01 data as a contaminant.
[b] sft^3/min = cubic feet per minute at standard temperature and pressure.
[c] sL/min = liters per minute at standard temperature and pressure.
[d] RC = residence chamber.
[e] DA = dilution air.

Table C-3. Calculation of Mass Emission Rates: Speciated NMOC (SNMOC), Hogged Fuel Boiler (11/29/01)

Parameters Required		Value	Units
Mass of Analyte in Total Combustion Air		0.1887	µg
Mass Fuel Consumed		216755.56	kg
Combustion Airflow Rate (Average)		164,419	sft^3/min[a]
Run Time		480.5	min
Venturi Flow Rate (Average)		18.77	sL/min[b]
Dilution Airflow Rate (Average)		845.52	sL/min
Flow Rate at Sample Collection Unit		0.0081	L/min
Calculations			
Total Volume of Combustion Air		2237122179	L
Volume of Combustion Air Sampled		9018.985	L
Volume of Dilution Air		406272.36	L
Dilution Ratio		46.0464	
Mass Flow Rate of SNMOC in Diluted Sample		0.0483	µg/L
Mass Flow Rate of SNMOC in Undiluted Sample		2.2259	µg/L
Total Mass of SNMOC in Sampled Air		20075.1836	µg
SNMOC in Total Combustion Air		4979566827	µg
Mass Emission Rate of SNMOC		22973.1908	µg/kg
		22.9732	mg/kg
Mass SNMOC Collected			
Volume Canister = Flow Rate into Canister×Test Duration			
Test Duration	480.5 min	*Volume:*	
Flow Rate, Dilution Air Canister	0.008125 L/min	3.9041	L
Flow Rate, Residence Chamber Canister	0.008125 L/min	3.9041	L
Mass SNMOC Collected = [SNMOC Conc.]×Volume Canister			
SNMOC RC[c] = 66.32 µg/m^3 = 66.32 ng/L = 0.06632 µg/L		0.2589	µg
SNMOC DA[d] = 17.98 µg/m^3 = 17.98 ng/L = 0.1798 µg/L		0.0702	µg
Mass SNMOC Collected		0.1887	µg
Residence Chamber	66.32 µg/m^3		
Dilution Air	17.98 µg/m^3		

[a] sft^3/min = cubic feet per minute at standard temperature and pressure.
[b] sL/min = liters per minute at standard temperature and pressure.
[c] RC = residence chamber.
[d] DA = dilution air.

Table C-4. Calculation of Mass Emission Rates: Total (Speciated + Unspeciated) NMOC, Hogged Fuel Boiler (11/27/01)

Parameters Required		Value	Units
Mass of Analyte in Total Combustion Air		0.1623	µg
Mass Fuel Consumed		378,529	kg
Combustion Airflow Rate (Average)		164418.761	sft^3/min[a]
Run Time		478.67	min
Venturi Flow Rate (Average)		18.75	sL/min[b]
Dilution Airflow Rate (Average)		843.92	sL/min
Flow Rate at Sample Collection Unit		0.0081	L/min
Calculations			
Total Volume of Air Sampled		2228602026	L
Volume of Combustion Air Sampled		8975.0625	L
Volume of Dilution Air		403959.186	L
Dilution Ratio		46.0091	
Mass Flow Rate of Total NMOC in Diluted Sample		0.0417	µg/L
Mass Flow Rate of Total NMOC in Undiluted Sample		1.9195	µg/L
Total Mass of Total NMOC in Sampled Air		17227.5995	µg
Total NMOC in Total Combustion Air		4277793410	µg
Mass Emission Rate of Total NMOC		11301.1012	µg/kg
		11.3011	mg/kg
Mass SNMOC Collected			
Volume Canister = Flow Rate into Canister×Test Duration			
Test Duration	478.67 min	*Volume:*	
Flow Rate, Dilution Air Canister	0.008125 L/min	3.8892	L
Flow Rate, Residence Chamber Canister	0.008125 L/min	3.8892	L
Mass SNMOC Collected = [SNMOC Conc.]×Volume Canister			
SNMOC RC[c] = 79.31 µg/m^3 = 79.31 ng/L = 0.07931 µg/L		0.3085	µg
SNMOC DA[d] = 37.59 µg/m^3 = 37.59 ng/L = 0.3759 µg/L		1462.0000	µg
Mass SNMOC Collected			
		0.1623	µg
Residence Chamber	79.31 µg/m^3		
Dilution Air	37.59 µg/m^3		

[a] sft^3/min = cubic feet per minute at standard temperature and pressure.
[b] sL/min = liters per minute at standard temperature and pressure.
[c] RC = residence chamber.
[d] DA = dilution air.

Table C-5. Calculation of Mass Emission Rates: Total (Speciated + Unspeciated) NMOC, Hogged Fuel Boiler (11/28/01)[a]

Parameters Required		Value	Units
Mass of Analyte in Total Combustion Air		0.5234	µg
Mass Fuel Consumed		405,633	kg
Combustion Airflow Rate (Average)		164418.76	sft^3/min[b]
Run Time		480.17	min
Venturi Flow Rate (Average)		18.72	sL/min[c]
Dilution Airflow Rate (Average)		843.82	sL/min
Flow Rate at Sample Collection Unit		0.0081	L/min
Calculations			
Total Volume of Combustion Air		2235585758	L
Volume of Combustion Air Sampled		8988.7824	L
Volume of Dilution Air		405177.05	L
Dilution Ratio		46.0759	
Mass Flow Rate of Total NMOC in Diluted Sample		0.1342	µg/L
Mass Flow Rate of Total NMOC in Undiluted Sample		6.1820	µg/L
Total Mass of Total NMOC in Sampled Air		55568.6297	µg
Total NMOC in Total Combustion Air		1.382×10^{10}	µg
Mass Emission Rate of Total NMOC		34071.1228	µg/kg
		34.0711	mg/kg
Mass SNMOC Collected			
Volume Canister = Flow Rate into Canister×Test Duration			
Test Duration	480.17 min	*Volume:*	
Flow Rate, Dilution Air Canister	0.008125 L/min	3.9014	L
Flow Rate, Residence Chamber Canister	0.008125 L/min	3.9014	L
Mass SNMOC Collected = [SNMOC Conc.]×Volume Canister			
SNMOC RC[d] = 161.11 µg/m³ = 161.11 ng/L = 0.1611 µg/L		0.6286	µg
SNMOC DA[e] = 26.94 µg/m³ = 26.94 ng/L = 0.0269 µg/L		0.1051	µg
Mass SNMOC Collected			
		0.5234	µg
Residence Chamber	161.11 µg/m³		
Dilution Air	26.94 µg/m³		

[a] n-hexane deleted from 11/28/01 data as a contaminant.
[b] sft^3/min = cubic feet per minute at standard temperature and pressure.
[c] sL/min = liters per minute at standard temperature and pressure.
[d] RC = residence chamber.
[e] DA = dilution air.

Table C-6. Calculation of Mass Emission Rates: Total (Speciated + Unspeciated) NMOC, Hogged Fuel Boiler (11/29/01)

Parameters Required		Value	Units
Mass of Analyte in Total Combustion Air		0.1978	µg
Mass Fuel Consumed		393,031	kg
Combustion Airflow Rate (Average)		164418.761	sft^3/min[a]
Run Time		480.5	min
Venturi Flow Rate (Average)		18.77	sL/min[b]
Dilution Airflow Rate (Average)		845.52	sL/min
Flow Rate at Sample Collection Unit		0.0081	L/min
Calculations			
Total Volume of Combustion Air		2237122179	L
Volume of Combustion Air Sampled		9018.985	L
Volume of Dilution Air		406272.36	L
Dilution Ratio		46.0464	
Mass Flow Rate of Total NMOC in Diluted Sample		0.0507	µg/L
Mass Flow Rate of Total NMOC in Undiluted Sample		2.3332	µg/L
Total Mass of Total NMOC in Sampled Air		21042.8287	µg
Total NMOC in Total Combustion Air		521987224	µg
Mass Emission Rate of Total NMOC		13280.3347	µg/kg
		13.2803	mg/kg
Mass SNMOC Collected			
Volume Canister = Flow Rate into Canister×Test Duration			
Test Duration	480.5 min	*Volume:*	
Flow Rate, Dilution Air Canister	0.008125 L/min	3.9041	L
Flow Rate, Residence Chamber Canister	0.008125 L/min	3.9041	L
Mass SNMOC Collected = [SNMOC Conc.]×Volume Canister			
SNMOC RC = 71.61 $\mu g/m^3$ = 71.61 ng/L = 0.7161 µg/L		0.2796	µg
SNMOC DA = 20.94 $\mu g/m^3$ = 20.94 ng/L = 0.0209 µg/L		0.0818	µg
Mass SNMOC Collected		0.1978	µg
Residence Chamber	71.61 $\mu g/m^3$		
Dilution Air	20.94 $\mu g/m^3$		

[a] sft^3/min = cubic feet per minute at standard temperature and pressure.
[b] sL/min = liters per minute at standard temperature and pressure.
[c] RC = residence chamber.
[d] DA = dilution air.

Table C-7. Calculation of Mass Emission Rates: Speciated Carbonyls, Hogged Fuel Boiler (11/27/01)

Parameters Required	Value	Units
Mass of Analyte in Total Combustion Air	4.8850	µg
Mass Fuel Consumed	378,529	kg
Combustion Airflow Rate (Average)	164418.761	sft^3/min[a]
Run Time	478.67	min
Venturi Flow Rate (Average)	18.75	sL/min[b]
Dilution Airflow Rate (Average)	843.92	sL/min
Flow Rate at Sample Collection Unit	0.80	L/min
Calculations		
Total Volume of Air Sampled	2228602026.0000	L
Volume of Combustion Air Sampled	8975.0625	L
Volume of Dilution Air	403959.1864	L
Dilution Ratio	46.0091	
Mass Flow Rate of Speciated Carbonyls in Diluted Sample	0.0126	µg/L
Mass Flow Rate of Speciated Carbonyls in Undiluted Sample	0.5869	µg/L
Total Mass of Speciated Carbonyls in Sampled Air	5267.6787	µg
Total Speciated Carbonyls in Total Combustion Air	1308019793.0000	µg
Mass Emission Rate of Total Speciated Carbonyls	3455.5348	µg/kg
	3.4555	mg/kg

[a] sft^3/min = cubic feet per minute at standard temperature and pressure.
[b] sL/min = liters per minute at standard temperature and pressure.

Table C-8. Calculation of Mass Emission Rates: Speciated Carbonyls, Hogged Fuel Boiler (11/28/01)

Parameters Required	Value	Units
Mass of Analyte in Total Combustion Air	1.3600	µg
Mass Fuel Consumed	405,633	kg
Combustion Air Flow Rate (Average)	164418.761	sft^3/min[a]
Run Time	480.17	min
Venturi Flow Rate (Average)	18.72	sL/min[b]
Dilution Air Flow Rate (Average)	843.82	sL/min
Flow Rate at Sample Collection Unit	0.80	L/min
Calculations		
Total Volume of Combustion Air	2235585758.0000	L
Volume of Combustion Air Sampled	8988.7824	L
Volume of Dilution Air	405177.0494	L
Dilution Ratio	46.0759	
Mass Flow Rate of Speciated Carbonyls in Diluted Sample	0.0035	µg/L
Mass Flow Rate of Speciated Carbonyls in Undiluted Sample	0.1631	µg/L
Total Mass of Speciated Carbonyls in Sampled Air	1466.3180	µg
Total Speciated Carbonyls in Total Combustion Air	364685615.0000	µg
Mass Emission Rate of Total Speciated Carbonyls	899.0522	µg/kg
	0.8991	mg/kg

[a] sft^3/min = cubic feet per minute at standard temperature and pressure.
[b] sL/min = liters per minute at standard temperature and pressure.

Table C-9. Calculation of Mass Emission Rates: Speciated Carbonyls, Hogged Fuel Boiler (11/29/01)

Parameters Required	Value	Units
Mass of Analyte in Total Combustion Air	1.6470	µg
Mass Fuel Consumed	393,031	kg
Combustion Airflow Rate (Average)	164418.761	sft^3/min[a]
Run Time	480.5	min
Venturi Flow Rate (Average)	18.77	sL/min[b]
Dilution Airflow Rate (Average)	845.52	sL/min
Flow Rate at Sample Collection Unit	0.80	L/min
Calculations		
Total Volume of Combustion Air	2237122179	L
Volume of Combustion Air Sampled	9018.9850	L
Volume of Dilution Air	406272.3600	L
Dilution Ratio	46.0464	
Mass Flow Rate of Speciated Carbonyls in Diluted Sample	0.0043	µg/L
Mass Flow Rate of Speciated Carbonyls in Undiluted Sample	0.1973	µg/L
Total Mass of Speciated Carbonyls in Sampled Air	1779.3570	µg
Total Speciated Carbonyls in Total Combustion Air	441362204	µg
Mass Emission Rate of Total Speciated Carbonyls	1122.9696	µg/kg
	1.1230	mg/kg

[a] sft^3/min = cubic feet per minute at standard temperature and pressure.
[b] sL/min = liters per minute at standard temperature and pressure.

Table C-10. Calculation of Mass Emission Rates: Total (Speciated + Unspeciated) Carbonyls, Hogged Fuel Boiler (11/27/01)

Parameters Required	Value	Units
Mass of Analyte in Total Combustion Air	4.8850	µg
Mass Fuel Consumed	378,529	kg
Combustion Airflow Rate (Average)	164418.761	sft^3/min[a]
Run Time	478.67	min
Venturi Flow Rate (Average)	18.75	sL/min[b]
Dilution Airflow Rate (Average)	843.92	sL/min
Flow Rate at Sample Collection Unit	0.80	L/min
Calculations		
Total Volume of Air Sampled	2228602026	L
Volume of Combustion Air Sampled	8975.0625	L
Volume of Dilution Air	403959.1864	L
Dilution Ratio	46.0091	
Mass Flow Rate of Total Carbonyls in Diluted Sample	0.0128	µg/L
Mass Flow Rate of Total Carbonyls in Undiluted Sample	0.5869	µg/L
Total Mass of Total Carbonyls in Sampled Air	5267.6787	µg
Total Carbonyls in Total Combustion Air	1308019793	µg
Mass Emission Rate of Total Carbonyls	3455.5348	µg/kg
	3.4555	mg/kg

[a] sft^3/min = cubic feet per minute at standard temperature and pressure.
[b] sL/min = liters per minute at standard temperature and pressure.

Table C-11. Calculation of Mass Emission Rates: Total (Speciated + Unspeciated) Carbonyls, Hogged Fuel Boiler (11/28/01)

Parameters Required	Value	Units
Mass of Analyte in Total Combustion Air	4.1465	µg
Mass Fuel Consumed	405,633	kg
Combustion Airflow Rate (Average)	164418.761	sft^3/min[a]
Run Time	480.17	min
Venturi Flow Rate (Average)	18.72	sL/min[b]
Dilution Air Flow Rate (Average)	843.82	sL/min
Flow Rate at Sample Collection Unit	0.80	L/min
Calculations		
Total Volume of Combustion Air	2235585758	L
Volume of Combustion Air Sampled	8988.7824	L
Volume of Dilution Air	405177.0494	L
Dilution Ratio	46.0759	
Mass Flow Rate of Total Carbonyls in Diluted Sample	0.0108	µg/L
Mass Flow Rate of Total Carbonyls in Undiluted Sample	0.4974	µg/L
Total Mass of Total Carbonyls in Sampled Air	4470.6526	µg
Total Carbonyls in Total Combustion Air	1111888899	µg
Mass Emission Rate of Total Carbonyls	2741.1177	µg/kg
	2.7411	mg/kg

[a] sft^3/min = cubic feet per minute at standard temperature and pressure.
[b] sL/min = liters per minute at standard temperature and pressure.

Table C-12. Calculation of Mass Emission Rates: Total (Speciated + Unspeciated) Carbonyls, Hogged Fuel Boiler (11/29/01)

Parameters Required	Value	Units
Mass of Analyte in Total Combustion Air	2.9215	µg
Mass Fuel Consumed	393,031	kg
Combustion Airflow Rate (Average)	164418.761	sft^3/min[a]
Run Time	480.5	min
Venturi Flow Rate (Average)	18.77	sL/min[b]
Dilution Air Flow Rate (Average)	845.52	sL/min
Flow Rate at Sample Collection Unit	0.80	L/min
Calculations		
Total Volume of Combustion Air	2237122179	L
Volume of Combustion Air Sampled	9018.9850	L
Volume of Dilution Air	406272.3600	L
Dilution Ratio	46.0464	
Mass Flow Rate of Total Carbonyls in Diluted Sample	0.0076	µg/L
Mass Flow Rate of Total Carbonyls in Undiluted Sample	0.3500	µg/L
Total Mass of Total Carbonyls in Sampled Air	3156.2790	µg
Total Carbonyls in Total Combustion Air	782902051	µg
Mass Emission Rate of Total Carbonyls	1991.9585	µg/kg
	1.9920	mg/kg

[a] sft^3/min = cubic feet per minute at standard temperature and pressure.
[b] sL/min = liters per minute at standard temperature and pressure.

Table C-13. Calculation of PM Emission Factors (11/27/01)

	Test	11/27/2001 (ave)			
1	Sampling time (min)	478.67			
2	TF sample	T100201T	T100201U	T100201V	T100201W
3	PM mass on filter (mg)	0.79	0.767	0.787	0.845
4	Array flow (sL/min[a])	8.518	8.518	8.594	8.594
5	PM conc. at filter (mg/L)	0.0001940	0.0001880	0.0001910	0.0002050
6a	avg. PM conc. at filter (mg/L)	0.0001910			
6b	PM mass on dilution chamber filter (mg)	0.0010000			
6c	Array flow (sL/min)	8.5940000			
6d	PM conc. at dilution air (mg/L)	0.0000000			
6e	Net PM mass conc. after dilution (mg/L)	0.0001910			
7	Probe flow (sL/min)	18.7500000			
8	Probe flow (m^3)	8.9800000			
9	Dilution air (sL/min)	843.9200000			
10	Dilution air (m^3)	403.9600000			
11	Dilution ratio	46.0100000			
12	PM conc. at stack (mg/L)	0.0088000			
13	Stack gas velocity (ft/min)	2153.4000000			
14	Stack temperature (°F)	320.0000000			
15	Stack pressure (in. Hg)	29.9800000			
16	Stack area (ft^2)	113.0973000			
17	Stack flow (sft^3/min[b])	165191.0000000			
18	Stack flow (sL/min)	4678208.3000000			
19	PM emission rate from stack (mg/min)	41071.6000000			
20	Fuel type	coal		wood	
21	Fuel volumetric feed (gal/min)				
22	Fuel density (lb/gal)				
23	Fuel density (kg/gal)				
24	Fuel mass feed rate (kg/min)	229.8000000		560.9000000	
25	Fuel mass feed rate (lb/min)	506.7000000		1236.7000000	
26	Fuel heating value (Btu/lb)	13335.0000000		4392.0000000	
27	Fuel heat feed rate (Btu/min)	6756844.5000000		5431586.4000000	
28	Total fuel mass feed rate (kg/min)	790.7000000			
29	**Emission factor (mg/kg)**	**51.9500000**			
30	Total fuel heat feed rate (Btu/min)	12188430.9000000			
31	**Emission factor (µg/kJ)**	**3.1900000**			

[a] sL/min = liters per minute at standard temperature and pressure.
[b] sft^3/min = cubic feet per minute at standard temperature and pressure.

Table C-14. Calculation of PM Emission Factors (11/28/01)

	Test	11/28/2001 (ave)			
1	Sampling time (min)	480.17			
2	TF sample	T100201A	T100201B	T100201Y	T100201Z
3	PM mass on filter (mg)	0.808	0.849	0.718	0.845
4	Array flow (sL/min[a])	8.643	8.643	8.530	8.530
5	PM conc. at filter (mg/L)	0.0001950	0.0002050	0.0001750	0.0002060
6a	avg. PM conc. at filter (mg/L)	0.0001950			
6b	PM mass on dilution chamber filter (mg)	0.0000000			
6c	Array flow (sL/min)	8.5680000			
6d	PM conc. at dilution air (mg/L)	0.0000000			
6e	Net PM mass conc. after dilution (mg/L)	0.0001950			
7	Probe flow (sL/min)	18.7200000			
8	Probe flow (m^3)	8.9900000			
9	Dilution air (sL/min)	843.8200000			
10	Dilution air (m^3)	405.1800000			
11	Dilution ratio	46.0800000			
12	PM conc. at stack (mg/L)	0.0090000			
13	Stack gas velocity (ft/min)	2153.4000000			
14	Stack temperature (°F)	320.0000000			
15	Stack pressure (in. Hg)	29.9800000			
16	Stack area (ft^2)	113.0973000			
17	Stack flow (sft^3/min[b])	165191.0000000			
18	Stack flow (sL/min)	4678208.3000000			
19	PM emission rate from stack (mg/min)	42079.7000000			
20	Fuel type	coal		wood	
21	Fuel volumetric feed (gal/min)				
22	Fuel density (lb/gal)				
23	Fuel density (kg/gal)				
24	Fuel mass feed rate (kg/min)	228.9000000		615.7000000	
25	Fuel mass feed rate (lb/min)	504.7000000		1357.7000000	
26	Fuel heating value (Btu/lb)	13335.0000000		4392.0000000	
27	Fuel heat feed rate (Btu/min)	6730174.5000000		5963018.4000000	
28	Total fuel mass feed rate (kg/min)	844.6000000			
29	**Emission factor (mg/kg)**	**49.8200000**			
30	Total fuel heat feed rate (Btu/min)	12693192.9000000			
31	**Emission factor (µg/kJ)**	**3.1400000**			

[a] sL/min = liters per minute at standard temperature and pressure.
[b] sft^3/min = cubic feet per minute at standard temperature and pressure.

Table C-15. Calculation of PM Emission Factors (11/29/01)

	Test	11/29/2001 (ave)			
1	Sampling time (min)	480.5			
2	TF sample	T100201F	T100201G	T100201D	T100201E
3	PM mass on filter (mg)	0.79	0.767	0.72	0.748
4	Array flow (sL/min[a])	8.621	8.621	8.584	8.584
5	PM conc. at filter (mg/L)	0.0001910	0.0001850	0.0001750	0.0001810
6a	avg. PM conc. at filter (mg/L)	0.0001830			
6b	PM mass on dilution chamber filter (mg)	0.0000000			
6c	Array flow (sL/min)	8.6210000			
6d	PM conc. at dilution air (mg/L)	0.0000000			
6e	Net PM mass conc. after dilution (mg/L)	0.0001830			
7	Probe flow (sL/min)	18.7700000			
8	Probe flow (m^3)	9.0200000			
9	Dilution air (sL/min)	845.5200000			
10	Dilution air (m^3)	406.2700000			
11	Dilution ratio	46.0500000			
12	PM conc. at stack (mg/L)	0.0084000			
13	Stack gas velocity (ft/min)	2153.4000000			
14	Stack temperature (°F)	320.0000000			
15	Stack pressure (in. Hg)	29.9800000			
16	Stack area (ft^2)	113.0973000			
17	Stack flow (sft^3/min[b])	165191.0000000			
18	Stack flow (sL/min)	4678208.3000000			
19	PM emission rate from stack (mg/min)	39409.1000000			
20	Fuel type	coal		wood	
21	Fuel volumetric feed (gal/min)				
22	Fuel density (lb/gal)				
23	Fuel density (kg/gal)				
24	Fuel mass feed rate (kg/min)	213.2000000		604.7000000	
25	Fuel mass feed rate (lb/min)	470.0000000		1333.3000000	
26	Fuel heating value (Btu/lb)	13335.0000000		4392.0000000	
27	Fuel heat feed rate (Btu/min)	6267450.0000000		5855853.6000000	
28	Total fuel mass feed rate (kg/min)	817.8000000			
29	**Emission factor (mg/kg)**	**48.1900000**			
30	Total fuel heat feed rate (Btu/min)	12123303.6000000			
31	**Emission factor (µg/kJ)**	**3.0800000**			

[a] sL/min = liters per minute at standard temperature and pressure.
[b] sft^3/min = cubic feet per minute at standard temperature and pressure.

Table C-16. Calculation of Individual Filter PM Emission Factors (11/27/01)

	Test	11/27/2001 (ave)			
1	Sampling time (min)	478.67			
2	TF sample	T100201T	T100201U	T100201V	T100201W
3	PM mass on filter (mg)	0.79	0.767	0.787	0.845
4	Array flow (sL/min[a])	8.518	8.518	8.594	8.594
5	PM conc. at filter (mg/L)	0.0001940	0.0001880	0.0001910	0.0002050
6b	PM mass on dilution chamber filter (mg)	0.0010000			
6c	Array flow (sL/min)	8.5940000			
6d	PM conc. at dilution air (mg/L)	0.0000000			
6e	Net PM mass conc. after dilution (mg/L)	0.0001940	0.0001880	0.0001910	0.0002050
7	Probe flow (sL/min)	18.7500000			
8	Probe flow (m^3)	8.9800000			
9	Dilution air (sL/min)	843.9200000			
10	Dilution air (m^3)	403.9600000			
11	Dilution ratio	46.0100000			
12	PM conc. at stack (mg/L)	0.0089000	0.0086000	0.0088000	0.0094000
13	Stack gas velocity (ft/min)	2153.4000000			
14	Stack temperature (°F)	320.0000000			
15	Stack pressure (in. Hg)	29.9800000			
16	Stack area (ft^2)	113.0973000			
17	Stack flow (sft^3/min[b])	165191.0000000			
18	Stack flow (sL/min)	4678208.3000000			
19	PM emission rate from stack (mg/min)	41651.5000	40437.4000	41125.8000	44160.5000
20	Fuel type	coal		wood	
21	Fuel volumetric feed (gal/min)				
22	Fuel density (lb/gal)				
23	Fuel density (kg/gal)				
24	Fuel mass feed rate (kg/min)	229.8000000		560.9000000	
25	Fuel mass feed rate (lb/min)	506.7000000		1236.7000000	
26	Fuel heating value (Btu/lb)	13335.0000000		4392.0000000	
27	Fuel heat feed rate (Btu/min)	6756844.5000000		5431586.4000000	
28	Total fuel mass feed rate (kg/min)	790.7000000			
29	Emission factor (mg/kg)	52.680	51.140	52.010	55.850
30	Total fuel heat feed rate (Btu/min)	12188430.9000000			
31	**Emission factor (µg/kJ)**	**3.240**	**3.150**	**3.200**	**3.430**
32	**Ave. Emission Factor (mg/kg)**	**51.9500000**			
33	**Ave. Emission Factor (µg/kJ)**	**3.1900000**			

[a] sL/min = liters per minute at standard temperature and pressure.

[b] sft^3/min = cubic feet per minute at standard temperature and pressure.

Table C-17. Calculation of Individual Filter PM Emission Factors (11/28/01)

	Test	11/28/2001 (ave)			
1	Sampling time (min)	480.3			
2	TF sample	T100201A	T100201B	T100201Y	T100201Z
3	PM mass on filter (mg)	0.808	0.849	0.718	0.845
4	Array flow (sL/min[a])	8.643	8.643	8.530	8.530
5	PM conc. at filter (mg/L)	0.0001950	0.0002050	0.0001750	0.0002060
6b	PM mass on dilution chamber filter (mg)	0.0000000			
6c	Array flow (sL/min)	8.5680000			
6d	PM conc. at dilution air (mg/L)	0.0000000			
6e	Net PM mass conc. after dilution (mg/L)	0.0001950	0.0002050	0.0001750	0.0002060
7	Probe flow (sL/min)	18.7200000			
8	Probe flow (m^3)	8.9900000			
9	Dilution air (sL/min)	843.8200000			
10	Dilution air (m^3)	405.0600000			
11	Dilution ratio	46.0800000			
12	PM conc. at stack (mg/L)	0.0090000	0.0094000	0.0081000	0.0095000
13	Stack gas velocity (ft/min)	2153.4000000			
14	Stack temperature (°F)	320.0000000			
15	Stack pressure (in. Hg)	29.9800000			
16	Stack area (ft^2)	113.0973000			
17	Stack flow (sft^3/min[b])	165191.0000000			
18	Stack flow (sL/min)	4678208.3000000			
19	PM emission rate from stack (mg/min)	41978.90	44109.10	37797.20	44482.80
20	Fuel type	coal		wood	
21	Fuel volumetric feed (gal/min)				
22	Fuel density (lb/gal)				
23	Fuel density (kg/gal)				
24	Fuel mass feed rate (kg/min)	228.9000000		615.7000000	
25	Fuel mass feed rate (lb/min)	504.7000000		1357.7000000	
26	Fuel heating value (Btu/lb)	13335.0000000		4392.0000000	
27	Fuel heat feed rate (Btu/min)	6730474.5000000		5963018.4000000	
28	Total fuel mass feed rate (kg/min)	844.6000000			
29	Emission factor (mg/kg)	49.700	52.220	44.750	52.670
30	Total fuel heat feed rate (Btu/min)	12693192.9000000			
31	**Emission factor (µg/kJ)**	**3.140**	**3.290**	**2.820**	**3.320**
32	**Ave. Emission Factor (mg/kg)**	**49.8400000**			
33	**Ave. Emission Factor (µg/kJ)**	**3.1400000**			

[a] sL/min = liters per minute at standard temperature and pressure.
[b] sft^3/min = cubic feet per minute at standard temperature and pressure.

Table C-18. Calculation of Individual Filter PM Emission Factors (11/29/01)

	Test	11/29/2001 (ave)			
1	Sampling time (min)	480.5			
2	TF sample	T100201F	T100201G	T100201D	T100201E
3	PM mass on filter (mg)	0.79	0.767	0.720	0.748
4	Array flow (sL/min[a])	8.621	8.621	8.584	8.584
5	PM conc. at filter (mg/L)	0.0001910	0.0001850	0.0001750	0.0001810
6b	PM mass on dilution chamber filter (mg)	0.0000000			
6c	Array flow (sL/min)	8.6210000			
6d	PM conc. at dilution air (mg/L)	0.0000000			
6e	Net PM mass conc. after dilution (mg/L)	0.0001910	0.0001850	0.0001750	0.0001810
7	Probe flow (sL/min)	18.7700000			
8	Probe flow (m^3)	9.0200000			
9	Dilution air (sL/min)	845.5200000			
10	Dilution air (m^3)	406.2700000			
11	Dilution ratio	46.0500000			
12	PM conc. at stack (mg/L)	0.0088000	0.0085000	0.0080000	0.0084000
13	Stack gas velocity (ft/min)	2153.4000000			
14	Stack temperature (°F)	320.0000000			
15	Stack pressure (in. Hg)	29.9800000			
16	Stack area (ft^2)	113.0973000			
17	Stack flow (sft^3/min[b])	165191.0000000			
18	Stack flow (sL/min)	4678208.3000000			
19	PM emission rate from stack (mg/min)	41081.9000	39885.9000	37603.1000	39065.5000
20	Fuel type	coal		wood	
21	Fuel volumetric feed (gal/min)				
22	Fuel density (lb/gal)				
23	Fuel density (kg/gal)				
24	Fuel mass feed rate (kg/min)	213.2000000		604.7000000	
25	Fuel mass feed rate (lb/min)	470.0000000		1333.3000000	
26	Fuel heating value (Btu/lb)	13335.0000000		4392.0000000	
27	Fuel heat feed rate (Btu/min)	6267450.0000000		5855853.6000000	
28	Total fuel mass feed rate (kg/min)	817.8000000			
29	Emission factor (mg/kg)	50.230	48.770	45.980	47.770
30	Total fuel heat feed rate (Btu/min)	12123303.6000000			
31	**Emission factor (µg/kJ)**	**3.210**	**3.120**	**2.940**	**3.050**
32	**Ave. Emission Factor (mg/kg)**	**48.1900000**			
33	**Ave. Emission Factor (µg/kJ)**	**3.0800000**			

[a] sL/min = liters per minute at standard temperature and pressure.
[b] sft^3/min = cubic feet per minute at standard temperature and pressure.

Appendix D

Data Tables for Individual $PM_{2.5}$ Mass Measurements

Contents

Table D-1. Gravimetric Measurements: Electrical Low Pressure Impactor Stages: Filters

ID		Initial Weight mg	Final Weight mg	PM mass mg
A101701C	IB112901H ELPI 1	32.723	32.721	-0.002
A101701B	IB112901H ELPI 2	33.929	33.974	0.045
A101701A	IB112901H ELPI 3	34.108	34.174	0.066
A101601Y	IB112901H ELPI 4	33.332	33.369	0.037
A101601X	IB112901H ELPI 5	33.164	33.193	0.029
A101601W	IB112901H ELPI 6	33.753	33.745	-0.008
A101601V	IB112901H ELPI 7	33.559	33.718	0.159
A101601U	IB112901H ELPI 8	33.182	33.578	0.396
A101601T	IB112901H ELPI 9	33.804	34.132	0.328
A101601S	IB112901H ELPI 10	33.316	33.425	0.109
A101601R	IB112901H ELPI 11	33.31	33.331	0.021
A101601Q	IB112901H ELPI 12	33.24	33.252	0.012
A101601P	IB112901H ELPI 13	32.848	32.852	0.004
A101701D	IB112901H ELPI FB	33.265	33.273	0.008

Table D-2. Gravimetric Measurements: Teflon Filters

ID		Initial wt. g	Final wt. g	PM mass g	PM mass mg	
T100201T	IB112701HR2A1	0.185371	0.186161	0.00079	0.790	
T100201U	IB112701HR2B1	0.186555	0.187322	0.000767	0.767	
T100201X	IB112701H FB	0.186201	0.186211	10^{-5}	0.010	
T100201V	IB112701HR6A1	0.183932	0.184719	0.000787	0.787	
T100201W	IB112701HR6B1	0.188563	0.189408	0.000845	0.845	small hole in filter
T100201S	IB112701HD1B1	0.187256	0.187257	10^{-6}	0.001	
T102201A	IB112801HR2A1	0.196291	0.197099	0.000808	0.808	
T102201B	IB112801HR2B1	0.184383	0.185232	0.000849	0.849	
T102201C	IB112801HD1B1	0.171894	0.171886	-8×10^{-6}	-0.008	small hole in filter
T100201Y	IB112801HR6A1	0.191657	0.192375	0.000718	0.718	
T100201Z	IB112801HR6B1	0.189683	0.190528	0.000845	0.845	
T102201F	IB112901HR2A1	0.187373	0.188133	0.00076	0.760	
T102201G	IB112901HR2B1	0.193098	0.193844	0.000746	0.746	
T102201H	IB112901H FB	0.186498	0.186489	-9×10^{-6}	-0.009	
T102201D	IB112901HR6A1	0.189819	0.190539	0.00072	0.720	
T102201E	IB112901HR6B1	0.173496	0.174244	0.000748	0.748	

Appendix E

Data Tables for Individual Carbonyl Samples

Contents

Table E-1. Carbonyls, Method and Field Blanks

Compound	CAS No.	Method Blank µg	Field Blank µg
formaldehyde	50-00-0	0.0 320	0.036
acetaldehyde	75-07-0	0.1480	0.065
acetone	67-64-1	0.2090	0.181
propionaldehyde	123-38-6	0.007	ND[a]
crotonaldehyde	4170-30-0	ND	ND
butyr/isobutyraldehyde	123-72-8	0.0500	0.052
benzaldehyde	100-52-7	ND	ND
isovaleraldehyde	590-86-3	ND	ND
valeraldehyde	110-62-3	0.008	ND
o-tolualdehyde	529-20-4	ND	ND
m-tolualdehyde	620-23-5	ND	ND
p-tolualdehyde	104-87-0	ND	ND
hexaldehyde	66-25-1	0.0180	0.018
2,5-dimethylbenzaldehyde	5779-94-2	ND	ND
diacetyl	431-03-8	ND	ND
methacrolein	78-85-3	ND	ND
2-butanone	78-93-3	0.0440	0.016
glyoxal	107-22-2	0.0940	0.083
acetophenone	98-86-2	ND	ND
methylglyoxal	78-98-8	0.0490	0.048
octanal	124-13-0	ND	ND
nonanal	124-19-6	0.1110	0.125
Sum, Speciated		**0.7700**	**0.624**
Sum, Unspeciated		**0.8170**	**0.873**
Total (Speciated + Unspeciated)		**1.5870**	**1.497**

[a] ND = not detected.

Table E-2A. Carbonyls, Individual Tube Results, Field Samples (11/27/01)

Site ID	WHF#2	WHF#2	WHF#2	WHB#2	WHB#2	WHB#2
Field ID	Hd3A1	Hd3A2	Hd3A3	Hr3A1	Hr3A2	Hr3A3
Volume Sampled	395.82	395.82	395.82	385.13	385.13	385.13
ERG ID	24261	24262	24263	24264	24265	24266
Sampling Date	11/27/01	11/27/01	11/27/01	11/27/01	11/27/01	11/27/01
Analysis Date	12/27/01	12/27/01	12/27/01	12/27/01	12/27/01	12/27/01
Data File	F1L~007	F1L~008	F1L~009	F1L~010	F1L~011	F1L~012

										Carbonyls	
Compound	CAS No.	DA,[a] front µg	DA, middle µg	DA, rear µg	DA 3 tubes µg	RC,[b] front µg	RC, middle µg	RC, rear µg	RC 3 tubes µg	RC-DA µg	No negs[c] RC-DA µg
formaldehyde	50-00-0	0.0650	0.0380	0.0360	0.1390	0.3490	0.0420	0.0250	0.4160	0.2770	0.2770
acetaldehyde	75-07-0	0.3190	0.0830	0.0690	0.4710	0.1070	0.1090	0.1040	0.3200	-0.1510	ND[d]
acetone	67-64-1	0.2540	0.2280	0.2270	0.7090	2.3060	1.8820	0.4570	4.6450	3.9360	3.9360
propionaldehyde	123-38-6	0.0060	0.0070	ND	0.0130	0.1390	ND	ND	0.1390	0.1260	0.1260
crotonaldehyde	4170-30-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
butyr/isobutyraldehyde	123-72-8	0.1110	0.1000	0.0790	0.2900	0.1770	0.1020	0.0940	0.3730	0.0830	0.0830
benzaldehyde	100-52-7	ND	0.0020	ND	0.0020	0.0670	0.0030	ND	0.0700	0.0680	0.0680
isovaleraldehyde	590-86-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
valeraldehyde	110-62-3	ND	ND	ND	ND	0.0690	ND	ND	0.0690	0.0690	0.0690
o-tolualdehyde	529-20-4	ND	0.0330	ND	0.0330	ND	ND	ND	ND	-0.0330	ND
m-tolualdehyde	620-23-5	ND	0.0190	ND	0.0190	ND	ND	ND	ND	-0.0190	ND
p-tolualdehyde	104-87-0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
hexaldehyde	66-25-1	0.0180	ND	ND	0.0180	0.0870	0.0230	0.0160	0.1260	0.1080	0.1080
2,5-dimethylbenzal-dehyde	5779-94-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
diacetyl	431-03-8	ND	ND	ND	ND	ND	0.0040	ND	0.0040	0.0040	0.0040
methacrolein	78-85-3	ND	ND	ND	ND	0.0020	ND	ND	0.0020	0.0020	0.0020
2-butanone	78-93-3	0.0250	0.0520	0.0380	0.1150	0.0780	0.0350	0.0380	0.1510	0.0360	0.0360
											continued
glyoxal	107-22-2	0.1310	0.1370	0.0850	0.3530	0.1390	0.1270	0.0930	0.3590	0.0060	0.0060
acetophenone	98-86-2	ND	ND	ND	ND	0.0390	ND	ND	0.0390	0.0390	0.0390
methylglyoxal	78-98-8	0.0470	0.0390	0.0460	0.1320	0.0780	0.0550	0.0490	0.1820	0.0500	0.0500

Table E-2A. (concluded)

Site ID	WHF#2	WHF#2	WHF#2	WHB#2	WHB#2	WHB#2		
Field ID	Hd3A1	Hd3A2	Hd3A3	Hr3A1	Hr3A2	Hr3A3		
Volume Sampled	395.82	395.82	395.82	385.13	385.13	385.13		
ERG ID	24261	24262	24263	24264	24265	24266		
Sampling Date	11/27/01	11/27/01	11/27/01	11/27/01	11/27/01	11/27/01		
Analysis Date	12/27/01	12/27/01	12/27/01	12/27/01	12/27/01	12/27/01		
Data File	F1L~007	F1L~008	F1L~009	F1L~010	F1L~011	F1L~012		

										Carbonyls	
Compound	CAS No.	DA,[a] front µg	DA, middle µg	DA, rear µg	DA 3 tubes µg	RC,[b] front µg	RC, middle µg	RC, rear µg	RC 3 tubes µg	RC-DA µg	No negs[c] RC-DA µg
octanal	124-13-0	0.0390	ND	ND	0.0390	0.0720	0.0480	ND	0.1200	0.0810	0.0810
nonanal	124-19-6	0.2330	0.1210	1.0600	1.4140	0.2950	0.1190	0.0870	0.5010	-0.9130	ND
Sum, Speciated		**1.2480**	**0.8590**	**1.6400**	**3.7470**	**4.0040**	**2.5490**	**0.9630**	**7.5160**	**3.7690**	**4.8850**
Sum, Unspeciated		**2.3845**	**1.0940**	**1.0580**	**4.5365**	**2.3495**	**1.0790**	**1.0300**	**4.4585**	**-0.0780**	**–[e]**
Total (Speciated + Unspeciated)		**3.6325**	**1.9530**	**2.6980**	**8.2835**	**6.3535**	**3.6280**	**1.9930**	**11.9745**	**3.6910**	**4.8850**

[a] DA = dilution air.
[b] RC = residence chamber.
[c] Entries for which RC-DA are negative are considered to be zero, or not detected.
[d] ND = not detected.
[e] RC-DA is a small negative number; zero is used in the calculations, and the "Total (Speciated + Unspeciated)" is considered to equal the "Sum, Speciated" for 11/27/01.

Table E-2B. Carbonyls, Individual Tube Results, Field Samples (11/28/01)

Site ID		WHB#2	WHB#2	WHB#2		WHB#2	WHB#2	WHB#2		
Field ID		Hd3A1	Hd3A2	Hd3A3		Hr3A1	Hr3A2	Hr3A3		
Volume Sampled		408.35	408.35	408.35		391.57	391.57	391.57		
ERG ID		24267	24268	24269		24272	24271	24270		
Sampling Date		11/28/01	11/28/01	11/28/01		11/28/01	11/28/01	11/28/01		
Analysis Date		12/17/01	12/17/01	12/17/01		12/28/01	12/28/01	12/28/01		
Data File		F1L~013	F1L~014	F1L~017		F1L~020	F1L~019	F1L~018		
Compound	**CAS No.**	**DA,[a] front µg**	**DA, middle µg**	**DA, rear µg**	**DA, 3 tubes µg**	**RC,[b] front µg**	**RC, middle µg**	**RC, rear µg**	**RC, 3 tubes µg**	**Carbonyls RC-DA µg**
formaldehyde	50-00-0	0.0500	0.0330	0.0330	0.1160	0.0260	0.0330	0.4970	0.5560	0.4400
acetaldehyde	75-07-0	0.1020	0.0730	0.0740	0.2490	0.1220	0.1180	0.9310	1.1710	0.9220
acetone	67-64-1	0.1280	0.2520	0.2330	0.6130	ND[c]	ND	ND	ND	ND
propionaldehyde	123-38-6	ND	ND	ND	ND	ND	ND	0.069	0.0690	0.0690
crotonaldehyde	4170-30-0	ND	ND	ND	ND	ND	ND	ND	ND	ND
butyr/isobutyraldehyde	123-72-8	0.0980	0.0930	0.0790	0.2700	0.0760	0.0940	0.1680	0.3380	0.0680
benzaldehyde	100-52-7	0.004	0.0010	0.0050	0.0100	ND	0.0010	0.0520	0.0530	0.0430
isovaleraldehyde	590-86-3	ND	ND	ND	ND	ND	ND	ND	ND	ND
valeraldehyde	110-62-3	ND	ND	ND	ND	ND	ND	0.047	0.0470	0.0470
o-tolualdehyde	529-20-4	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-tolualdehyde	620-23-5	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-tolualdehyde	104-87-0	ND	ND	ND	ND	ND	0.033	ND	0.0330	0.0330
hexaldehyde	66-25-1	0.0160	0.0140	0.0160	0.0460	0.0240	0.0160	0.0600	0.1000	0.0540
2,5-dimethylbenzal-dehyde	5779-94-2	ND	ND	ND	ND	ND	ND	ND	ND	ND
diacetyl	431-03-8	ND	ND	ND	ND	ND	ND	ND	ND	ND
methacrolein	78-85-3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-butanone	78-93-3	0.0160	0.0330	0.0250	0.0740	0.0680	0.0220	0.0500	0.1400	0.0660
glyoxal	107-22-2	0.0810	0.1420	0.0910	0.3140	ND	ND	0.0890	0.0890	ND
acetophenone	98-86-2	ND	ND	ND	ND	ND	ND	0.028	0.0280	0.0280
										continued
methylglyoxal	78-98-8	0.0510	0.0340	0.0340	0.1190	0.0550	0.0510	0.0750	0.1810	0.0620
octanal	124-13-0	0.0340	ND	ND	0.0340	ND	ND	0.0650	0.0650	0.0310

Table E-2B. (concluded)

Site ID		WHB#2	WHB#2	WHB#2		WHB#2	WHB#2	WHB#2		
Field ID		Hd3A1	Hd3A2	Hd3A3		Hr3A1	Hr3A2	Hr3A3		
Volume Sampled		408.35	408.35	408.35		391.57	391.57	391.57		
ERG ID		24267	24268	24269		24272	24271	24270		
Sampling Date		11/28/01	11/28/01	11/28/01		11/28/01	11/28/01	11/28/01		
Analysis Date		12/17/01	12/17/01	12/17/01		12/28/01	12/28/01	12/28/01		
Data File		F1L~013	F1L~014	F1L~017		F1L~020	F1L~019	F1L~018		
Compound	**CAS No.**	**DA,[a] front µg**	**DA, middle µg**	**DA, rear µg**	**DA, 3 tubes µg**	**RC,[b] front µg**	**RC, middle µg**	**RC, rear µg**	**RC, 3 tubes µg**	**Carbonyls RC-DA µg**
nonanal	124-19-6	0.2350	0.0840	0.0450	0.3640	0.0980	0.1020	0.2740	0.4740	0.1100
Sum, Speciated		**0.8150**	**0.7590**	**0.6350**	**2.2090**	**0.4690**	**0.4700**	**2.4050**	**3.3440**	**1.9730**
Sum, Unspeciated		**1.642**	**0.9775**	**1.0140**	**3.6335**	**0.8775**	**1.6925**	**3.8500**	**6.4200**	**2.7865**
Total (Speciated + Unspeciated)		**2.4570**	**1.7365**	**1.6490**	**5.8425**	**1.3465**	**2.1625**	**6.2550**	**9.7640**	**4.7595**

[a] DA = dilution air.
[b] RC = residence chamber.
[c] ND = not detected.

Table E-2C. Carbonyls, Individual Tube Results, Field Samples (11/29/01)

Site ID		**WHB#2**	**WHB#2**	**WHB#2**		**WHB#2**	**WHB#2**	**WHB#2**	
Field ID		**Hd3A1**	**Hd3A2**	**Hd3A3**		**Hr3A1**	**Hr3A2**	**Hr3A3**	
Volume Sampled		**464.65**	**464.65**	**464.65**		**403.44**	**403.44**	**403.44**	
ERG ID		**24273**	**24273**	**24273**		**24276**	**24277**	**24278**	
Sampling Date		**11/29/01**	**11/29/01**	**11/29/01**		**11/29/01**	**11/29/01**	**11/29/01**	
Analysis Date		**12/28/01**	**12/28/01**	**12/28/01**		**12/28/01**	**12/28/01**	**12/28/01**	
Data File		**F1L~021**	**F1L~022**	**F1L~023**		**F1L~024**	**F1L~025**	**F1L~026**	

Compound	**CAS No.**	**DA,[a] front µg**	**DA, middle µg**	**DA, rear µg**	**DA, 3 tubes µg**	**RC,[b] front µg**	**RC, middle µg**	**RC, rear µg**	**RC, 3 tubes µg**	**Carbonyls RC-DA µg**
formaldehyde	50-00-0	0.0560	0.0360	0.0480	0.1400	0.3140	0.0350	0.0310	0.3800	0.2400
acetaldehyde	75-07-0	0.2310	0.0690	0.1360	0.4360	0.7020	0.071	0.115	0.8880	0.4520
acetone	67-64-1	0.1270	0.2340	0.2360	0.5970	0.6140	0.4200	0.2330	1.2670	0.6700
propionaldehyde	123-38-6	0.0090	ND[c]	ND	0.0090	0.049	ND	0.011	0.0600	0.0510
crotonaldehyde	4170-30-0	ND	ND	ND	ND	ND	ND	ND	ND	ND
butyr/isobutyraldehyde	123-72-8	0.1120	0.1080	0.1050	0.3250	0.1480	0.1300	0.1180	0.3960	0.0710
benzaldehyde	100-52-7	ND	0.0010	0.0030	0.0040	0.0340	0.0050	0.0010	0.0400	0.0360
isovaleraldehyde	590-86-3	ND	ND	ND	ND	ND	ND	ND	ND	ND
valeraldehyde	110-62-3	ND	ND	ND	ND	0.032	ND	ND	0.0320	0.0320
o-tolualdehyde	529-20-4	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-tolualdehyde	620-23-5	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-tolualdehyde	104-87-0	ND	ND	ND	ND	ND	ND	ND	ND	ND
hexaldehyde	66-25-1	0.0270	0.0140	0.0190	0.0600	0.0470	0.0160	0.0180	0.0810	0.0210
2,5-dimethylbenzal-dehyde	5779-94-2	ND	ND	ND	ND	ND	ND	ND	ND	ND
diacetyl	431-03-8	0.0030	ND	ND	0.0030	0.0010	0.001	ND	0.0010	ND
methacrolein	78-85-3	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-butanone	78-93-3	0.0040	0.0290	0.0370	0.0700	0.0310	0.0350	0.0420	0.1080	0.0380
glyoxal	107-22-2	0.0720	0.0670	0.1560	0.2950	0.1040	0.1200	ND	0.2240	ND
acetophenone	98-86-2	ND	ND	ND	ND	0.0300	ND	ND	0.0300	0.0300

Table E-2C. (concluded)

Site ID		**WHB#2**	**WHB#2**	**WHB#2**		**WHB#2**	**WHB#2**	**WHB#2**	
Field ID		**Hd3A1**	**Hd3A2**	**Hd3A3**		**Hr3A1**	**Hr3A2**	**Hr3A3**	
Volume Sampled		**464.65**	**464.65**	**464.65**		**403.44**	**403.44**	**403.44**	
ERG ID		**24273**	**24273**	**24273**		**24276**	**24277**	**24278**	
Sampling Date		**11/29/01**	**11/29/01**	**11/29/01**		**11/29/01**	**11/29/01**	**11/29/01**	
Analysis Date		**12/28/01**	**12/28/01**	**12/28/01**		**12/28/01**	**12/28/01**	**12/28/01**	
Data File		**F1L~021**	**F1L~022**	**F1L~023**		**F1L~024**	**F1L~025**	**F1L~026**	
Compound	**CAS No.**	**DA,[a] front µg**	**DA, middle µg**	**DA, rear µg**	**DA, 3 tubes µg**	**RC,[b] front µg**	**RC, middle µg**	**RC, rear µg**	**RC, 3 tubes µg**	**Carbonyls RC-DA µg**
methylglyoxal	78-98-8	0.0500	0.0500	0.0540	0.1540	0.0560	0.0530	0.0480	0.1570	0.0030
octanal	124-13-0	0.0400	0.0370	ND	0.0770	0.0580	ND	ND	0.0580	ND
nonanal	124-19-6	0.2630	0.0920	0.1120	0.4670	0.2880	0.0770	0.1050	0.4700	0.0030
Sum, Speciated		**0.9940**	**0.7370**	**0.9060**	**2.6370**	**2.5080**	**0.9630**	**0.7220**	**4.1920**	**1.6470**
Sum, Unspeciated		**1.2215**	**1.0145**	**0.9305**	**3.1665**	**2.4570**	**0.9880**	**0.9960**	**4.4410**	**1.2745**
Total (Speciated + Unspeciated)		**2.2155**	**1.7515**	**1.8365**	**5.8035**	**4.9650**	**1.9510**	**1.7180**	**8.6340**	**2.9215**

[a] DA = dilution air.
[b] RC = residence chamber.
[c] ND = not detected.

Table E-3A. Hogged Fuel Boiler, Carbonyls and Uncertainties (11/27/01)

Compound	CAS No.	RC-DA[a] µg	Uncertainty Plus/Minus	% Total	Uncertainty Plus/Minus
formaldehyde	50-00-0	0.277	0.0305	7.349	0.810
acetaldehyde	75-07-0	ND[b]			
acetone	67-64-1	3.9360	0.1665	104.431	4.417
propionaldehyde	123-38-6	0.1260		3.343	ND
crotonaldehyde	4170-30-0	ND			
butyr/isobutyraldehyde	123-72-8	0.0830	0.0048	2.202	0.129
benzaldehyde	100-52-7	0.0680	0.0021	1.804	0.055
isovaleraldehyde	590-86-3	ND			
valeraldehyde	110-62-3	0.0690		1.831	ND
o-tolualdehyde	529-20-4	ND			
m-tolualdehyde	620-23-5	ND			
p-tolualdehyde	104-87-0	ND			
hexaldehyde	66-25-1	0.1080	0.0100	2.865	0.266
2,5-dimethylbenzaldehyde	5779-94-2	ND			
diacetyl	431-03-8	0.0040	0.0003	0.106	0.009
methacrolein	78-85-3	0.0020	0.0001	0.053	0.003
2-butanone	78-93-3	0.0360	0.0029	0.955	0.078
glyoxal	107-22-2	0.0060	0.0002	0.159	0.004
acetophenone	98-86-2	0.0390	0.0019	1.035	0.049
methylglyoxal	78-98-8	0.0500	0.0061	1.327	0.163
octanal	124-13-0	0.0810	0.0065	2.149	0.173
nonanal	124-19-6	ND			
Sum, Speciated		**4.8850**			
Sum, Unspeciated					
Total (Speciated + Unspeciated)		**4.8850**			

[a] RC = residence chamber; DA = dilution air.
[b] ND = not detected.

Table E-3B. Hogged Fuel Boiler, Carbonyls and Uncertainties (11/28/01)

Compound	CAS No.	RC-DA[a] µg	Uncertainty Plus/Minus	% Total	Uncertainty Plus/Minus
formaldehyde	50-00-0	0.4400	0.0485	0.3676	0.0405
acetaldehyde	75-07-0	0.9220	0.0105	0.7703	0.0088
acetone	67-64-1	ND[b]	ND	ND	
propionaldehyde	123-38-6	0.0690	0.0005	0.0576	0.0004
crotonaldehyde	4170-30-0	ND			
butyr/isobutyraldehyde	123-72-8	0.0680	0.0040	0.0568	0.0033
benzaldehyde	100-52-7	0.0430	0.0013	0.0359	0.0011
isovaleraldehyde	590-86-3	ND			
valeraldehyde	110-62-3	0.0470	0.0045	0.0393	0.0038
o-tolualdehyde	529-20-4	ND			
m-tolualdehyde	620-23-5	ND			
p-tolualdehyde	104-87-0	0.0330	0.0019	0.0276	0.0015
hexaldehyde	66-25-1	0.0540	0.0050	0.0451	0.0042
2,5-dimethylbenzaldehyde	5779-94-2	ND			
diacetyl	431-03-8	ND			
methacrolein	78-85-3	ND			
2-butanone	78-93-3	0.0660	0.0054	0.0551	0.0045
glyoxal	107-22-2	ND			
acetophenone	98-86-2	0.0280	0.0013	0.0234	0.0011
methylglyoxal	78-98-8	0.0620	0.0076	0.0518	0.0064
octanal	124-13-0	0.0310	0.0025	0.0259	0.0021
nonanal	124-19-6	0.1100	0.0089	0.0919	0.0074
Sum, Speciated		**1.9730**			
Sum, Unspeciated		**2.7865**			
Total (Speciated + Unspeciated)		**4.7595**			

[a] RC = residence chamber; DA = dilution air.
[b] ND = not detected.

Table E-3C. Hogged Fuel Boiler, Carbonyls and Uncertainties (11/29/01)

Compound	CAS No.	RC-DA[a] µg	Uncertainty Plus/Minus	% Total	Uncertainty Plus/Minus	Uncertainty µg/m^3
formaldehyde	50-00-0	0.24	0.0264	8.4791	0.9344	0.0035
acetaldehyde	75-07-0	0.452	0.0052	15.9689	0.1820	0.005
acetone	67-64-1	0.6700	0.0283	23.6707	1.0013	0.0058
propionaldehyde	123-38-6	0.051	0.0003	1.8018	0.0119	0.0027
crotonaldehyde	4170-30-0	ND[b]				0.003
butyr/isobutyraldehyde	123-72-8	0.071	0.0041	2.5084	0.1465	0.0076
benzaldehyde	100-52-7	0.036	0.0011	1.2719	0.0389	0.004
isovaleraldehyde	590-86-3	ND				0.0044
valeraldehyde	110-62-3	0.032	0.0031	1.1305	0.1083	0.004
o-tolualdehyde	529-20-4	ND				0.0199
m-tolualdehyde	620-23-5	ND				0.0199
p-tolualdehyde	104-87-0	ND				0.0199
hexaldehyde	66-25-1	0.021	0.0020	0.7419	0.0690	0.0028
2,5-dimethylbenzaldehyde	5779-94-2	ND				0.0159
diacetyl	431-03-8	ND				0.011
methacrolein	78-85-3	ND				0.0072
2-butanone	78-93-3	0.0380	0.0031	1.3425	0.1091	0.0077
glyoxal	107-22-2	ND				0.0196
acetophenone	98-86-2	0.03	0.0014	1.0599	0.0505	1.0258
methylglyoxal	78-98-8	0.0030	0.0004	0.1060	0.0130	0.0146
octanal	124-13-0	ND				0.0106
nonanal	124-19-6	0.003	0.0002	0.1060	0.0085	0.0211
Sum, Speciated		**1.5560**				
Sum, Unspeciated		**1.2745**				
Total (Speciated + Unspeciated)		**2.8305**				

[a] RC = residence chamber; DA = dilution air.
[b] ND = not detected.

Table E-4. Hogged Fuel Boiler, Summary of Carbonyls for Test Days 11/27–29/01

Compound	CAS No.	Field Blank µg	RC-DA[a] 11/27/01 µg	RC-DA 11/28/01 µg	RC-DA 11/29/01 µg
formaldehyde	50-00-0	0.036	0.2770	0.4400	0.2400
acetaldehyde	75-07-0	0.0650	ND[b]	0.922	0.4520
acetone	67-64-1	0.181	3.936	ND	0.6700
propionaldehyde	123-38-6	ND	0.126	0.069	0.0510
crotonaldehyde	4170-30-0	ND	ND	ND	ND
butyr/isobutyraldehyde	123-72-8	0.0520	0.0830	0.068	0.0710
benzaldehyde	100-52-7	ND	0.0680	0.043	0.0360
isovaleraldehyde	590-86-3	ND	ND	ND	ND
valeraldehyde	110-62-3	ND	0.0690	0.047	0.0320
o-tolualdehyde	529-20-4	ND	ND	ND	ND
m-tolualdehyde	620-23-5	ND	ND	ND	ND
p-tolualdehyde	104-87-0	ND	ND	0.033	ND
hexaldehyde	66-25-1	0.0180	0.1080	0.054	0.0210
2,5-dimethylbenzaldehyde	5779-94-2	ND	ND	ND	ND
diacetyl	431-03-8	ND	0.0040	ND	ND
methacrolein	78-85-3	ND	0.0020	ND	ND
2-butanone	78-93-3	0.0160	0.0360	0.0660	0.0380
glyoxal	107-22-2	0.0830	0.0060	ND	ND
acetophenone	98-86-2	ND	0.0390	0.0280	0.0300
methylglyoxal	78-98-8	0.0480	0.0500	0.0620	0.0030
octanal	124-13-0	ND	0.0810	0.0310	ND
nonanal	124-19-6	0.1250	ND	0.1100	0.0030
Sum, Speciated		**0.6240**	**4.8850**	**1.9730**	**1.6470**
Mean, Speciated				**2.8350**	
Standard Deviation, Speciated				**1.7828**	
Sum, Unspeciated		**0.8730**	**—[c]**	**2.7865**	**1.2745**
Total (Speciated + Unspeciated)		**1.4970**	**4.8850**	**4.7595**	**2.9215**
Mean, Total				**4.1887**	
Standard Deviation, Total				**1.0992**	

[a] RC = residence chamber; DA = dilution air.
[b] ND = not detected.
[c] RC-DA is a small negative number; zero is used in the calculations, and the "Total (Speciated + Unspeciated)" is considered to equal the "Sum, Speciated" for 11/27/01.

Appendix F

Data Tables for Individual NMOC Samples

Contents

Table F-1. SNMOCs from Hogged Fuel Boiler No 2: Laboratory Blank and Ambient Canisters (11/27/01)

Compound	CAS No.	Laboratory Blank µg/m³	Ambient Canisters µg/m³
ethylene	74-85-1	0.11	0.84
acetylene	74-86-2	ND[a]	0.54
ethane	74-84-0	0.09	1.84
propylene	115-07-1	ND	0.31
propane	74-98-6	ND	1.79
propyne	74-99-7	ND	ND
isobutane	75-28-5	ND	0.55
isobutene/1-butene	115-11-7/106-98-0	ND	0.26
1,3-butadiene	106-99-0	ND	ND
n-butane	106-97-8	0.13	1.08
trans-2-butene	624-64-6	ND	0.13
cis-2-butene	590-18-1	ND	0.16
3-methyl-1-butene	563-45-1	ND	ND
isopentane	78-78-4	0.13	ND
1-pentene	109-67-1	ND	0.13
2-methyl-1-butene	563-46-2	ND	0.16
n-pentane	109-66-0	0.09	0.53
isoprene	78-79-4	ND	0.17
trans-2-pentene	646-04-8	ND	0.19
cis-2-pentene	627-20-3	ND	0.18
2-methyl-2-butene	513-35-9	ND	ND
2,2-dimethylbutane	75-83-2	0.10	0.28
cyclopentene	142-29-0	ND	ND
4-methyl-1-pentene	691-37-2	ND	ND
cyclopentane	287-92-3	ND	0.17
2,3-dimethylbutane	79-29-8	ND	0.29
2-methylpentane	107-83-5	ND	1.37
3-methylpentane	96-14-0	0.09	10.14
2-methyl-1-pentene	763-29-1	ND	ND
1-hexene	592-41-6	0.10	0.23
2-ethyl-1-butene	760-21-4	ND	ND
n-hexane	110-54-3	0.08	404.42[b]
trans-2-hexene	4050-45-7	ND	ND
cis-2-hexene	7688-21-3	ND	ND
methylcyclopentane	96-37-7	ND	52.95
2,4-dimethylpentane	108-08-7	0.07	0.21
benzene	71-43-2	0.09	2.11

continued

Table F-1. (continued)

Compound	CAS No.	Laboratory Blank µg/m³	Ambient Canisters µg/m³
cyclohexane	110-82-7	0.11	0.36
2-methylhexane	591-76-4	ND	0.46
2,3-dimethylpentane	565-59-3	0.11	0.35
3-methylhexane	589-34-4	ND	0.33
1-heptene	592-76-7	ND	ND
2,2,4-trimethylpentane	540-84-1	ND	0.26
n-heptane	142-82-5	ND	0.24
methylcyclohexane	108-87-2	ND	0.25
2,2,3-trimethylpentane	564-02-3	ND	ND
2,3,4-trimethylpentane	565-75-3	ND	0.14
toluene	108-88-3	0.09	0.75
2-methylheptane	592-27-8	ND	0.14
3-methylheptane	589-81-1	ND	0.14
1-octene	111-66-0	ND	ND
n-octane	111-65-9	ND	0.18
ethylbenzene	100-41-4	ND	0.16
m-xylene/*p*-xylene	108-38-3/106-42-3	ND	0.29
styrene	100-42-5	ND	0.12
o-xylene	95-47-6	ND	0.18
1-nonene	124-11-8	ND	ND
n-nonane	111-84-2	ND	0.14
isopropylbenzene	98-82-8	ND	0.14
alpha-pinene	80-56-8	ND	10.35
n-propylbenzene	103-65-1	ND	0.11
m-ethyltoluene	620-14-4	0.07	0.80
p-ethyltoluene	622-96-8	ND	0.16
1,3,5-trimethylbenzene	108-67-8	ND	0.09
o-ethyltoluene	611-14-3	ND	ND
beta-pinene	127-91-3	ND	1.21
1,2,4-trimethylbenzene	95-63-6	0.08	0.21
1-decene	872-05-9	ND	ND
n-decane	124-18-5	0.07	0.23
1,2,3-trimethylbenzene	526-73-8	ND	0.13
m-diethylbenzene	141-93-5	ND	0.11
p-diethylbenzene	105-05-5	ND	ND
1-undecene	821-95-4	ND	0.13
n-undecane	1120-21-4	0.27	0.49
1-dodecene	112-41-4	ND	ND

continued

Table F-1. (concluded)

Compound	CAS No.	Laboratory Blank µg/m³	Ambient Canisters µg/m³
n-dodecane	112-40-3	0.26	0.61
1-tridecene	2437-56-1	ND	ND
n-tridecane	629-50-5	ND	ND
Total Speciated		**2.14**	**500.29**
Total Unspeciated		**1.56**	**147.28**
Total (Speciated + Unspeciated)[c]		**3.70**	**647.57**

[a] ND = not detected.
[b] *n*-Hexane in the ambient canister is a contaminant from the denuders. Since the ambient canister is not involved in further calculations, the *n*-hexane value is included as a reference.
[c] Total NMOC with unknowns in µg/m³ is an estimate based on propane only.

Table F-2A. SNMOCs[a] from Hogged Fuel Boiler #2 Collected in Canisters on 11/27/01

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	Residence Chamber µg	Dilution Air V=3.900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
ethylene	74-85-1	1.59	0.0062	0.97	0.0038	0.0024	0.0024
acetylene	74-86-2	0.96	0.0037	0.55	0.0021	0.0016	0.0016
ethane	74-84-0	3.72	0.0145	3.30	0.0129	0.0016	0.0016
propylene	115-07-01	2.09	0.0082	1.42	0.0055	0.0026	0.0026
propane	74-98-6	7.25	0.0283	6.73	0.0262	0.0020	0.0020
propyne	74-99-7	ND[d]	ND	ND	ND	ND	ND
isobutane	75-28-5	0.73	0.0028	0.46	0.0018	0.0011	0.0011
isobutene/1-butene	115-11-7/106-98-0	1.24	0.0048	0.28	0.0011	0.0037	0.0037
1,3-butadiene	106-99-0	ND	ND	ND	ND	ND	ND
n-butane	106-97-8	1.01	0.0039	0.50	0.0020	0.0020	0.0020
trans-2-butene	624-64-6	0.42	0.0016	0.12	0.0005	0.0012	0.0012
cis-2-butene	590-18-1	0.65	0.0025	0.17	0.0007	0.0019	0.0019
3-methyl-1-butene	563-45-1	ND	ND	ND	ND	ND	ND
isopentane	78-78-4	0.79	0.0031	0.23	0.0009	0.0022	0.0022
1-pentene	109-67-1	0.44	0.0017	0.17	0.0007	0.0011	0.0011
2-methyl-1-butene	563-46-2	ND	ND	ND	ND	ND	ND
n-pentane	109-66-0	0.73	0.0028	0.23	0.0009	0.0020	0.0020
isoprene	78-79-4	0.33	0.0013	0.13	0.0005	0.0008	0.0008
trans-2-pentene	646-04-8	0.49	0.0019	0.11	0.0004	0.0015	0.0015
cis-2-pentene	627-20-3	0.54	0.0021	0.16	0.0006	0.0015	0.0015
2-methyl-2-butene	513-35-9	ND	ND	ND	ND	ND	ND
2,2-dimethylbutane	75-83-2	1.13	0.0044	0.22	0.0009	0.0035	0.0035
cyclopentene	142-29-0	ND	ND	ND	ND	ND	ND
4-methyl-1-pentene	691-37-2	ND	ND	ND	ND	ND	ND

continued

Table F-2A. (continued)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	Residence Chamber µg	Dilution Air V=3.900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
cyclopentane	287-92-3	0.49	0.0019	0.16	0.0006	0.0013	0.0013
2,3-dimethylbutane	79-29-8	0.91	0.0035	0.25	0.0010	0.0026	0.0026
2-methylpentane	107-83-5	10.85	0.0423	0.23	0.0009	0.0414	0.0414
3-methylpentane	96-14-0	0.75	0.0029	0.25	0.0010	0.0020	0.0020
2-methyl-1-pentene	763-29-1	ND	ND	ND	ND	ND	ND
1-hexene	592-41-6	1.00	0.0039	0.25	0.0010	0.0029	0.0029
2-ethyl-1-butene	760-21-4	ND	ND	ND	ND	ND	ND
n-hexane	110-54-3	3.48	0.0136	1.27	0.0050	0.0086	0.0086
trans-2-hexene	4050-45-7	ND	ND	ND	ND	ND	ND
cis-2-hexene	7688-21-3	ND	ND	ND	ND	ND	ND
methylcyclopentane	96-37-7	0.75	0.0029	0.28	0.0011	0.0018	0.0018
2,4-dimethylpentane	108-08-7	0.55	0.0021	0.19	0.0007	0.0014	0.0014
benzene	71-43-2	8.63	0.0337	0.27	0.0011	0.0326	0.0326
cyclohexane	110-82-7	0.73	0.0028	0.20	0.0008	0.0021	0.0021
2-methylhexane	591-76-4	0.98	0.0038	0.13	0.0005	0.0033	0.0033
2,3-dimethylpentane	565-59-3	0.94	0.0037	0.25	0.0010	0.0027	0.0027
3-methylhexane	589-34-4	0.52	0.0020	0.16	0.0006	0.0014	0.0014
1-heptene	592-76-7	2.44	0.0095	ND	ND	0.0095	0.0095
2,2,4-trimethylpentane	540-84-1	0.47	0.0018	0.14	0.0005	0.0013	0.0013
n-heptane	142-82-5	0.49	0.0019	0.14	0.0005	0.0014	0.0014
methylcyclohexane	108-87-2	0.54	0.0021	0.18	0.0007	0.0014	0.0014
2,2,3-trimethylpentane	564-02-3	ND	ND	ND	ND	ND	ND
2,3,4-trimethylpentane	565-75-3	0.48	0.0019	0.09	0.0004	0.0015	0.0015
toluene	108-88-3	0.89	0.0035	0.26	0.0010	0.0025	0.0025

continued

Table F-2A. (continued)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	Residence Chamber µg	Dilution Air V=3.900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
2-methylheptane	592-27-8	0.37	0.0014	0.12	0.0005	0.0010	0.0010
3-methylheptane	589-81-1	0.38	0.0015	0.09	0.0004	0.0011	0.0011
1-octene	111-66-0	ND	ND	ND	ND	ND	ND
n-octane	111-65-9	0.77	0.0030	0.14	0.0005	0.0025	0.0025
ethylbenzene	100-41-4	0.36	0.0014	0.08	0.0003	0.0011	0.0011
m-xylene/*p*-xylene	108-38-3/106-42-3	0.67	0.0026	0.14	0.0005	0.0021	0.0021
styrene	100-42-5	ND	ND	ND	ND	ND	ND
o-xylene	95-47-6	1.40	0.0055	ND	ND	0.0055	0.0055
1-nonene	124-11-8	ND	ND	ND	ND	ND	ND
n-nonane	111-84-2	0.51	0.0020	0.10	0.0004	0.0016	0.0016
isopropylbenzene	98-82-8	0.35	0.0014	0.11	0.0004	0.0009	0.0009
alpha-pinene	80-56-8	ND	ND	ND	ND	ND	ND
n-propylbenzene	103-65-1	ND	ND	0.08	0.0003	-0.0003	ND
m-ethyltoluene	620-14-4	0.33	0.0013	0.16	0.0006	0.0007	0.0007
p-ethyltoluene	622-96-8	0.38	0.0015	0.09	0.0004	0.0011	0.0011
1,3,5-trimethylbenzene	108-67-8	ND	ND	ND	ND	ND	ND
o-ethyltoluene	611-14-3	0.39	0.0015	ND	ND	0.0015	0.0015
beta-pinene	127-91-3	ND	ND	ND	ND	ND	ND
1,2,4-trimethylbenzene	95-63-6	0.36	0.0014	0.13	0.0005	0.0009	0.0009
1-decene	872-05-9	ND	ND	ND	ND	ND	ND
n-decane	124-18-5	0.63	0.0025	0.21	0.0008	0.0016	0.0016
1,2,3-trimethylbenzene	526-73-8	ND	ND	0.09	0.0004	-0.0004	ND
m-diethylbenzene	141-93-5	ND	ND	ND	ND	ND	ND
p-diethylbenzene	105-05-5	ND	ND	ND	ND	ND	ND

continued

Table F-2A. (concluded)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	Residence Chamber µg	Dilution Air V=3.900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
1-undecene	821-95-4	ND	ND	ND	ND	ND	ND
n-undecane	1120-21-4	0.50	0.0020	0.47	0.0018	0.0001	0.0001
1-dodecene	112-41-4	ND	ND	ND	ND	ND	ND
n-dodecane	112-40-3	1.21	0.0047	0.98	0.0038	0.0009	0.0009
1-tridecene	2437-56-1	ND	ND	ND	ND	ND	ND
n-tridecane	629-50-5	ND	ND	ND	ND	ND	ND
Total Speciated		**68.61**	**0.2676**	**23.44**	**0.0914**	**0.1762**	**0.1768**
Total Unspeciated		**10.70**	**0.0417**	**14.15**	**0.0552**	**-0.0135**	
Total (Speciated + Unspeciated)[e]		**79.31**	**0.3093**	**37.59**	**0.1466**	**0.1627**	**0.1768**

[a] SNMOCs = speciated nonmethane organic compounds.
[b] RC = residence chamber: DA = dilution air.
[c] Compounds for which DA>RC are listed as ND or zero.
[d] ND = not detected.
[e] Total NMOC with unknowns in µg/m³ is an estimate based on propane only.

Table F-2B. SNMOCs[a] from Hogged Fuel Boiler #2 Collected in Canisters on 11/28/01

Compound	CAS No.	Residence Chamber V=3/900L µg/m³	Residence Chamber µg	Dilution Air V=30900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
ethylene	74-85-1	1.67	0.0065	0.89	0.0035	0.0030	0.0030
acetylene	74-86-2	0.88	0.0034	0.48	0.0019	0.0016	0.0016
ethane	74-84-0	2.45	0.0096	1.85	0.0072	0.0023	0.0023
propylene	115-07-01	1.88	0.0073	1.23	0.0048	0.0025	0.0025
propane	74-98-6	8.66	0.0338	8.18	0.0319	0.0019	0.0019
propyne	74-99-7	ND[d]	ND	ND	ND	ND	ND
isobutane	75-28-5	0.48	0.0019	0.30	0.0012	0.0007	0.0007
isobutene/1-butene	115-11-7/106-98-0	0.91	0.0035	0.29	0.0011	0.0024	0.0024
1,3-butadiene	106-99-0	ND	ND	ND	ND	ND	ND
n-butane	106-97-8	0.96	0.0037	0.42	0.0016	0.0021	0.0021
trans-2-butene	624-64-6	0.39	0.0015	0.17	0.0007	0.0009	0.0009
cis-2-butene	590-18-1	0.62	0.0024	0.19	0.0007	0.0017	0.0017
3-methyl-1-butene	563-45-1	ND	ND	ND	ND	ND	ND
isopentane	78-78-4	ND	ND	0.26	0.0010	-0.0010	ND
1-pentene	109-67-1	0.58	0.0023	0.10	0.0004	0.0019	0.0019
2-methyl-1-butene	563-46-2	ND	ND	ND	ND	ND	ND
n-pentane	109-66-0	0.73	0.0028	0.17	0.0007	0.0022	0.0022
isoprene	78-79-4	ND	ND	0.11	0.0004	-0.0004	ND
trans-2-pentene	646-04-8	0.46	0.0018	0.15	0.0006	0.0012	0.0012
cis-2-pentene	627-20-3	0.51	0.0020	0.17	0.0007	0.0013	0.0013
2-methyl-2-butene	513-35-9	ND	ND	ND	ND	ND	ND
2,2-dimethylbutane	75-83-2	1.14	0.0044	0.21	0.0008	0.0036	0.0036
cyclopentene	142-29-0	ND	ND	ND	ND	ND	ND
4-methyl-1-pentene	691-37-2	ND	ND	ND	ND	ND	ND

continued

Table F-2B. (continued)

Compound	CAS No.	Residence Chamber V=3/900L µg/m³	Residence Chamber µg	Dilution Air V=30900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
cyclopentane	287-92-3	0.46	0.0018	0.12	0.0005	0.0013	0.0013
2,3-dimethylbutane	79-29-8	0.97	0.0038	0.26	0.0010	0.0028	0.0028
2-methylpentane	107-83-5	10.41	0.0406	0.36	0.0014	0.0392	0.0392
3-methylpentane	96-14-0	9.17	0.0358	0.24	0.0009	0.0348	0.0348
2-methyl-1-pentene	763-29-1	ND	ND	ND	ND	ND	ND
1-hexene	592-41-6	1.19	0.0046	0.27	0.0011	0.0036	0.0036
2-ethyl-1-butene	760-21-4	ND	ND	ND	ND	ND	ND
n-hexane	110-54-3	ND	1.4612	2.60	0.0101	-0.0104	ND[e]
trans-2-hexene	4050-45-7	ND	ND	ND	ND	ND	ND
cis-2-hexene	7688-21-3	ND	ND	ND	ND	ND	ND
methylcyclopentane	96-37-7	53.42	0.2083	0.50	0.0020	0.2064	0.2064
2,4-dimethylpentane	108-08-7	0.66	0.0026	0.15	0.0006	0.0020	0.0020
benzene	71-43-2	10.90	0.0425	0.24	0.0009	0.0416	0.0416
cyclohexane	110-82-7	0.68	0.0027	0.20	0.0008	0.0019	0.0019
2-methylhexane	591-76-4	0.45	0.0018	0.24	0.0009	0.0008	0.0008
2,3-dimethylpentane	565-59-3	1.15	0.0045	0.31	0.0012	0.0033	0.0033
3-methylhexane	589-34-4	0.45	0.0018	0.14	0.0005	0.0012	0.0012
1-heptene	592-76-7	ND	ND	ND	ND	ND	ND
2,2,4-trimethylpentane	540-84-1	ND	ND	0.18	0.0007	-0.0007	ND
n-heptane	142-82-5	0.62	0.0024	0.12	0.0005	0.0020	0.0020
methylcyclohexane	108-87-2	0.62	0.0024	0.16	0.0006	0.0018	0.0018
2,2,3-trimethylpentane	564-02-3	ND	ND	ND	ND	ND	ND
2,3,4-trimethylpentane	565-75-3	0.42	0.0016	0.11	0.0004	0.0012	0.0012
toluene	108-88-3	0.72	0.0028	0.26	0.0010	0.0018	0.0018

continued

Table F-2B. (continued)

Compound	CAS No.	Residence Chamber V=3/900L µg/m³	Residence Chamber µg	Dilution Air V=30900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
2-methylheptane	592-27-8	0.42	0.0016	0.11	0.0004	0.0012	0.0012
3-methylheptane	589-81-1	0.51	0.0020	0.10	0.0004	0.0016	0.0016
1-octene	111-66-0	ND	ND	ND	ND	ND	ND
n-octane	111-65-9	0.79	0.0031	0.15	0.0006	0.0025	0.0025
ethylbenzene	100-41-4	0.37	0.0014	0.08	0.0003	0.0011	0.0011
m-xylene/*p*-xylene	108-38-3/106-42-3	0.74	0.0003	ND	ND	0.0029	0.0029
styrene	100-42-5	ND	ND	ND	ND	ND	ND
o-xylene	95-47-6	1.62	0.0063	0.08	0.0003	0.0060	0.0060
1-nonene	124-11-8	ND	ND	ND	ND	ND	ND
n-nonane	111-84-2	0.69	0.0027	0.00	ND	0.0027	0.0027
isopropylbenzene	98-82-8	0.55	0.0021	0.09	0.0004	0.0018	0.0018
alpha-pinene	80-56-8	ND	ND	ND	ND	ND	ND
n-propylbenzene	103-65-1	0.33	0.0013	0.09	0.0004	0.0009	0.0009
m-ethyltoluene	620-14-4	0.35	0.0014	0.13	0.0005	0.0009	0.0009
p-ethyltoluene	622-96-8	0.34	0.0013	0.10	0.0004	0.0009	0.0009
1,3,5-trimethylbenzene	108-67-8	ND	ND	ND	ND	ND	ND
o-ethyltoluene	611-14-3	ND	ND	0.08	0.0003	-0.0003	ND
beta-pinene	127-91-3	ND	ND	ND	ND	ND	ND
1,2,4-trimethylbenzene	95-63-6	0.40	0.0016	0.14	0.0005	0.0010	0.0010
1-decene	872-05-9	ND	ND	ND	ND	ND	ND
n-decane	124-18-5	0.55	0.0021	0.14	0.0005	0.0016	0.0016
1,2,3-trimethylbenzene	526-73-8	ND	ND	ND	ND	ND	ND
m-diethylbenzene	141-93-5	ND	ND	ND	ND	ND	ND
p-diethylbenzene	105-05-5	ND	ND	ND	ND	ND	ND

continued

Table F-2B. (concluded)

Compound	CAS No.	Residence Chamber V=3/900L µg/m³	Residence Chamber µg	Dilution Air V=30900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
1-undecene	821-95-4	ND	ND	ND	ND	ND	ND
n-undecane	1120-21-4	0.56	0.0022	0.22	0.0009	0.0013	0.0013
1-dodecene	112-41-4	ND	ND	ND	ND	ND	ND
n-dodecane	112-40-3	0.30	0.0012	0.28	0.0011	7.8×10^{-5}	7.8×10^{-5}
1-tridecene	2437-56-1	ND	ND	ND	ND	ND	ND
n-tridecane	629-50-5	ND	ND	ND	ND	ND	ND
Total Speciated		**123.13**	**0.4802**	**23.42**	**0.0913**	**0.3889**	**1.8525**
Total Unspeciated		**37.98**	**0.1481**	**3.52**	**0.0137**	**0.1344**	**0.1344**
Total (Speciated + Unspeciated)[f]		**161.11**	**0.6283**	**26.94**	**0.1051**	**0.5233**	**1.9869**

[a] SNMOCs = speciated nonmethane organic compounds.
[b] RC = residence chamber: DA = dilution air.
[c] Compounds for which DA>RC are listed as ND or zero.
[d] ND = not detected.
[e] *n*-hexane on 11/28/01 is considered an artifact from denuder solvent; a value of zero is used in calculations.
[f] Total NMOC with unknowns in µg/m³ is an estimate based on propane only.

Table F-2C. SNMOCs[a] from Hogged Fuel Boiler #2 Collected in Canisters on 11/29/01

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	Residence Chamber µg	Dilution Air V=3.900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
ethylene	74-85-1	1.41	0.0055	0.68	0.0027	0.0028	0.0028
acetylene	74-86-2	0.95	0.0037	0.35	0.0014	0.0023	0.0023
ethane	74-84-0	2.07	0.0081	1.49	0.0058	0.0023	0.0023
propylene	115-07-01	1.01	0.0039	0.50	0.0020	0.0020	0.0020
propane	74-98-6	5.23	0.0204	4.61	0.0180	0.0024	0.0024
propyne	74-99-7	ND[d]	ND	ND	ND	ND	ND
isobutane	75-28-5	0.53	0.0021	0.25	0.0010	0.0011	0.0011
isobutene/1-butene	115-11-7/106-98-0	0.97	0.0038	0.32	0.0012	0.0025	0.0025
1,3-butadiene	106-99-0	ND	ND	ND	ND	ND	ND
n-butane	106-97-8	1.08	0.0042	0.42	0.0016	0.0026	0.0026
trans-2-butene	624-64-6	0.43	0.0017	0.16	0.0006	0.0011	0.0011
cis-2-butene	590-18-1	0.62	0.0024	0.23	0.0009	0.0015	0.0015
3-methyl-1-butene	563-45-1	ND	ND	ND	ND	ND	ND
isopentane	78-78-4	0.92	0.0036	0.28	0.0011	0.0025	0.0025
1-pentene	109-67-1	0.52	0.0020	0.13	0.0005	0.0015	0.0015
2-methyl-1-butene	563-46-2	ND	ND	ND	ND	ND	ND
n-pentane	109-66-0	0.52	0.0020	0.18	0.0007	0.0013	0.0013
isoprene	78-79-4	ND	ND	0.14	0.0005	-0.0006	ND
trans-2-pentene	646-04-8	0.49	0.0019	0.13	0.0005	0.0014	0.0014
cis-2-pentene	627-20-3	0.62	0.0024	0.16	0.0006	0.0018	0.0018
2-methyl-2-butene	513-35-9	ND	ND	ND	ND	ND	ND
2,2-dimethylbutane	75-83-2	2.17	0.0085	0.21	0.0008	0.0076	0.0076
cyclopentene	142-29-0	ND	ND	ND	ND	ND	ND
4-methyl-1-pentene	691-37-2	ND	ND	ND	ND	ND	ND

continued

Table F-2C. (continued)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	Residence Chamber µg	Dilution Air V=3.900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
cyclopentane	287-92-3	0.50	0.0020	0.15	0.0006	0.0014	0.0014
2,3-dimethylbutane	79-29-8	0.95	0.0037	0.26	0.0010	0.0027	0.0027
2-methylpentane	107-83-5	7.63	0.0298	0.39	0.0015	0.0282	0.0282
3-methylpentane	96-14-0	0.88	0.0034	0.19	0.0007	0.0027	0.0027
2-methyl-1-pentene	763-29-1	ND	ND	ND	ND	ND	ND
1-hexene	592-41-6	0.85	0.0033	0.25	0.0010	0.0023	0.0023
2-ethyl-1-butene	760-21-4	ND	ND	ND	ND	ND	ND
n-hexane	110-54-3	5.12	0.0200	0.23	0.0009	0.0191	0.0191
trans-2-hexene	4050-45-7	ND	ND	ND	ND	ND	ND
cis-2-hexene	7688-21-3	ND	ND	ND	ND	ND	ND
methylcyclopentane	96-37-7	1.14	0.0044	0.17	0.0007	0.0038	0.0038
2,4-dimethylpentane	108-08-7	0.77	0.0030	0.17	0.0007	0.0023	0.0023
benzene	71-43-2	9.27	0.0362	0.14	0.0005	0.0356	0.0356
cyclohexane	110-82-7	0.82	0.0032	0.21	0.0008	0.0024	0.0024
2-methylhexane	591-76-4	0.97	0.0038	0.15	0.0006	0.0032	0.0032
2,3-dimethylpentane	565-59-3	1.19	0.0046	0.28	0.0011	0.0035	0.0035
3-methylhexane	589-34-4	0.63	0.0025	0.22	0.0009	0.0016	0.0016
1-heptene	592-76-7	ND	ND	ND	ND	ND	ND
2,2,4-trimethylpentane	540-84-1	6.12	0.0239	0.17	0.0007	0.0232	0.0232
n-heptane	142-82-5	0.36	0.0014	0.10	0.0004	0.0010	0.0010
methylcyclohexane	108-87-2	0.54	0.0021	0.19	0.0007	0.0014	0.0014
2,2,3-trimethylpentane	564-02-3	ND	ND	ND	ND	ND	ND
2,3,4-trimethylpentane	565-75-3	0.42	0.0016	0.12	0.0005	0.0012	0.0012
toluene	108-88-3	0.68	0.0027	0.23	0.0009	0.0018	0.0018

continued

Table F-2C. (continued)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	Residence Chamber µg	Dilution Air V=3.900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
2-methylheptane	592-27-8	0.37	0.0014	0.11	0.0004	0.0010	0.0010
3-methylheptane	589-81-1	0.44	0.0017	0.11	0.0004	0.0013	0.0013
1-octene	111-66-0	0	ND	0	ND	ND	ND
n-octane	111-65-9	0.71	0.0028	0.10	0.0004	0.0024	0.0024
ethylbenzene	100-41-4	ND	ND	0.09	0.0004	-0.0004	ND
m-xylene/*p*-xylene	108-38-3/106-42-3	0.44	0.0017	0.12	0.0005	0.0012	0.0012
styrene	100-42-5	0.00	ND	0.00	ND	ND	ND
o-xylene	95-47-6	1.51	0.0059	0.00	ND	0.0059	0.0059
1-nonene	124-11-8	ND	ND	ND	ND	ND	ND
n-nonane	111-84-2	0.54	0.0021	0.00	ND	0.0021	0.0021
isopropylbenzene	98-82-8	0.45	0.0018	0.12	0.0005	0.0013	0.0013
alpha-pinene	80-56-8	ND	ND	ND	ND	ND	ND
n-propylbenzene	103-65-1	0.43	0.0017	0.08	0.0003	0.0014	0.0014
m-ethyltoluene	620-14-4	0.33	0.0013	0.10	0.0004	0.0009	0.0009
p-ethyltoluene	622-96-8	0.37	0.0014	0.11	0.0004	0.0010	0.0010
1,3,5-trimethylbenzene	108-67-8	0.30	0.0012	0.07	0.0003	0.0009	0.0009
o-ethyltoluene	611-14-3	0	ND	0.07	0.0003	-0.0003	ND
beta-pinene	127-91-3	0.00	ND	0.19	0.0007	-0.0007	ND
1,2,4-trimethylbenzene	95-63-6	0.35	0.0014	0.14	0.0005	0.0008	0.0008
1-decene	872-05-9	0	ND	0	ND	ND	ND
n-decane	124-18-5	0.51	0.0020	0.22	0.0009	0.0011	0.0011
1,2,3-trimethylbenzene	526-73-8	ND	ND	ND	ND	ND	ND
m-diethylbenzene	141-93-5	0.00	ND	0.09	0.0004	-0.0004	ND
p-diethylbenzene	105-05-5	ND	ND	ND	ND	ND	ND

continued

Table F-2C. (concluded)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	Residence Chamber µg	Dilution Air V=3.900L µg/m³	Dilution Air µg	SNMOC RC-DA[b] µg	No Negs[c] SNMOC RC-DA µg
1-undecene	821-95-4	ND	ND	ND	ND	ND	ND
n-undecane	1120-21-4	0.74	0.0029	1.20	0.0047	-0.0018	ND
1-dodecene	112-41-4	ND	ND	ND	ND	ND	ND
n-dodecane	112-40-3	0.45	0.0018	1.20	0.0047	-0.0029	ND
1-tridecene	2437-56-1	ND	ND	ND	ND	ND	ND
n-tridecane	629-50-5	ND	ND	ND	ND	ND	ND
Total Speciated		**66.32**	**0.2586**	**17.98**	**0.0701**	**0.1885**	**0.1955**
Total Unspeciated		**5.29**	**0.0206**	**2.96**	**0.0115**	**0.0091**	**0.0091**
Total (Speciated +Unspeciated)[e]		**71.61**	**0.2793**	**20.94**	**0.0817**	**0.1976**	**0.2046**

[a] SNMOCs = speciated nonmethane organic compounds.
[b] RC = residence chamber: DA = dilution air.
[c] Compounds for which DA>RC are listed as ND or zero.
[d] ND = not detected.
[e] Total NMOC with unknowns in µg/m³ is an estimate based on propane only.

Table F-3. Summary of SNMOCs[a] Collected in Canisters from Hogged Fuel Boiler #2 on Test 11/27/01 through 11/29/01

Compound	CAS No.	No Negs[b] SNMOC RC-DA[c] 11/27/01 µg	No Negs SNMOC RC-DA 11/28/01 µg	No Negs SNMOC RC-DA 11/29/01 µg
ethylene	74-85-1	0.0024	0.0030	0.0028
acetylene	74-86-2	0.0016	0.0016	0.0023
ethane	74-84-0	0.0016	0.0023	0.0023
propylene	115-07-1	0.0026	0.0025	0.0020
propane	74-98-6	0.0020	0.0019	0.0024
propyne	74-99-7	ND[d]	ND	ND
isobutane	75-28-5	0.0011	0.0007	0.0011
isobutene/1-butene	115-11-7/106-98-0	0.0037	0.0024	0.0025
1,3-butadiene	106-99-0	ND	ND	ND
n-butane	106-97-8	0.0020	0.0021	0.0026
trans-2-butene	624-64-6	0.0012	0.0009	0.0011
cis-2-butene	590-18-1	0.0019	0.0017	0.0015
3-methyl-1-butene	563-45-1	ND	ND	ND
isopentane	78-78-4	0.0022	ND	0.0025
1-pentene	109-67-1	0.0011	0.0019	0.0015
2-methyl-1-butene	563-46-2	ND	ND	ND
n-pentane	109-66-0	0.0020	0.0022	0.0013
isoprene	78-79-4	0.0008	ND	ND
trans-2-pentene	646-04-8	0.0015	0.0012	0.0014
cis-2-pentene	627-20-3	0.0015	0.0013	0.0018
2-methyl-2-butene	513-35-9	ND	ND	ND
2,2-dimethylbutane	75-83-2	0.0035	0.0036	0.0076
cyclopentene	142-29-0	ND	ND	ND
4-methyl-1-pentene	691-37-2	ND	ND	ND
cyclopentane	287-92-3	0.0013	0.0013	0.0014
2,3-dimethylbutane	79-29-8	0.0026	0.0028	0.0027
2-methylpentane	107-83-5	0.0414	0.0392	0.0282
3-methylpentane	96-14-0	0.0020	0.0348	0.0027
2-methyl-1-pentene	763-29-1	ND	ND	ND
1-hexene	592-41-6	0.0029	0.0036	0.0023
2-ethyl-1-butene	760-21-4	ND	ND	ND
n-hexane	110-54-3	0.0086	ND[e]	0.0191
trans-2-hexene	4050-45-7	ND	ND	ND
cis-2-hexene	7688-21-3	ND	ND	ND
methylcyclopentane	96-37-7	0.0018	0.2064	0.0038

continued

Table F-3. (continued)

Compound	CAS No.	No Negs[b] SNMOC RC-DA[c] 11/27/01 µg	No Negs SNMOC RC-DA 11/28/01 µg	No Negs SNMOC RC-DA 11/29/01 µg
2,4-dimethylpentane	108-08-7	0.0014	0.0020	0.0023
benzene	71-43-2	0.0326	0.0416	0.0356
cyclohexane	110-82-7	0.0021	0.0019	0.0024
2-methylhexane	591-76-4	0.0033	0.0008	0.0032
2,3-dimethylpentane	565-59-3	0.0027	0.0033	0.0035
3-methylhexane	589-34-4	0.0014	0.0012	0.0016
1-heptene	592-76-7	0.0095	ND	ND
2,2,4-trimethylpentane	540-84-1	0.0013	ND	0.0232
n-heptane	142-82-5	0.0014	0.0020	0.0010
methylcyclohexane	108-87-2	0.0014	0.0018	0.0014
2,2,3-trimethylpentane	564-02-3	ND	ND	ND
2,3,4-trimethylpentane	565-75-3	0.0015	0.0012	0.0012
toluene	108-88-3	0.0025	0.0018	0.0018
2-methylheptane	592-27-8	0.0010	0.0012	0.0010
3-methylheptane	589-81-1	0.0011	0.0016	0.0013
1-octene	111-66-0	ND	ND	ND
n-octane	111-65-9	0.0025	0.0025	0.0024
ethylbenzene	100-41-4	0.0011	0.0011	ND
m-xylene/*p*-xylene	108-38-3/106-42-3	0.0021	0.0029	0.0012
styrene	100-42-5	ND	ND	ND
o-xylene	95-47-6	0.0055	0.0060	0.0059
1-nonene	124-11-8	ND	ND	ND
n-nonane	111-84-2	0.0016	0.0027	0.0021
isopropylbenzene	98-82-8	0.0009	0.0018	0.0013
alpha-pinene	80-56-8	ND	ND	ND
n-propylbenzene	103-65-1	ND	0.0009	0.0014
m-ethyltoluene	620-14-4	0.0007	0.0009	0.0009
p-ethyltoluene	622-96-8	0.0011	0.0009	0.0010
1,3,5-trimethylbenzene	108-67-8	ND	ND	0.0009
o-ethyltoluene	611-14-3	0.0015	ND	ND
beta-pinene	127-91-3	ND	ND	ND
1,2,4-trimethylbenzene	95-63-6	0.0009	0.0010	0.0008
1-decene	872-05-9	ND	ND	ND
n-decane	124-18-5	0.0016	0.0016	0.0011
1,2,3-trimethylbenzene	526-73-8	ND	ND	ND
m-diethylbenzene	141-93-5	ND	ND	ND

continued

Table F-3. (concluded)

Compound	CAS No.	No Negs[b] SNMOC RC-DA[c] 11/27/01 µg	No Negs SNMOC RC-DA 11/28/01 µg	No Negs SNMOC RC-DA 11/29/01 µg
p-diethylbenzene	105-05-5	ND	ND	ND
1-undecene	821-95-4	ND	ND	ND
n-undecane	1120-21-4	0.0001	0.0013	ND
1-dodecene	112-41-4	ND	ND	ND
n-dodecane	112-40-3	0.0009	7.8×10^{-5}	ND
1-tridecene	2437-56-1	ND	ND	ND
n-tridecane	629-50-5	ND	ND	ND
Total Speciated		**0.1768**	**0.4015**	**0.1955**
Total Unspeciated		**—[f]**	**0.1344**	**0.0091**
Total (Speciated + Unspeciated)[g]		**0.1768**	**0.5359**	**0.2046**

[a] SNMOCs = speciated nonmethane organic compounds.
[b] RC = residence chamber: DA = dilution air.
[c] Compounds for which DA>RC are listed as ND or zero.
[d] ND = not detected.
[e] *n*-hexane on 11/28/01 is considered an artifact from denuder solvent; a value of zero is used in calculations.
[f] RC-DA is a small negative number; zero is used in the calculations, and the "Total (Speciated + Unspeciated)" is considered to equal the "Total Speciated" for 11/27/01.
[g] Total NMOC with unknowns in $\mu g/m^3$ is an estimate based on propane only.

Table F-4A. Total SNMOCs[a] Collected from Hogged Fuel Boiler #2 on 11/27/01

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	SNMOC RC-DA µg	No Negs[d] SNMOC RC-DA µg
ethylene	74-85-1	1.59	656.5655	0.97	391.8404	264.7250	264.7250
acetylene	74-86-2	0.96	396.4169	0.55	222.1776	174.2393	174.2393
ethane	74-84-0	3.72	1536.1154	3.3	1333.0650	203.0501	203.0501
propylene	115-07-1	2.09	863.0326	1.42	573.6220	289.4105	289.4105
propane	74-98-6	7.25	2993.7733	6.73	2718.6450	275.1280	275.1280
propyne	74-99-7	ND[e]	ND	ND	ND	ND	ND
isobutane	75-28-5	0.73	301.4420	0.46	185.8212	115.6208	115.6208
isobutene/1-butene	115-11-7/106-98-0	1.24	512.0385	0.28	113.1086	398.9299	398.9299
1,3-butadiene	106-99-0	ND	ND	ND	ND	ND	ND
n-butane	106-97-8	1.01	417.0636	0.50	201.9796	215.0840	215.0840
trans-2-butene	624-64-6	0.42	173.4324	0.12	48.4751	124.9573	124.9573
cis-2-butene	590-18-1	0.65	268.4073	0.17	68.6731	199.7342	199.7342
3-methyl-1-butene	563-45-1	ND	ND	ND	ND	ND	ND
isopentane	78-78-4	0.79	326.2181	0.23	92.9106	233.3074	233.3074
1-pentene	109-67-1	0.44	181.6911	0.17	68.6731	113.0180	113.0180
2-methyl-1-butene	563-46-2	ND	ND	ND	ND	ND	ND
n-pentane	109-66-0	0.73	301.4420	0.23	92.9106	208.5314	208.5314
isoprene	78-79-4	0.33	136.2683	0.13	52.5147	83.7536	83.7536
trans-2-pentene	646-04-8	0.49	202.3378	0.11	44.4355	157.9023	157.9023
cis-2-pentene	627-20-3	0.54	222.9845	0.16	64.6335	158.3510	158.3510
2-methyl-2-butene	513-35-9	ND	ND	ND	ND	ND	ND
2,2-dimethylbutane	75-83-2	1.13	466.6157	0.22	88.8710	377.7447	377.7447
cyclopentene	142-29-0	ND	ND	ND	ND	ND	ND
4-methyl-1-pentene	691-37-2	ND	ND	ND	ND	ND	ND

continued

Table F-4A. (continued)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	SNMOC RC-DA µg	No Negs[d] SNMOC RC-DA µg
cyclopentane	287-92-3	0.49	202.3378	0.16	64.6335	137.7043	137.7043
2,3-dimethylbutane	79-29-8	0.91	375.7702	0.25	100.9898	274.7804	274.7804
2-methylpentane	107-83-5	10.85	4480.3366	0.23	92.9106	4387.4260	4387.4260
3-methylpentane	96-14-0	0.75	309.7007	0.25	100.9898	208.7109	208.7109
2-methyl-1-pentene	763-29-1	ND	ND	ND	ND	ND	ND
1-hexene	592-41-6	1	412.9343	0.25	100.9898	311.9445	311.9445
2-ethyl-1-butene	760-21-4	ND	ND	ND	ND	ND	ND
n-hexane	110-54-3	3.48	1437.0112	1.27	513.0282	923.9830	923.9830
trans-2-hexene	4050-45-7	ND	ND	ND	ND	ND	ND
cis-2-hexene	7688-21-3	ND	ND	ND	ND	ND	ND
methylcyclopentane	96-37-7	0.75	309.7007	0.28	113.1086	196.5921	196.5921
2,4-dimethylpentane	108-08-7	0.55	227.1138	0.19	76.7523	150.3616	150.3616
benzene	71-43-2	8.63	3563.6226	0.27	109.0690	3454.5540	3454.5540
cyclohexane	110-82-7	0.73	301.4420	0.2	80.7918	220.6502	220.6502
2-methylhexane	591-76-4	0.98	404.6756	0.13	52.5147	352.1609	352.1609
2,3-dimethylpentane	565-59-3	0.94	388.1582	0.25	100.9898	287.1684	287.1684
3-methylhexane	589-34-4	0.52	214.7258	0.16	64.6335	150.0923	150.0923
1-heptene	592-76-7	2.44	1007.5596	ND	ND	1007.5600	1007.5600
2,2,4-trimethylpentane	540-84-1	0.47	194.0791	0.14	56.5543	137.5248	137.5248
n-heptane	142-82-5	0.49	202.3378	0.14	56.5543	145.7835	145.7835
methylcyclohexane	108-87-2	0.54	222.9845	0.18	72.7127	150.2718	150.2718
2,2,3-trimethylpentane	564-02-3	ND	ND	0	ND	ND	ND
2,3,4-trimethylpentane	565-75-3	0.48	198.2084	0.09	36.3563	161.8521	161.8521
toluene	108-88-3	0.89	367.5115	0.26	105.0294	262.4821	262.4821

continued

Table F-4A. (continued)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	SNMOC RC-DA µg	No Negs[d] SNMOC RC-DA µg
2-methylheptane	592-27-8	0.37	152.7857	0.12	48.4751	104.3106	104.3106
3-methylheptane	589-81-1	0.38	156.9150	0.09	36.3563	120.5587	120.5587
1-octene	111-66-0	ND	ND	ND	ND	ND	ND
n-octane	111-65-9	0.77	317.9594	0.14	56.5543	261.4051	261.4051
ethylbenzene	100-41-4	0.36	148.6563	0.08	32.3167	116.3396	116.3396
m-xylene/*p*-xylene	108-38-3/106-42-3	0.67	276.6660	0.14	56.5543	220.1117	220.1117
styrene	100-42-5	ND	ND	ND	ND	ND	ND
o-xylene	95-47-6	1.4	578.1080	ND	ND	578.1080	578.1080
1-nonene	124-11-8	ND	ND	ND	ND	ND	ND
n-nonane	111-84-2	0.51	210.5965	0.1	40.3959	170.2005	170.2005
isopropylbenzene	98-82-8	0.35	144.5270	0.11	44.4355	100.0915	100.0915
alpha-pinene	80-56-8	ND	ND	ND	ND	ND	ND
n-propylbenzene	103-65-1	ND	ND	0.08	32.3167	-32.3167	ND
m-ethyltoluene	620-14-4	0.33	136.2683	0.16	64.6335	71.6348	71.6348
p-ethyltoluene	622-96-8	0.38	156.9150	0.09	36.3563	120.5587	120.5587
1,3,5-trimethylbenzene	108-67-8	ND	ND	ND	ND	ND	ND
o-ethyltoluene	611-14-3	0.39	161.0444	ND	ND	161.0444	161.0444
beta-pinene	127-91-3	ND	ND	ND	ND	ND	ND
1,2,4-trimethylbenzene	95-63-6	0.36	148.6563	0.13	52.5147	96.1416	96.1416
1-decene	872-05-9	ND	ND	ND	ND	ND	ND
n-decane	124-18-5	0.63	260.1486	0.21	84.8314	175.3171	175.3171
1,2,3-trimethylbenzene	526-73-8	ND	ND	0.09	36.3563	-36.3563	ND
m-diethylbenzene	141-93-5	ND	ND	ND	ND	ND	ND
p-diethylbenzene	105-05-5	ND	ND	ND	ND	ND	ND

continued

Table F-4A. (concluded)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	SNMOC RC-DA µg	No Negs[d] SNMOC RC-DA µg
1-undecene	821-95-4	ND	ND	ND	ND	ND	ND
n-undecane	1120-21-4	0.50	206.4671	0.47	189.8608	16.6063	16.6063
1-dodecene	112-41-4	ND	ND	ND	ND	ND	ND
n-dodecane	112-40-3	1.21	499.6504	0.98	395.8800	103.7704	103.7704
1-tridecene	2437-56-1	ND	ND	ND	ND	ND	ND
n-tridecane	629-50-5	ND	ND	ND	ND	ND	ND
Total Speciated		**68.61**	**28331.4190**	**23.44**	**9468.8030**	**18862.6200**	**18931.2900**
Total Unspeciated		**10.70**	**4418.3965**	**14.15**	**5716.0230**	**-1297.6300**	**0.0000[f]**
Total (Speciated + Unspeciated)[g]		**79.31**	**32749.8150**	**37.59**	**15184.8300**	**17564.9900**	**18931.2900**

[a] SNMOCs = speciated nonmethane organic compounds.
[b] RC = residence chamber.
[c] DA = dilution air.
[d] Compounds for which DA>RC are listed as ND or zero.
[e] ND = not detected.
[f] RC-DA is a negative number; zero is used in the calculations, and the "Total (Speciated + Unspeciated)" is considered to equal the "Total Speciated" for 11/27/01.
[g] Total NMOC with unknowns in µg/m³ is an estimate based on propane only.

Table F-4B. Total SNMOCs[a] Collected from Hogged Fuel Boiler #2 on 11/28/01

Compound	CAS No.	Residence Chamber V=3.9L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	SNMOC RC-DA µg	No Negs[d] SNMOC RC-DA µg
ethylene	74-85-1	1.67	691.6569	0.89	360.6	331.0494	331.0494
acetylene	74-86-2	0.88	364.4659	0.48	194.5	169.9809	169.9809
ethane	74-84-0	2.45	1014.7063	1.85	749.6	265.1287	265.1287
propylene	115-07-1	1.88	778.6318	1.23	498.4	280.2640	280.2640
propane	74-98-6	8.66	3586.6761	8.18	3314.3	272.3278	272.3278
propyne	74-99-7	ND[e]	ND	ND	ND	ND	ND
isobutane	75-28-5	0.48	198.7996	0.3	121.6	77.2465	77.2465
isobutene/1-butene	115-11-7/106-98-0		0.9100	376.8909	0.3	117.5013	259.3896
1,3-butadiene	106-99-0	ND	ND	ND	ND	ND	ND
n-butane	106-97-8	0.96	397.5992	0.42	170.2	227.4248	227.4248
trans-2-butene	624-64-6	0.39	161.5247	0.17	68.9	92.6446	92.6446
cis-2-butene	590-18-1	0.62	256.7828	0.19	77.0	179.7992	179.7992
3-methyl-1-butene	563-45-1	ND	ND	ND	ND	ND	ND
isopentane	78-78-4	0	ND	0.26	105.3	-105.3460	ND
1-pentene	109-67-1	0.58	240.2162	0.1	40.5	199.6985	199.6985
2-methyl-1-butene	563-46-2	ND	ND	ND	ND	ND	ND
n-pentane	109-66-0	0.73	302.3411	0.17	68.9	233.4610	233.4610
isoprene	78-79-4	ND	ND	0.11	44.6	-44.5695	ND
trans-2-pentene	646-04-8	0.46	190.5163	0.15	60.8	129.7397	129.7397
cis-2-pentene	627-20-3	0.51	211.2246	0.17	68.9	142.3445	142.3445
2-methyl-2-butene	513-35-9	ND	ND	ND	ND	ND	ND
2,2-dimethylbutane	75-83-2	1.14	472.1490	0.21	85.1	387.0619	387.0619
cyclopentene	142-29-0	ND	ND	ND	ND	ND	ND
4-methyl-1-pentene	691-37-2	ND	ND	ND	ND	ND	ND

continued

Table F-4B. (continued)

Compound	CAS No.	Residence Chamber V=3.9L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	SNMOC RC-DA µg	No Negs[d] SNMOC RC-DA µg
cyclopentane	287-92-3	0.46	190.5163	0.12	48.6	141.8950	141.8950
2,3-dimethylbutane	79-29-8	0.97	401.7409	0.26	105.3	296.3948	296.3948
2-methylpentane	107-83-5	10.41	4311.4663	0.36	145.9	4165.6026	4165.6026
3-methylpentane	96-14-0	9.17	3797.9007	0.24	97.2	3700.6582	3700.6582
2-methyl-1-pentene	763-29-1	ND	ND	ND	ND	ND	ND
1-hexene	592-41-6	1.19	492.8573	0.27	109.4	383.4595	383.4595
2-ethyl-1-butene	760-21-4	ND	ND	ND	ND	ND	ND
n-hexane	110-54-3	ND[f]	ND[f]	2.6	1053.5	-1053.5000	ND
trans-2-hexene	4050-45-7	ND	ND	ND	ND	ND	ND
cis-2-hexene	7688-21-3	ND	ND	ND	ND	ND	ND
methylcyclopentane	96-37-7	53.42	22124.7387	0.5	202.6	21922.1502	21922.1502
2,4-dimethylpentane	108-08-7	0.66	273.3494	0.15	60.8	212.5729	212.5729
benzene	71-43-2	10.9	4514.4076	0.24	97.2	4417.1651	4417.1651
cyclohexane	110-82-7	0.68	281.6328	0.2	81.0	200.5974	200.5974
2-methylhexane	591-76-4	0.45	186.3746	0.24	97.2	89.1321	89.1321
2,3-dimethylpentane	565-59-3	1.15	476.2907	0.31	125.6	350.6858	350.6858
3-methylhexane	589-34-4	0.45	186.3746	0.14	56.7	129.6498	129.6498
1-heptene	592-76-7	ND	ND	ND	ND	ND	ND
2,2,4-trimethylpentane	540-84-1	ND	ND	0.18	72.9	-72.9319	ND
n-heptane	142-82-5	0.62	256.7828	0.12	48.6	208.1616	208.1616
methylcyclohexane	108-87-2	0.62	256.7828	0.16	64.8	191.9545	191.9545
2,2,3-trimethylpentane	564-02-3	ND	ND	ND	ND	ND	ND
2,3,4-trimethylpentane	565-75-3	0.42	173.9496	0.11	44.6	129.3802	129.3802
toluene	108-88-3	0.72	298.1994	0.26	105.3	192.8534	192.8534

continued

Table F-4B. (continued)

Compound	CAS No.	Residence Chamber V=3.9L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	SNMOC RC-DA µg	No Negs[d] SNMOC RC-DA µg
2-methylheptane	592-27-8	0.42	173.9496	0.11	44.6	129.3802	129.3802
3-methylheptane	589-81-1	0.51	211.2246	0.10	40.5	170.7069	170.7069
1-octene	111-66-0	ND	ND	ND	ND	ND	ND
n-octane	111-65-9	0.79	327.1910	0.15	60.8	266.4145	266.4145
ethylbenzene	100-41-4	0.37	153.2414	0.08	32.4	120.8272	120.8272
m-xylene/*p*-xylene	108-38-3/106-42-3		0.7400	306.4827	ND	ND	306.4827
styrene	100-42-5	ND	ND	ND	ND	ND	ND
o-xylene	95-47-6	1.62	670.9486	0.08	32.4	638.5345	638.5345
1-nonene	124-11-8	ND	ND	ND	ND	ND	ND
n-nonane	111-84-2	0.69	285.7744	0	ND	285.7744	285.7744
isopropylbenzene	98-82-8	0.55	227.7912	0.09	36.5	191.3253	191.3253
-pinene	80-56-8	ND	ND	ND	ND	ND	ND
n-propylbenzene	103-65-1	0.33	136.6747	0.09	36.5	100.2088	100.2088
m-ethyltoluene	620-14-4	0.35	144.9580	0.13	52.7	92.2850	92.2850
p-ethyltoluene	622-96-8	0.34	140.8164	0.1	40.5	100.2987	100.2987
1,3,5trimethylbenzene	108-67-8	ND	ND	ND	ND	ND	ND
o-ethyltoluene	611-14-3	ND	ND	0.08	32.4	-32.4142	ND
beta-pinene	127-91-3	ND	ND	ND	ND	ND	ND
1,2,4-trimethylbenzene	95-63-6	0.4	165.6663	0.14	56.7	108.9415	108.9415
1-decene	872-05-9	ND	ND	ND	ND	ND	ND
n-decane	124-18-5	0.55	227.7912	0.14	56.7	171.0664	171.0664
1,2,3-trimethylbenzene	526-73-8	ND	ND	ND	ND	ND	ND
m-diethylbenzene	141-93-5	ND	ND	ND	ND	ND	ND
p-diethylbenzene	105-05-5	ND	ND	ND	ND	ND	ND

continued

Table F-4B. (concluded)

Compound	CAS No.	Residence Chamber V=3.9L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	SNMOC RC-DA µg	No Negs[d] SNMOC RC-DA µg
1-undecene	821-95-4	ND	ND	ND	ND	ND	ND
n-undecane	1120-21-4	0.56	231.9329	0.22	89.1	142.7939	142.7939
1-dodecene	112-41-4	ND	ND	ND	ND	ND	ND
n-dodecane	112-40-3	0.3	124.2497	0.28	113.5	10.8002	10.8002
1-tridecene	2437-56-1	ND	ND	ND	ND	ND	ND
n-tridecane	629-50-5	ND	ND	ND	ND	ND	ND
Total Speciated		**123.13**	**50996.2389**	**23.42**	**9489.2**	**41506.9924**	**42815.7142**
Total Unspeciated		**37.98**	**15730.0183**	**3.52**	**1426.2**	**14303.7951**	**14303.7951**
Total (Speciated + Unspeciated)[g]		**161.11**	**66726.2571**	**26.94**	**10915.5**	**55810.7875**	**57119.5093**

[a] SNMOCs = speciated nonmethane organic compounds.
[b] RC = residence chamber.
[c] DA = dilution air.
[d] Compounds for which DA>RC are listed as ND or zero.
[e] ND = not detected.
[f] *n*-hexane on 11/28/01 is considered an artifact from denuder solvent; a value of zero is used in calculations.
[g] Total NMOC with unknowns in µg/m³ is an estimate based on propane only.

Table F-4C. Total SNMOCs[a] Collected from Hogged Fuel Boiler #2 on 11/29/01

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	RC-DA SNMOC µg	No Negs[d] RC-DA SNMOC µg
ethylene	74-85-1	1.41	585.5608	0.68	278.3320	307.2290	307.2287
acetylene	74-86-2	0.95	394.5268	0.35	143.2590	251.2680	251.2676
ethane	74-84-0	2.07	859.6531	1.49	609.8750	249.7780	249.7782
propylene	115-07-1	1.01	419.4443	0.50	204.6560	214.7880	214.7883
propane	74-98-6	5.23	2171.9737	4.61	1886.9300	285.0460	285.0455
propyne	74-99-7	ND[e]	ND	ND	ND	ND	ND
isobutane	75-28-5	0.53	220.1044	0.25	102.3280	117.7760	117.7764
isobutene/1-butene	115-11-7/106-98-0		0.9700	402.8326	0.3200	130.9800	271.8528
1,3-butadiene	106-99-0	ND	ND	ND	ND	ND	ND
n-butane	106-97-8	1.08	448.5147	0.42	171.9110	276.6040	276.6036
trans-2-butene	624-64-6	0.43	178.5753	0.16	65.4899	113.0850	113.0854
cis-2-butene	590-18-1	0.62	257.4806	0.23	94.1418	163.3390	163.3389
3-methyl-1-butene	563-45-1	ND	ND	ND	ND	ND	ND
isopentane	78-78-4	0.92	382.0680	0.28	114.6070	267.4610	267.4607
1-pentene	109-67-1	0.52	215.9515	0.13	53.2106	162.7410	162.7409
2-methyl-1-butene	563-46-2	ND	ND	ND	ND	ND	ND
n-pentane	109-66-0	0.52	215.9515	0.18	73.6762	142.2750	142.2753
isoprene	78-79-4	0	ND	0.14	57.3037	-57.3037	ND
trans-2-pentene	646-04-8	0.49	203.4928	0.13	53.2106	150.2820	150.2822
cis-2-pentene	627-20-3	0.62	257.4806	0.16	65.4899	191.9910	191.9907
2-methyl-2-butene	513-35-9	ND	ND	ND	ND	ND	ND
2,2-dimethylbutane	75-83-2	2.17	901.1822	0.21	85.9555	815.2270	815.2267
cyclopentene	142-29-0	ND	ND	ND	ND	ND	ND
4-methyl-1-pentene	691-37-2	ND	ND	ND	ND	ND	ND

continued

Table F-4C. (continued)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	RC-DA SNMOC µg	No Negs[d] RC-DA SNMOC µg
cyclopentane	287-92-3	0.5	207.6457	0.15	61.3968	146.2490	146.2489
2,3-dimethylbutane	79-29-8	0.95	394.5268	0.26	106.4210	288.1060	288.1057
2-methylpentane	107-83-5	7.63	3168.6730	0.39	159.6320	3009.0400	3009.0410
3-methylpentane	96-14-0	0.88	365.4564	0.19	77.7693	287.6870	287.6871
2-methyl-1-pentene	763-29-1	ND	ND	ND	ND	ND	ND
1-hexene	592-41-6	0.85	352.9976	0.25	102.3280	250.6700	250.6696
2-ethyl-1-butene	760-21-4	ND	ND	ND	ND	ND	ND
n-hexane	110-54-3	5.12	2126.2917	0.23	94.1418	2032.1500	2032.1500
trans-2-hexene	4050-45-7	ND	ND	ND	ND	ND	ND
cis-2-hexene	7688-21-3	ND	ND	ND	ND	ND	ND
methylcyclopentane	96-37-7	1.14	473.4321	0.17	69.5830	403.8490	403.8491
2,4-dimethylpentane	108-08-7	0.77	319.7743	0.17	69.5830	250.1910	250.1913
benzene	71-43-2	9.27	3849.7508	0.14	57.3037	3792.4500	3792.4470
cyclohexane	110-82-7	0.82	340.5389	0.21	85.9555	254.5830	254.5834
2-methylhexane	591-76-4	0.97	402.8326	0.15	61.3968	341.4360	341.4358
2,3-dimethylpentane	565-59-3	1.19	494.1967	0.28	114.6070	379.5890	379.5893
3-methylhexane	589-34-4	0.63	261.6335	0.22	90.0486	171.5850	171.5849
1-heptene	592-76-7	ND	ND	ND	ND	ND	ND
2,2,4-trimethylpentane	540-84-1	6.12	2541.5830	0.17	69.5830	2472.0000	2472.0000
2,3,4-trimethylpentane	565-75-3	0.42	174.4224	0.12	49.1174	125.3050	125.3049
toluene	108-88-3	0.68	282.3981	0.23	94.1418	188.2560	188.2564
2-methylheptane	592-27-8	0.37	153.6578	0.11	45.0243	108.6330	108.6335
3-methylheptane	589-81-1	0.44	182.7282	0.11	45.0243	137.7040	137.7039
1-octene	111-66-0	ND	ND	ND	ND	ND	ND

continued

Table F-4C. (continued)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	RC-DA SNMOC µg	No Negs[d] RC-DA SNMOC µg
n-octane	111-65-9	0.71	294.8569	0.1	40.9312	253.9260	253.9257
ethylbenzene	100-41-4	ND	ND	0.09	36.8381	-36.8381	ND
m-xylene/*p*-xylene	108-38-3/106-42-3		0.4400	182.7282	0.1200	49.1174	133.6108
styrene	100-42-5	ND	ND	ND	ND	ND	ND
o-xylene	95-47-6	1.51	627.0899	ND	ND	627.0900	627.0899
1-nonene	124-11-8	ND	ND	ND	ND	ND	ND
n-nonane	111-84-2	0.54	224.2573	ND	ND	224.2570	224.2573
isopropylbenzene	98-82-8	0.45	186.8811	0.12	49.1174	137.7640	137.7637
alpha-pinene	80-56-8	ND	ND	ND	ND	ND	ND
n-propylbenzene	103-65-1	0.43	178.5753	0.08	32.7450	145.8300	145.8303
m-ethyltoluene	620-14-4	0.33	137.0461	0.1	40.9312	96.1149	96.1150
p-ethyltoluene	622-96-8	0.37	153.6578	0.11	45.0243	108.6330	108.6335
1,3,5-trimethylbenzene	108-67-8	0.3	124.5874	0.07	28.6518	95.9356	95.9356
o-ethyltoluene	611-14-3	ND	ND	0.07	28.6518	-28.6518	ND
beta-pinene	127-91-3	ND	ND	0.19	77.7693	-77.7693	ND
1,2,4-trimethylbenzene	95-63-6	0.35	145.3520	0.14	57.3037	88.0483	88.0483
1-decene	872-05-9	ND	ND	ND	ND	ND	ND
n-decane	124-18-5	0.51	211.7986	0.22	90.0486	121.7500	121.7500
1,2,3-trimethylbenzene	526-73-8	ND	ND	ND	ND	ND	ND
m-diethylbenzene	141-93-5	ND	ND	0.09	36.8381	-36.8381	ND
p-diethylbenzene	105-05-5	ND	ND	ND	ND	ND	ND
1-undecene	821-95-4	ND	ND	ND	ND	ND	ND
n-undecane	1120-21-4	0.74	307.3156	1.2	491.1740	-183.8590	ND
1-dodecene	112-41-4	ND	ND	ND	ND	ND	ND

continued

Table F-4C. (concluded)

Compound	CAS No.	Residence Chamber V=3.900L µg/m³	RC[b] Total Collected µg	Dilution Air V=3.900L µg/m³	DA[c] Total Collected µg	RC-DA SNMOC µg	No Negs[d] RC-DA SNMOC µg
n-dodecane	112-40-3	0.45	186.8811	1.2	491.1740	-304.2930	ND
1-tridecene	2437-56-1	ND	ND	ND	ND	ND	ND
n-tridecane	629-50-5	ND	ND	ND	ND	ND	ND
Total Speciated		**66.32**	**27542.1220**	**17.98**	**7359.4300**	**20182.7000**	**20908.2500**
Total Unspeciated		**5.29**	**2196.8912**	**2.96**	**1211.5600**	**985.328**	**985.3278**
Total (Speciated + Unspeciated)[f]		**71.61**	**29739.0132**	**20.94**	**8570.9900**	**21168**	**21893.57**

[a] SNMOCs = speciated nonmethane organic compounds.
[b] RC = residence chamber.
[c] DA = dilution air.
[d] Compounds for which DA>RC are listed as ND or zero.
[e] ND = not detected.
[f] Total NMOC with unknowns in µg/m³ is an estimate based on propane only.

Table F-5A. SNMOC Values for 11/27/01 in SPECIATE Format

Compound	CAS No.	SNMOC[a] RC-DA[b] µg	Uncertainty µg	Percent Total	Uncertainty as % Total
ethylene	74-85-1	264.7250	10.5008	1.3983	0.0555
acetylene	74-86-2	174.2393	9.6931	0.9204	0.0512
ethane	74-84-0	203.0501	8.7956	1.0726	0.0465
propylene	115-07-1	289.4105	5.5645	1.5287	0.0294
propane	74-98-6	275.1280	9.8726	1.4533	0.0521
propyne	74-99-7	ND[c]	8.9751	ND	ND
isobutane	75-28-5	115.6208	5.0260	0.6107	0.0265
isobutene/1-butene	115-11-7/106-98-0	398.9299	3.2310	2.1073	0.0171
1,3-butadiene	106-99-0	ND	4.7568	ND	ND
n-butane	106-97-8	215.0840	9.0648	1.1361	0.0479
trans-2-butene	624-64-6	124.9573	5.8338	0.6601	0.0308
cis-2-butene	590-18-1	199.7342	8.7058	1.0550	0.0460
3-methyl-1-butene	563-45-1	ND	12.6548	ND	ND
isopentane	78-78-4	233.3074	13.0138	1.2324	0.0687
1-pentene	109-67-1	113.0180	7.2698	0.5970	0.0384
2-methyl-1-butene	563-46-2	ND	7.2698	ND	ND
n-pentane	109-66-0	208.5314	9.0648	1.1015	0.0479
isoprene	78-79-4	83.7536	1.0770	0.4424	ND
trans-2-pentene	646-04-8	157.9023	7.3596	0.8341	ND
cis-2-pentene	627-20-3	158.3510	10.8598	0.8365	0.0574
2-methyl-2-butene	513-35-9	ND	10.5008	ND	ND
2,2-dimethylbutane	75-83-2	377.7447	13.2831	1.9953	0.0702
cyclopentene	142-29-0	ND	12.5651	ND	ND
4-methyl-1-pentene	691-37-2	ND	12.9241	ND	ND
cyclopentane	287-92-3	137.7043	6.1928	0.7274	0.0327
2,3-dimethylbutane	79-29-8	274.7804	15.3474	1.4515	ND
2-methylpentane	107-83-5	4387.4260	7.0903	23.1755	0.0375
3-methylpentane	96-14-0	208.7109	13.5523	1.1025	0.0716
2-methyl-1-pentene	763-29-1	ND	13.5523	ND	ND
1-hexene	592-41-6	311.9445	13.7318	1.6478	0.0725
2-ethyl-1-butene	760-21-4	ND	13.4626	ND	ND
n-hexane	110-54-3	923.9830	10.4111	4.8807	0.0550
trans-2-hexene	4050-45-7	ND	10.4111	ND	ND
cis-2-hexene	7688-21-3	ND	10.4111	ND	ND
methylcyclopentane	96-37-7	196.5921	8.6161	1.0385	0.0455
2,4-dimethylpentane	108-08-7	150.3616	10.7701	0.7942	0.0569
benzene	71-43-2	3454.5540	6.8210	18.2479	0.0360
cyclohexane	110-82-7	220.6502	15.2576	1.1655	ND

continued

Table F-5A. (continued)

Compound	CAS No.	SNMOC[a] RC-DA[b] µg	Uncertainty µg	Percent Total	Uncertainty as % Total
2-methylhexane	591-76-4	352.1609	1.7950	1.8602	0.0095
2,3-dimethylpentane	565-59-3	287.1684	8.9751	1.5169	0.0474
3-methylhexane	589-34-4	150.0923	7.5391	0.7928	ND
1-heptene	592-76-7	1007.5600	7.4493	5.3222	ND
2,2,4-trimethylpentane	540-84-1	137.5248	9.0648	0.7264	0.0479
n-heptane	142-82-5	145.7835	4.5773	0.7701	0.0242
methylcyclohexane	108-87-2	150.2718	8.7058	0.7938	0.0460
2,2,3-trimethylpentane	564-02-3	ND	9.0648	ND	ND
2,3,4-trimethylpentane	565-75-3	161.8521	6.2825	0.8549	0.0332
toluene	108-88-3	262.4821	3.5900	1.3865	0.0190
2-methylheptane	592-27-8	104.3106	3.5003	0.5510	ND
3-methylheptane	589-81-1	120.5587	3.4105	0.6368	0.0180
1-octene	111-66-0	ND	3.3208	ND	ND
n-octane	111-65-9	261.4051	1.7950	1.3808	0.0095
ethylbenzene	100-41-4	116.3396	2.4233	0.6145	ND
m-xylene/*p*-xylene	108-38-3/106-42-3	220.1117	3.7695	1.1627	ND
styrene	100-42-5	ND	6.1928	ND	ND
o-xylene	95-47-6	578.1080	2.4233	3.0537	0.0128
1-nonene	124-11-8	ND	1.8848	ND	ND
n-nonane	111-84-2	170.2005	1.8848	0.8990	0.0100
isopropylbenzene	98-82-8	100.0915	3.5900	0.5287	ND
alpha-pinene	80-56-8	ND	1.8848	ND	ND
n-propylbenzene	103-65-1	ND	1.7950	ND	ND
m-ethyltoluene	620-14-4	71.6348	4.1285	0.3784	0.0218
p-ethyltoluene	622-96-8	120.5587	4.7568	0.6368	0.0251
1,3,5-trimethylbenzene	108-67-8	ND	2.6028	ND	ND
o-ethyltoluene	611-14-3	161.0444	2.7823	0.8507	0.0147
beta-pinene	127-91-3	ND	1.8848	ND	ND
1,2,4-trimethylbenzene	95-63-6	96.1416	2.6028	0.5078	0.0137
1-decene	872-05-9	ND	1.9745	ND	ND
n-decane	124-18-5	175.3171	1.9745	0.9261	ND
1,2,3-trimethylbenzene	526-73-8	ND	2.1540	ND	ND
m-diethylbenzene	141-93-5	ND	1.1668	ND	ND
p-diethylbenzene	105-05-5	ND	1.3463	ND	ND
1-undecene	821-95-4	ND	1.7053	ND	ND
n-undecane	1120-21-4	16.6063	1.7053	0.0877	0.0090
1-dodecene	112-41-4	ND	3.7695	ND	ND
n-dodecane	112-40-3	103.7704	3.8593	0.5481	ND

continued

Table F-5A. (concluded)

Compound	CAS No.	SNMOC[a] RC-DA[b] µg	Uncertainty µg	Percent Total	Uncertainty as % Total
1-tridecene	2437-56-1	ND	3.7695	ND	ND
n-tridecane	629-50-5	ND	3.8593	ND	ND
Total Speciated		**18931.2885**			
Total Unspeciated		**0.0000[d]**			
Total (Speciated + Unspeciated)[e]		**18931.2885**			

[a] SNMOCs = speciated nonmethane organic compounds.
[b] RC = residence chamber; DA = dilution air.
[c] ND = not detected.
[d] RC-DA is a negative number; zero is used in the calculations, and the "Total (Speciated + Unspeciated)" is considered to equal the "Total Speciated" for 11/27/01.
[e] Total NMOC with unknowns in $\mu g/m^3$ is an estimate based on propane only.

Table F-5B. SNMOC Values for 11/28/01 in SPECIATE Format

Compound	CAS No.	SNMOC[a] RC-DA[b] µg	Uncertainty µg	Percent Total	Uncertainty as % Total
ethylene	74-85-1	331.0494	10.5169	0.1567	0.0050
acetylene	74-86-2	169.9809	9.7079	0.0805	0.0046
ethane	74-84-0	265.1287	8.8090	0.1255	0.0042
propylene	115-07-1	280.2640	5.5730	0.1327	0.0026
propane	74-98-6	272.3278	9.8877	0.1289	0.0047
propyne	74-99-7	ND[c]	8.9888	ND	
isobutane	75-28-5	77.2465	5.0337	0.0366	0.0024
isobutene/1-butene	115-11-7/106-98-0	259.3896	3.2360	0.1228	0.0015
1,3-butadiene	106-99-0	ND	4.7641	ND	
n-butane	106-97-8	227.4248	9.0787	0.1077	0.0043
trans-2-butene	624-64-6	92.6446	5.8427	0.0439	0.0028
cis-2-butene	590-18-1	179.7992	8.7191	0.0851	0.0041
3-methyl-1-butene	563-45-1	ND	12.6742	ND	
isopentane	78-78-4	ND	13.0337	ND	
1-pentene	109-67-1	199.6985	7.2809	0.0945	0.0034
2-methyl-1-butene	563-46-2	ND	7.2809	ND	
n-pentane	109-66-0	233.4610	9.0787	0.1105	0.0043
isoprene	78-79-4	ND	1.0787	ND	
trans-2-pentene	646-04-8	129.7397	7.3708	0.0614	
cis-2-pentene	627-20-3	142.3445	10.8764	0.0674	0.0051
2-methyl-2-butene	513-35-9	ND	10.5169	ND	
2,2-dimethylbutane	75-83-2	387.0619	13.3034	0.1832	0.0063
cyclopentene	142-29-0	ND	12.5843	ND	
4-methyl-1-pentene	691-37-2	ND	12.9438	ND	
cyclopentane	287-92-3	141.8950	6.2023	0.0672	0.0029
2,3-dimethylbutane	79-29-8	296.3948	15.3708	0.1403	0.0073
2-methylpentane	107-83-5	4165.6030	7.1011	1.9721	0.0034
3-methylpentane	96-14-0	3700.6580	13.5731	1.7520	0.0064
2-methyl-1-pentene	763-29-1	ND	13.5731	ND	
1-hexene	592-41-6	383.4595	13.7528	0.1815	0.0065
2-ethyl-1-butene	760-21-4	ND	13.4832	ND	
n-hexane	110-54-3	ND[d]	ND[d]	ND[d]	
trans-2-hexene	4050-45-7	ND	10.4270	ND	
cis-2-hexene	7688-21-3	ND	10.4270	ND	
methylcyclopentane	96-37-7	21922.1500	8.6292	10.3786	0.0041
2,4-dimethylpentane	108-08-7	212.5729	10.7865	0.1006	0.0051
benzene	71-43-2	4417.1650	6.8315	2.0912	0.0032
cyclohexane	110-82-7	200.5974	15.2809	0.0950	

continued

Table F-5B. (continued)

Compound	CAS No.	SNMOC[a] RC-DA[b] µg	Uncertainty µg	Percent Total	Uncertainty as % Total
2-methylhexane	591-76-4	89.1321	1.7978	0.0422	0.0009
2,3-dimethylpentane	565-59-3	350.6858	8.9888	0.1660	0.0043
3-methylhexane	589-34-4	129.6498	7.5506	0.0614	0.0036
1-heptene	592-76-7	ND	7.4607	ND	
2,2,4-trimethylpentane	540-84-1	ND	9.0787	ND	
n-heptane	142-82-5	208.1616	4.5843	0.0985	0.0022
methylcyclohexane	108-87-2	191.9545	8.7191	0.0909	0.0041
2,2,3-trimethylpentane	564-02-3	ND	9.0787	ND	
2,3,4-trimethylpentane	565-75-3	129.3802	6.2921	0.0613	0.0030
toluene	108-88-3	192.8534	3.5955	0.0913	0.0017
2-methylheptane	592-27-8	129.3802	3.5056	0.0613	0.0017
3-methylheptane	589-81-1	170.7069	3.4157	0.0808	0.0016
1-octene	111-66-0	ND	3.3258	ND	
n-octane	111-65-9	266.4144	1.7978	0.1261	0.0009
ethylbenzene	100-41-4	120.8272	2.4270	0.0572	0.0011
m-xylene/*p*-xylene	108-38-3/106-42-3	306.4827	3.7753	0.1451	0.0018
styrene	100-42-5	ND	6.2023	ND	ND
o-xylene	95-47-6	638.5345	2.4270	0.3023	0.0011
1-nonene	124-11-8	ND	1.8876	ND	
n-nonane	111-84-2	285.7744	1.8876	0.1353	0.0009
isopropylbenzene	98-82-8	191.3253	3.5955	0.0906	0.0017
alpha-pinene	80-56-8	ND	1.8876	ND	
n-propylbenzene	103-65-1	100.2088	1.7978	0.0474	0.0009
m-ethyltoluene	620-14-4	92.2850	4.1348	0.0437	0.0020
p-ethyltoluene	622-96-8	100.2987	4.7641	0.0475	0.0023
1,3,5-trimethylbenzene	108-67-8	ND	2.6067	ND	
o-ethyltoluene	611-14-3	ND	2.7865	ND	
beta-pinene	127-91-3	ND	1.8876	ND	ND
1,2,4-trimethylbenzene	95-63-6	108.9415	2.6067	0.0516	0.0012
1-decene	872-05-9	ND	1.9775	ND	
n-decane	124-18-5	171.0664	1.9775	0.0810	0.0009
1,2,3-trimethylbenzene	526-73-8	ND	2.1573	ND	ND
m-diethylbenzene	141-93-5	ND	1.1685	ND	ND
p-diethylbenzene	105-05-5	ND	1.3483	ND	ND
1-undecene	821-95-4	ND	1.7079	ND	
n-undecane	1120-21-4	142.7939	1.7079	0.0676	0.0008
1-dodecene	112-41-4	ND	3.7753	ND	ND
n-dodecane	112-40-3	10.8002	3.8652	0.0051	ND

continued

Table F-5B. (concluded)

Compound	CAS No.	SNMOC[a] RC-DA[b] µg	Uncertainty µg	Percent Total	Uncertainty as % Total
1-tridecene	2437-56-1	ND	3.7753	ND	
n-tridecane	629-50-5	ND	3.8652	ND	ND
Total Speciated		**42815.71**			
Total Unspeciated		**14303.8**			
Total (Speciated + Unspeciated)[e]		**57119.51**			

[a] SNMOCs = speciated nonmethane organic compounds.
[b] RC = residence chamber; DA = dilution air.
[c] ND = not detected.
[d] *n*-hexane on 11/28/01 is considered an artifact from denuder solvent; a value of zero is used in calculations.
[e] Total NMOC with unknowns in $\mu g/m^3$ is an estimate based on propane only.

Table F-5C. SNMOC Values for 11/29/01 in SPECIATE Format

Compound	CAS No.	SNMOC[a] RC-DA[b] µg	Uncertainty µg	Percent Total	Uncertainty as % Total
ethylene	74-85-1	307.2287	10.5522	1.4033	0.0482
acetylene	74-86-2	251.2676	9.7405	1.1477	0.0445
ethane	74-84-0	249.7782	8.8386	1.1409	0.0404
propylene	115-07-1	214.7883	5.5918	0.9811	0.0255
propane	74-98-6	285.0455	9.9209	1.3020	0.0453
propyne	74-99-7	ND[c]	ND	ND	ND
isobutane	75-28-5	117.7764	5.0506	0.5380	0.0231
isobutene/1-butene	115-11-7/106-98-0	271.8528	3.2468	1.2417	0.0148
1,3-butadiene	106-99-0	ND	ND	ND	ND
n-butane	106-97-8	276.6036	9.1092	1.2634	0.0416
trans-2-butene	624-64-6	113.0854	5.8623	0.5165	0.0268
cis-2-butene	590-18-1	163.3389	8.7484	0.7461	0.0400
3-methyl-1-butene	563-45-1	ND	ND	ND	ND
isopentane	78-78-4	267.4607	13.0775	1.2216	0.0597
1-pentene	109-67-1	162.7409	7.3054	0.7433	0.0334
2-methyl-1-butene	563-46-2	ND	ND	ND	ND
n-pentane	109-66-0	142.2753	9.1092	0.6499	0.0416
isoprene	78-79-4	ND	ND	ND	ND
trans-2-pentene	646-04-8	150.2822	7.3956	0.6864	ND
cis-2-pentene	627-20-3	191.9907	10.9130	0.8769	0.0498
2-methyl-2-butene	513-35-9	ND	ND	ND	ND
2,2-dimethylbutane	75-83-2	815.2267	13.3481	3.7236	0.0610
cyclopentene	142-29-0	ND	ND	ND	ND
4-methyl-1-pentene	691-37-2	ND	ND	ND	ND
cyclopentane	287-92-3	146.2489	6.2231	0.6680	0.0284
2,3-dimethylbutane	79-29-8	288.1057	15.4225	1.3159	0.0704
2-methylpentane	107-83-5	3009.0410	7.1250	13.7440	0.0325
3-methylpentane	96-14-0	287.6871	13.6187	1.3140	0.0622
2-methyl-1-pentene	763-29-1	ND	ND	ND	ND
1-hexene	592-41-6	250.6696	13.7990	1.1449	0.0630
2-ethyl-1-butene	760-21-4	ND	ND	ND	ND
n-hexane	110-54-3	2032.1500	10.4620	9.2819	0.0478
trans-2-hexene	4050-45-7	ND	ND	ND	ND
cis-2-hexene	7688-21-3	ND	ND	ND	ND
methylcyclopentane	96-37-7	403.8491	8.6582	1.8446	0.0395
2,4-dimethylpentane	108-08-7	250.1913	10.8228	1.1428	0.0494
benzene	71-43-2	3792.4470	6.8544	17.3222	0.0313
cyclohexane	110-82-7	254.5834	15.3323	1.1628	0.0700

continued

Table F-5C. (continued)

Compound	CAS No.	SNMOC[a] RC-DA[b] µg	Uncertainty µg	Percent Total	Uncertainty as % Total
2-methylhexane	591-76-4	341.4358	1.8038	1.5595	0.0082
2,3-dimethylpentane	565-59-3	379.5893	9.0190	1.7338	0.0412
3-methylhexane	589-34-4	171.5849	7.5759	0.7837	0.0346
1-heptene	592-76-7	ND	ND	ND	ND
2,2,4-trimethylpentane	540-84-1	2472.0000	9.1092	11.2910	0.0416
n-heptane	142-82-5	108.5737	4.5997	0.4959	0.0210
methylcyclohexane	108-87-2	146.4881	8.7484	0.6691	0.0400
2,2,3-trimethylpentane	564-02-3	ND	ND	ND	ND
2,3,4-trimethylpentane	565-75-3	125.3049	6.3133	0.5723	0.0288
toluene	108-88-3	188.2564	3.6076	0.8599	0.0165
2-methylheptane	592-27-8	108.6335	3.5174	0.4962	0.0161
3-methylheptane	589-81-1	137.7039	3.4272	0.6290	0.0157
1-octene	111-66-0	ND	ND	ND	ND
n-octane	111-65-9	253.9257	1.8038	1.1598	0.0082
ethylbenzene	100-41-4	ND	ND	ND	ND
m-xylene/*p*-xylene	108-38-3/106-42-3	133.6108	3.7880	0.6103	0.0173
styrene	100-42-5	ND	ND	ND	ND
o-xylene	95-47-6	627.0899	2.4351	2.8643	0.0111
1-nonene	124-11-8	ND	ND	ND	ND
n-nonane	111-84-2	224.2573	1.8940	1.0243	0.0087
isopropylbenzene	98-82-8	137.7637	3.6076	0.6292	0.0165
alpha-pinene	80-56-8	ND	ND	ND	ND
n-propylbenzene	103-65-1	145.8303	1.8038	0.6661	0.0082
m-ethyltoluene	620-14-4	96.1150	4.1487	0.4390	0.0189
p-ethyltoluene	622-96-8	108.6335	4.7801	0.4962	0.0218
1,3,5-trimethylbenzene	108-67-8	95.9356	2.6155	0.4382	0.0119
o-ethyltoluene	611-14-3	ND	ND	ND	ND
beta-pinene	127-91-3	ND	ND	ND	ND
1,2,4-trimethylbenzene	95-63-6	88.0483	2.6155	0.4022	0.0119
1-decene	872-05-9	ND	ND	ND	ND
n-decane	124-18-5	121.7500	1.9842	0.5561	0.0091
1,2,3-trimethylbenzene	526-73-8	ND	ND	ND	ND
m-diethylbenzene	141-93-5	ND	ND	ND	ND
p-diethylbenzene	105-05-5	ND	ND	ND	ND
1-undecene	821-95-4	ND	ND	ND	ND
n-undecane	1120-21-4	ND	ND	ND	ND
1-dodecene	112-41-4	ND	ND	ND	ND
n-dodecane	112-40-3	ND	ND	ND	ND

continued

Table F-5C. (concluded)

Compound	CAS No.	SNMOC[a] RC-DA[b] µg	Uncertainty µg	Percent Total	Uncertainty as % Total
1-tridecene	2437-56-1	ND	ND	ND	ND
n-tridecane	629-50-5	ND	ND	ND	ND
Total Speciated		**20908.25**			
Total Unspeciated		**21168.02**			
Total (Speciated + Unspeciated)[d]		**42076.27**			

[a] SNMOCs = speciated nonmethane organic compounds.
[b] RC = residence chamber; DA = dilution air.
[c] ND = not detected.
[d] Total NMOC with unknowns in $\mu g/m^3$ is an estimate based on propane only.

Table F-6. Summary of SNMOCs[a] from Hogged Fuel Boiler #2 for All Test Days as Weight Percent of Total

Compound	CAS No.	11/27/01 RC-DA[b] µg	Percent Total	11/28/01 RC-DA µg	Percent Total	11/29/01 RC-DA µg	Percent Total
ethylene	74-85-1	264.7250	1.3983	331.0494	0.5796	307.2287	1.4033
acetylene	74-86-2	174.2393	0.9204	169.9809	0.2976	251.2676	1.1477
ethane	74-84-0	203.0501	1.0726	265.1287	0.4642	249.7782	1.1409
propylene	115-07-1	289.4105	1.5287	280.2640	0.4907	214.7883	0.9811
propane	74-98-6	275.1280	1.4533	272.3278	0.4768	285.0455	1.3020
propyne	74-99-7	ND[c]	ND	ND	ND	ND	ND
isobutane	75-28-5	115.6208	0.6107	77.2465	0.1352	117.7764	0.5380
isobutene/1-butene	115-11-7/106-98-0	398.9299	2.1073	259.3896	0.4541	271.8528	1.2417
1,3-butadiene	106-99-0	ND	ND	ND	ND	ND	ND
n-butane	106-97-8	215.0840	1.1361	227.4248	0.3982	276.6036	1.2634
trans-2-butene	624-64-6	124.9573	0.6601	92.6446	0.1622	113.0854	0.5165
cis-2-butene	590-18-1	199.7342	1.0550	179.7992	0.3148	163.3389	0.7461
3-methyl-1-butene	563-45-1	ND	ND	ND	ND	ND	ND
isopentane	78-78-4	233.3074	1.2324	ND	ND	267.4607	1.2216
1-pentene	109-67-1	113.0180	0.5970	199.6985	0.3496	162.7409	0.7433
2-methyl-1-butene	563-46-2	ND	ND	ND	ND	ND	ND
n-pentane	109-66-0	208.5314	1.1015	233.4610	0.4087	142.2753	0.6499
isoprene	78-79-4	83.7536	0.4424	ND	ND	ND	ND
trans-2-pentene	646-04-8	157.9023	0.8341	129.7397	0.2271	150.2822	0.6864
cis-2-pentene	627-20-3	158.3510	0.8365	142.3445	0.2492	191.9907	0.8769
2-methyl-2-butene	513-35-9	ND	ND	ND	ND	ND	ND
2,2-dimethylbutane	75-83-2	377.7447	1.9953	387.0619	0.6776	815.2267	3.7236
cyclopentene	142-29-0	ND	ND	ND	ND	ND	ND
4-methyl-1-pentene	691-37-2	ND	ND	ND	ND	ND	ND
cyclopentane	287-92-3	137.7043	0.7274	141.8950	0.2484	146.2489	0.6680

continued

Table F-6. (continued)

Compound	CAS No.	11/27/01 RC-DA[b] µg	Percent Total	11/28/01 RC-DA µg	Percent Total	11/29/01 RC-DA µg	Percent Total
3-dimethylbutane	79-29-8	274.7804	1.4515	296.3948	0.5189	288.1057	1.3159
2-methylpentane	107-83-5	4387.4260	23.1755	4165.6030	7.2928	3009.0410	13.7440
3-methylpentane	96-14-0	208.7109	1.1025	3700.6580	6.4788	287.6871	1.3140
2-methyl-1-pentene	763-29-1	ND	ND	ND	ND	ND	ND
1-hexene	592-41-6	311.9445	1.6478	383.4595	0.6713	250.6696	1.1449
2-ethyl-1-butene	760-21-4	ND	ND	ND	ND	ND	ND
n-hexane	110-54-3	923.9830	4.8807	ND[d]	ND[d]	2032.1500	9.2819
trans-2-hexene	4050-45-7	ND	ND	ND	ND	ND	ND
cis-2-hexene	7688-21-3	ND	ND	ND	ND	ND	ND
methylcyclopentane	96-37-7	196.5921	1.0385	21922.1500	38.3794	403.8491	1.8446
2,4-dimethylpentane	108-08-7	150.3616	0.7942	212.5729	0.3722	250.1913	1.1428
benzene	71-43-2	3454.5540	18.2479	4417.1650	7.7332	3792.4470	17.3222
cyclohexane	110-82-7	220.6502	1.1655	200.5974	0.3512	254.5834	1.1628
2-methylhexane	591-76-4	352.1609	1.8602	89.1321	0.1560	341.4358	1.5600
2,3-dimethylpentane	565-59-3	287.1684	1.5169	350.6858	0.6140	379.5893	1.7338
3-methylhexane	589-34-4	150.0923	0.7928	129.6498	0.2270	171.5849	0.7837
1-heptene	592-76-7	1007.5600	5.3222	ND	ND	ND	ND
2,2,4-trimethylpentane	540-84-1	137.5248	0.7264	ND	ND	2472.0000	11.2091
n-heptane	142-82-5	145.7835	0.7701	208.1616	0.3644	108.5737	0.4959
methylcyclohexane	108-87-2	150.2718	0.7938	191.9545	0.3361	146.4881	0.6691
2,2,3-trimethylpentane	564-02-3	ND	ND	ND	ND	ND	ND
2,3,4-trimethylpentane	565-75-3	161.8521	0.8549	129.3802	0.2265	125.3049	0.5723
toluene	108-88-3	262.4821	1.3865	192.8534	0.3376	188.2564	0.8599
2-methylheptane	592-27-8	104.3106	0.5510	129.3802	0.2265	108.6335	0.4962
3-methylheptane	589-81-1	120.5587	0.6368	170.7069	0.2989	137.7039	0.6290

continued

Table F-6. (continued)

Compound	CAS No.	11/27/01 RC-DA[b] µg	Percent Total	11/28/01 RC-DA µg	Percent Total	11/29/01 RC-DA µg	Percent Total
1-octene	111-66-0	ND	ND	ND	ND	ND	ND
n-octane	111-65-9	261.4051	1.3808	266.4144	0.4664	253.9257	1.1598
ethylbenzene	100-41-4	116.3396	0.6145	120.8272	0.2115	ND	ND
m-xylene/*p*-xylene	108-38-3/106-42-3	220.1117	1.1627	306.4827	0.5366	133.6108	0.6103
styrene	100-42-5	ND	ND	ND	ND	ND	ND
o-xylene	95-47-6	578.1080	3.0537	638.5345	1.1179	627.0899	2.8643
1-nonene	124-11-8	ND	ND	ND	ND	ND	ND
n-nonane	111-84-2	170.2005	0.8990	285.7744	0.5003	224.2573	1.0243
isopropylbenzene	98-82-8	100.0915	0.5287	191.3253	0.3350	137.7637	0.6292
alpha-pinene	80-56-8	ND	ND	ND	ND	ND	ND
n-propylbenzene	103-65-1	ND	ND	100.2088	0.1754	145.8303	0.6661
m-ethyltoluene	620-14-4	71.6348	0.3784	92.2850	0.1616	96.1150	0.4390
p-ethyltoluene	622-96-8	120.5587	0.6368	100.2987	0.1756	108.6335	0.4962
1,3,5-trimethylbenzene	108-67-8	ND	ND	ND	ND	95.9356	0.4382
o-ethyltoluene	611-14-3	161.0444	0.8507	ND	ND	ND	ND
beta-pinene	127-91-3	ND	ND	ND	ND	ND	ND
1,2,4-trimethylbenzene	95-63-6	96.1416	0.5078	108.9415	0.1907	88.0483	0.4022
1-decene	872-05-9	ND	ND	ND	ND	ND	ND
n-decane	124-18-5	175.3171	0.9261	171.0664	0.2995	121.7500	0.5561
1,2,3-trimethylbenzene	526-73-8	ND	ND	ND	ND	ND	ND
m-diethylbenzene	141-93-5	ND	ND	ND	ND	ND	ND
p-diethylbenzene	105-05-5	ND	ND	ND	ND	ND	ND
1-undecene	821-95-4	ND	ND	ND	ND	ND	ND
n-undecane	1120-21-4	16.6063	0.0877	142.7939	0.2500	ND	ND
1-dodecene	112-41-4	ND	ND	ND	ND	ND	ND

continued

Table F-6. (concluded)

Compound	CAS No.	11/27/01 RC-DA[b] µg	Percent Total	11/28/01 RC-DA µg	Percent Total	11/29/01 RC-DA µg	Percent Total
n-dodecane	112-40-3	103.7704	0.5481	10.8002	0.1891	ND	ND
1-tridecene	2437-56-1	ND	ND	ND	ND	ND	ND
n-tridecane	629-50-5	ND	ND	ND	ND	ND	ND
Total Speciated		**18931.29**		**42815.71**		**20908.25**	
Total Unspeciated		**0**[e]		**14303.8**		**985.3278**	
Total (Speciated + Unspeciated)[f]		**18931.29**		**57119.51**		**21893.57**	

[a] SNMOCs = speciated nonmethane organic compounds.
[b] RC = residence chamber: DA = dilution air.
[c] ND = not detected.
[d] *n*-hexane on 11/28/01 is considered an artifact from denuder solvent; a value of zero is used in calculations.
[e] RC-DA is a small negative number; zero is used in the calculations, and the "Total (Speciated + Unspeciated)" is considered to equal the "Total Speciated" for 11/27/01.
[f] Total NMOC with unknowns in $\mu g/m^3$ is an estimate based on propane only.

Appendix G

Data Tables for Individual Air Toxics Samples

Contents

Table G-1. Air Toxics, Hogged Fuel Boiler #2, Laboratory Blank and Ambient Air

Compounds	CAS No.	Laboratory Blank µg/m³	Ambient Air 11/27/01 µg/m³
ethylene			
acetylene	74-86-2	ND[a]	0.39
propylene	115-07-1	ND	ND
dichlorodifluoromethane	75-71-8	ND	2.58
chloromethane	74-87-3	ND	1.80
dichlorotetrafluoroethane	1320-37-2	ND	ND
vinyl chloride	75-01-4	ND	ND
1,3-butadiene	106-99-0	ND	ND
bromomethane	74-83-9	ND	ND
chloroethane	75-00-3	ND	ND
acetonitrile	75-05-8	ND	ND
acetone	67-64-1	ND	ND
trichlorofluoromethane	75-69-4	ND	1.40
acrylonitrile	107-13-1	ND	ND
1,1-dichloroethene	75-35-4	ND	ND
methylene chloride	75-09-2	ND	485.21[b]
trichlorotrifluoroethane	26523-64-8	ND	0.60
trans-1,2-dichloroethylene	56-60-5	ND	ND
1,1-dichloroethane	75-34-3	ND	ND
methyl *tert*-butyl ether	1634-04-1	ND	ND
methyl ethyl ketone	78-93-3	ND	ND
chloroprene	126-99-8	ND	ND
cis-1,3-dichloroethylene	156-59-2	ND	ND
bromochloromethane	74-97-5	ND	ND
chloroform	67-66-3	ND	ND
erthyl *tert*-butyl ether	637-92-3	ND	ND
1,2-dichloroethane	107-06-2	ND	ND
1,1,1-trichloroethane	71-55-6	ND	0.13
benzene	71-43-2	ND	2.24
carbon tetrachloride	56-23-5	ND	0.61
tert-amyl methyl ether	994-05-8	ND	ND
1,2-dichloropropane	78-87-5	ND	ND
ethyl acrylate	140-88-5	ND	ND
bromodichloromethane	75-27-4	ND	ND
trichloroethylene	79-01-6	ND	ND
methyl methacrylate	80-62-6	ND	ND
cis-1,2-dichloropropene	10061-01-5	ND	ND
methyl isobutyl ketone	108-10-1	ND	ND

continued

Table G-1. (concluded)

Compounds	CAS No.	Laboratory Blank µg/m^3	Ambient Air 11/27/01 µg/m^3
trans-1,2-dichloropropene	10061-02-6	ND	ND
1,1,2-trichloroethane	79-00-5	ND	ND
toluene	108-88-3	ND	0.74
dibromochloromethane	124-48-1	ND	ND
1,2-dibromoethane	106-93-4	ND	ND
n-octane	111-65-9	ND	ND
tetrachloroethylene	127-18-4	ND	ND
chlorobenzene	108-90-7	ND	ND
ethylbenzene	100-41-4	ND	0.14
m-, *p*-xylene	108-38-3/106-42-3	ND	0.67
bromoform	75-25-2	ND	ND
styrene	100-42-5	ND	ND
1,1,2,2-tetrachloroethane	79-34-5	ND	ND
o-xylene	95-47-6	ND	0.16
1,3,5-trimethylbenzene	108-67-8	ND	ND
1,2,4-trimethylbenzene	95-63-6	ND	0.20
m-dichlorobenzene	541-73-1	ND	ND
chloromethylbenzene	100-44-7	ND	ND
p-dichlorobenzene	106-46-7	ND	ND
o-dichlorobenzene	95-50-1	ND	ND
1,2,4-trichlorobenzene	120-82-1	ND	ND
hexachloro-1,3-butadiene	87-68-3	ND	ND

[a] ND = not detected.

[b] Methylene chloride in the ambient canister is a contaminant from the denuders. The value is included as a reference.

Table G-2A. Air Toxics from Hogged Fuel Boiler #2 on 11/27/01

Compounds	CAS No.	Residence Chamber µg/m³	Dilution Air µg/m³	Air Toxics RC-DA[a] µg/m³	Ambient µg/m³
acetylene	74-86-2	0.72	0.41	0.31	0.39
propylene	115-07-1	1.59	1.29	0.30	ND[b]
dichlorodifluoromethane	75-71-8	4.31	4.48	-0.17	2.58
chloromethane	74-87-3	1.56	1.80	-0.24	1.8
dichlorotetrafluoroethane	1320-37-2	ND	ND	ND	ND
vinyl chloride	75-01-4	ND	ND	ND	ND
1,3-butadiene	106-99-0	ND	ND	ND	ND
bromomethane	74-83-9	ND	ND	ND	ND
chloroethane	75-00-3	ND	ND	ND	ND
acetonitrile	75-05-8	ND	ND	ND	ND
acetone	67-64-1	ND	ND	ND	ND
trichlorofluoromethane	75-69-4	ND	0.06	-0.06	1.4
acrylonitrile	107-13-1	ND	ND	ND	ND
1,1-dichloroethene	75-35-4	ND	ND	ND	ND
methylene chloride	75-09-2	65.07	3.48	61.59	485.21[c]
trichlorotrifluoroethane	26523-64-8	ND	ND	ND	0.6
trans-1,2-dichloroethylene	56-60-5	ND	ND	ND	ND
1,1-dichloroethane	75-34-3	ND	ND	ND	ND
methyl *tert*-butyl ether	1634-04-1	ND	ND	ND	ND
methyl ethyl ketone	78-93-3	ND	ND	ND	ND
chloroprene	126-99-8	ND	ND	ND	ND
cis-1,3-dichloroethylene	156-59-2	ND	ND	ND	ND
bromochloromethane	74-97-5	ND	ND	ND	ND
chloroform	67-66-3	ND	ND	ND	ND
erthyl *tert*-butyl ether	637-92-3	ND	ND	ND	ND
1,2-dichloroethane	107-06-2	ND	ND	ND	ND
1,1,1-trichloroethane	71-55-6	ND	ND	ND	0.13
benzene	71-43-2	9.57	0.22	9.35	2.24
carbon tetrachloride	56-23-5	ND	ND	ND	0.61
tert-amyl methyl ether	994-05-8	ND	ND	ND	ND
1,2-dichloropropane	78-87-5	ND	ND	ND	ND
ethyl acrylate	140-88-5	ND	ND	ND	ND
bromodichloromethane	75-27-4	ND	ND	ND	ND
trichloroethylene	79-01-6	ND	ND	ND	ND
methyl methacrylate	80-62-6	ND	ND	ND	ND
cis-1,2-dichloropropene	10061-01-5	ND	ND	ND	ND
methyl isobutyl ketone	108-10-1	ND	ND	ND	ND
trans-1,2-dichloropropene	10061-02-6	ND	ND	ND	ND

continued

Table G-2A. (concluded)

Compounds	CAS No.	Residence Chamber µg/m³	Dilution Air µg/m³	Air Toxics RC-DA[a] µg/m³	Ambient µg/m³
1,1,2-trichloroethane	79-00-5	ND	ND	ND	ND
toluene	108-88-3	0.77	0.25	0.52	0.74
dibromochloromethane	124-48-1	ND	ND	ND	ND
1,2-dibromoethane	106-93-4	ND	ND	ND	ND
n-octane	111-65-9	ND	ND	ND	ND
tetrachloroethylene	127-18-4	ND	ND	ND	ND
chlorobenzene	108-90-7	ND	ND	ND	ND
ethylbenzene	100-41-4	0.29	0.09	0.20	0.14
m-, *p*-xylene	108-38-3/106-42-3	ND	ND	ND	0.67
bromoform	75-25-2	ND	ND	ND	ND
styrene	100-42-5	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	79-34-5	ND	ND	ND	ND
o-xylene	95-47-6	ND	ND	ND	0.16
1,3,5-trimethylbenzene	108-67-8	ND	ND	ND	ND
1,2,4-trimethylbenzene	95-63-6	0.34	0.11	0.23	0.20
m-dichlorobenzene	541-73-1	ND	ND	ND	ND
chloromethylbenzene	100-44-7	ND	ND	ND	ND
p-dichlorobenzene	106-46-7	ND	ND	ND	ND
o-dichlorobenzene	95-50-1	ND	ND	ND	ND
1,2,4-trichlorobenzene	120-82-1	ND	ND	ND	ND
hexachloro-1,3-butadiene	87-68-3	ND	ND	ND	ND

[a] RC = residence chamber: DA = dilution air.

[b] ND = not detected.

[c] Methylene chloride in the ambient canister is a contaminant from the denuders. The value is included as a reference.

Table G-2B. Air Toxics from Hogged Fuel Boiler #2 on 11/28/01

Compounds	CAS No.	Residence Chamber µg/m³	Dilution Air µg/m³	Air Toxics RC-DA[a] µg/m³
acetylene	74-86-2	0.67	0.37	0.30
propylene	115-07-1	1.22	1.14	0.08
dichlorodifluoromethane	75-71-8	4.34	5.34	-1
chloromethane	74-87-3	1.25	1.59	-0.34
dichlorotetrafluoroethane	1320-37-2	ND[b]	ND	ND
vinyl chloride	75-01-4	ND	ND	ND
1,3-butadiene	106-99-0	ND	ND	ND
bromomethane	74-83-9	ND	ND	ND
chloroethane	75-00-3	ND	ND	ND
acetonitrile	75-05-8	ND	ND	ND
acetone	67-64-1	ND	ND	ND
trichlorofluoromethane	75-69-4	ND	0.09	-0.09
acrylonitrile	107-13-1	ND	ND	ND
1,1-dichloroethene	75-35-4	ND	ND	ND
methylene chloride	75-09-2	ND	9.18	-9.18
trichlorotrifluoroethane	26523-64-8	ND	ND	ND
trans-1,2-dichloroethylene	56-60-5	ND	ND	ND
1,1-dichloroethane	75-34-3	ND	ND	ND
methyl *tert*-butyl ether	1634-04-1	ND	ND	ND
methyl ethyl ketone	78-93-3	ND	ND	ND
chloroprene	126-99-8	ND	ND	ND
cis-1,3-dichloroethylene	156-59-2	ND	ND	ND
bromochloromethane	74-97-5	ND	ND	ND
chloroform	67-66-3	ND	ND	ND
erthyl *tert*-butyl ether	637-92-3	ND	ND	ND
1,2-dichloroethane	107-06-2	ND	ND	ND
1,1,1-trichloroethane	71-55-6	ND	ND	ND
benzene	71-43-2	11.14	0.20	10.94
carbon tetrachloride	56-23-5	ND	ND	ND
tert-amyl methyl ether	994-05-8	ND	ND	ND
1,2-dichloropropane	78-87-5	ND	ND	ND
ethyl acrylate	140-88-5	ND	ND	ND
bromodichloromethane	75-27-4	ND	ND	ND
trichloroethylene	79-01-6	ND	ND	ND
methyl methacrylate	80-62-6	ND	ND	ND
cis-1,2-dichloropropene	10061-01-5	ND	ND	ND
methyl isobutyl ketone	108-10-1	ND	ND	ND
trans-1,2-dichloropropene	10061-02-6	ND	ND	ND

continued

Table G-2B. (concluded)

Compounds	CAS No.	Residence Chamber µg/m^3	Dilution Air µg/m^3	Air Toxics RC-DA[a] µg/m^3
1,1,2-trichloroethane	79-00-5	ND	ND	ND
toluene	108-88-3	0.56	0.18	0.38
dibromochloromethane	124-48-1	ND	ND	ND
1,2-dibromoethane	106-93-4	ND	ND	ND
n-octane	111-65-9	ND	ND	ND
tetrachloroethylene	127-18-4	ND	ND	ND
chlorobenzene	108-90-7	ND	ND	ND
ethylbenzene	100-41-4	0.30	ND	0.3
m-, *p*-xylene	108-38-3/106-42-3	ND	ND	ND
bromoform	75-25-2	ND	ND	ND
styrene	100-42-5	ND	ND	ND
1,1,2,2-tetrachloroethane	79-34-5	ND	ND	ND
o-xylene	95-47-6	ND	ND	ND
1,3,5-trimethylbenzene	108-67-8	ND	ND	ND
1,2,4-trimethylbenzene	95-63-6	ND	ND	ND
m-dichlorobenzene	541-73-1	ND	ND	ND
chloromethylbenzene	100-44-7	ND	ND	ND
p-dichlorobenzene	106-46-7	ND	ND	ND
o-dichlorobenzene	95-50-1	ND	ND	ND
1,2,4-trichlorobenzene	120-82-1	ND	ND	ND
hexachloro-1,3-butadiene	87-68-3	ND	ND	ND

[a] RC = residence chamber: DA = dilution air.

[b] ND = not detected.

Table G-2C. Air Toxics from Hogged Fuel Boiler #2 on 11/29/01

Compounds	CAS No.	Residence Chamber µg/m³	Dilution Air µg/m³	Air Toxics RC-DA[a] µg/m³
acetylene	74-86-2	0.75	0.27	0.48
propylene	115-07-1	0.35	0.37	-0.02
dichlorodifluoromethane	75-71-8	4.70	5.46	-0.76
chloromethane	74-87-3	1.33	1.32	0.01
dichlorotetrafluoroethane	1320-37-2	ND[b]	ND	ND
vinyl chloride	75-01-4	ND	ND	ND
1,3-butadiene	106-99-0	ND	ND	ND
bromomethane	74-83-9	ND	ND	ND
chloroethane	75-00-3	ND	ND	ND
acetonitrile	75-05-8	ND	ND	ND
acetone	67-64-1	ND	ND	ND
trichlorofluoromethane	75-69-4	ND	0.07	-0.07
acrylonitrile	107-13-1	ND	ND	ND
1,1-dichloroethene	75-35-4	ND	ND	ND
methylene chloride	75-09-2	9.78	1.11	8.67
trichlorotrifluoroethane	26523-64-8	ND	ND	ND
trans-1,2-dichloroethylene	56-60-5	ND	ND	ND
1,1-dichloroethane	75-34-3	ND	ND	ND
methyl *tert*-butyl ether	1634-04-1	ND	ND	ND
methyl ethyl ketone	78-93-3	ND	ND	ND
chloroprene	126-99-8	ND	ND	ND
cis-1,3-dichloroethylene	156-59-2	ND	ND	ND
bromochloromethane	74-97-5	ND	ND	ND
chloroform	67-66-3	ND	ND	ND
erthyl *tert*-butyl ether	637-92-3	ND	ND	ND
1,2-dichloroethane	107-06-2	ND	ND	ND
1,1,1-trichloroethane	71-55-6	ND	ND	ND
benzene	71-43-2	9.75	0.16	9.59
carbon tetrachloride	56-23-5	ND	ND	ND
tert-amyl methyl ether	994-05-8	ND	ND	ND
1,2-dichloropropane	78-87-5	ND	ND	ND
ethyl acrylate	140-88-5	ND	ND	ND
bromodichloromethane	75-27-4	ND	ND	ND
trichloroethylene	79-01-6	ND	ND	ND
methyl methacrylate	80-62-6	ND	ND	ND
cis-1,2-dichloropropene	10061-01-5	ND	ND	ND
methyl isobutyl ketone	108-10-1	ND	ND	ND
trans-1,2-dichloropropene	10061-02-6	ND	ND	ND

continued

Table G-2C. (concluded)

Compounds	CAS No.	Residence Chamber µg/m^3	Dilution Air µg/m^3	Air Toxics RC-DA[a] µg/m^3
1,1,2-trichloroethane	79-00-5	ND	ND	ND
toluene	108-88-3	0.52	0.19	0.33
dibromochloromethane	124-48-1	ND	ND	ND
1,2-dibromoethane	106-93-4	ND	ND	ND
n-octane	111-65-9	ND	ND	ND
tetrachloroethylene	127-18-4	ND	ND	ND
chlorobenzene	108-90-7	ND	ND	ND
ethylbenzene	100-41-4	0.29	0.07	0.22
m-, *p*-xylene	108-38-3/106-42-3	ND	ND	ND
bromoform	75-25-2	ND	ND	ND
styrene	100-42-5	ND	ND	ND
1,1,2,2-tetrachloroethane	79-34-5	ND	ND	ND
o-xylene	95-47-6	ND	ND	ND
1,3,5-trimethylbenzene	108-67-8	ND	ND	ND
1,2,4-trimethylbenzene	95-63-6	ND	ND	ND
m-dichlorobenzene	541-73-1	ND	ND	ND
chloromethylbenzene	100-44-7	ND	ND	ND
p-dichlorobenzene	106-46-7	ND	ND	ND
o-dichlorobenzene	95-50-1	ND	ND	ND
1,2,4-trichlorobenzene	120-82-1	ND	ND	ND
hexachloro-1,3-butadiene	87-68-3	ND	ND	ND

[a] RC = residence chamber: DA = dilution air.

[b] ND = not detected.

Table G-3. Summary of Air Toxics from Hogged Fuel Boiler #2 for All Test Days

Compounds	CAS No.	Ambient µg/m^3	Air Toxics RC-DA[a] 11/27/01 µg/m^3	Air Toxics RC-DA 11/28/01 µg/m^3	Air Toxics RC-DA 11/29/01 µg/m^3
acetylene	74-86-2	0.39	0.31	0.30	0.48
propylene	115-07-1	ND[b]	0.30	0.08	ND
dichlorodifluoromethane	75-71-8	2.58	ND	ND	ND
chloromethane	74-87-3	1.80	ND	ND	0.01
trichlorofluoromethane	75-69-4	1.40	ND	ND	ND
methylene chloride	75-09-2	485.21[c]	61.59	454.07[d]	8.67
trichlorotrifluoroethane	26523-64-8	0.60	ND	ND	ND
1,1,1-trichloroethane	71-55-6	0.13	ND	ND	ND
benzene	71-43-2	2.24	9.35	10.94	9.59
carbon tetrachloride	56-23-5	0.61	ND	ND	ND
1,1,2-trichloroethane	79-00-5	0	0	0	0
toluene	108-88-3	0.74	0.52	0.38	0.33
ethylbenzene	100-41-4	0.14	0.20	0.30	0.22
m-, *p*-xylene	108-38-3/106-42-3	0.67	ND	ND	ND
o-xylene	95-47-6	0.16	ND	ND	ND
1,2,4-trimethylbenzene	95-63-6	0.20	0.23	ND	ND

[a] RC = residence chamber: DA = dilution air.
[b] ND = not detected.
[c] Methylene chloride in the ambient canister is a contaminant from the denuders. The value is included as a reference.
[d] Methylene chloride on 11/28/01 is considered an artifact.

Appendix H

Data Tables for Individual $PM_{2.5}$ Elemental Samples

Table H-1. $PM_{2.5}$ Elemental Analysis, Hogged Fuel Boiler #2

XRF Elemental Analysis Results (wt.% of $PM_{2.5}$ Mass) by Sample

	Filter ID					
Element	T100201T IB112701 HR2A1	T100201U IB112701 HR2B1	T102201A IB112801H R2A1	T102201B IB112801 HR2A1	T102201F IB112901 HR2A1	T102201G IB112901 HR2B1
Sodium	0.877	0.828	0.957	0.859	0.963	1.03
Magnesium	0.519	0.519	0.494	0.483	0.538	0.534
Aluminum	16.41	16.41	15.71	14.55	15.32	15.43
Silicon	17.84	17.73	17.43	16.06	17	17.21
Phosphorus	0.547	0.558	0.573	0.514	0.678	0.571
Sulfur	3.08	3.08	2.66	2.33	3.02	3
Chlorine	1.03	0.783	0.608	1.11	1.02	1.1
Potassium	6.97	6.83	6.4	5.85	7.27	7.49
Calcium	2.36	2.47	2.46	2.01	2.42	2.46
Titanium	1.59	1.67	1.64	1.51	1.62	1.63
Vanadium	0.094	0.121	0.123	0.107	0.104	0.089
Manganese	0.395					
Iron	4.51	4.5	4.54	4.95	4.39	4.57
Cobalt	0.103					
Nickel	0.182			0.33		
Copper	0.206	0.199				
Zinc	0.211	0.325	0.352	0.298	0.247	0.194
Bromine	0.276	0.306				
Strontium	0.39				0.43	0.36

Appendix I

Data Tables for Individual $PM_{2.5}$ EC/OC Samples

Table I-1. EC/OC Carbon Samples, NIOSH Method 5040, Hogged Fuel Boiler #2

OC/EC data (wt% of PM mass) by Sample

Filter ID	OC	EC
Q052901N IB112701HR4A1	5.8	1.5
Q053001A IB112701HR4B1	7.1	0.8
Q060401J IB112701HR8A1	5.1	1.6
Q060401K IB112701HR8B1	5.5	1.7
Q060401M IB112701HR10A3	0.5	0.4
q060401N IB112701HR10B3	0.3	0.4
Q060401U IB112801HR4A1	7.0	1.3
Q060401V IB112801HR4B1	6.3	1.4
Q060401S IB112801HR8A1	5.8	2.2
Q060401T IB112801HR8B1	6.0	2.0
Q060401P IB112801HR10A3	1.5	0.7
Q060401Q IB112801HR10B3	1.0	0.9
Q101501E IB112901HR4A1	6.4	2.3
Q101501D IB112901HR4B1	6.2	2.0
Q101501A IB112901HR8A1	6.8	2.1
Q101501B IB112901HR8B1	6.1	2.1
Q060401X IB112901HR10A3	1.6	1.2
Q060401Y IB112901HR10B3	1.2	1.0

Appendix J

Data Tables for Individual $PM_{2.5}$ Inorganic Ion Samples

Table J-1. Calibration Ranges for $PM_{2.5}$ Inorganic Ion Analyses, Hogged Fuel Boiler

Inorganic Ions by Ion Chromatography

	Date			
	11/27/01 – 11/28/01		11/29/01	
Ion	High Conc. ppm	Low Conc. ppm	High Conc. ppm	Low Conc. ppm
Chloride	2.7	1	2.5	0.9
Nitrate	2.8	1	2.65	0.94
Sulfate	3.2	1.1	2.71	1
Ammonium	1.87	0.67	2.2	0.9
Potassium	1.85	0.66	2	0.8
Magnesium	0.68	1.9	2.3	0.95
Calcium	1.8	0.64	2.2	0.91

Table J-2. Inorganic Ion Samples, Hogged Fuel Boiler #2

Ion Chromatography Results (wt. % of $PM_{2.5}$ Mass) by Sample

	Filter ID					
	T100201V IB112701H R6A1	T100201W IB112701H R6B1	T100201Y IB112801H R6A1	T100201Z IB112801H R6B1	T102201D IB112901H R6A1	T102201E IB112901H R6B1
Ion						
Ammonium	ND[a]	ND	ND	ND	ND	ND
Potassium	2.36	2.15	2.17	1.85	2.83	2.76
Magnesium	ND	ND	ND	ND	ND	ND
Calcium	0.93	0.81	0.80	0.77	0.95	0.91
Chloride	1.57	1.28	1.52	1.64	1.52	1.34
Nitrate	ND	ND	ND	ND	ND	ND
Sulphate	8.74	8.62	8.16	8.50	8.63	8.52
S_2O_3	ND	ND	ND	ND	ND	ND

[a] ND = not detected.

Appendix K

Supporting Calibration and Data Tables for Individual Semivolatile Organic Compounds

Contents

Table K-1. Calibration Ranges for PM Speciated Organic Compounds, Standard Suite #1

Compound	High Calibration Concentration µg/mL	Low Calibration Concentration µg/mL
dimethyl phthalate	19	0.8
diethyl phthalate	19	0.8
naphthalene	10	0.8
2-methylnaphthalene	21.28	0.968
1-methylnaphthalene	21.28	0.896
2,7-dimethylnaphthalene	18.24	0.768
1,3-dimethylnaphthalene	18.24	0.768
2,6-dimethylnaphthalene	18.24	0.768
acenaphthylene	38	1.6
acenaphthene	19	0.8
fluorene	3.8	0.16
1-methylfluorene	9.5	0.4
phenanthrene	1.9	0.08
anthracene	1.9	0.08
9-methylanthracene	18.62	0.784
octylcyclohexane	9.5	0.4
norpristane	9.5	0.4
decylcyclohexane	9.5	0.4
pristane	9.5	0.4
phytane	9.5	0.4
tridecylcyclohexane	9.5	0.4
dibutyl phthalate	19	0.8
butyl benzyl phthalate	19	0.8
*bis(*2-ethylhexyl) phthalate	19	0.8
dioctyl phthalate	19	0.8
fluoranthene	3.8	0.16
pyrene	1.9	0.08
chrysene	1.9	0.08
benzo[a]anthracene	1.9	0.08
benzo[k]fluoranthene	1.9	0.08
benzo[b]fluoranthene	3.8	0.16
benzo[a]pyrene	1.9	0.08
nonadecylcyclohexane	9.5	0.4
squalane	19.855	0.836
indeno[1,2,3-cd]pyrene	1.9	0.08
dibenzo[a,h]anthracene	3.8	0.16
benzo[ghi]perylene	3.8	0.16

continued

Table K-1. (concluded)

Compound	High Calibration Concentration µg/mL	Low Calibration Concentration µg/mL
coronene	2.375	0.1
cholestane 1	0.95	0.04
cholestane 2	0.95	0.04
cholestane 3	0.95	0.04
cholestane 4	0.95	0.04
ABB-20R-24S-methylcholestane	0.95	0.04
ABB-20R-ethylcholestane	0.95	0.04
17A(H)-22,29,30-trisnorhopane	0.95	0.04
17B(H)-21A(H)-norhopane	0.95	0.04
17B(H)-21B(H)-hopane	0.95	0.04
17B(H)-21A(H)-hopane	0.95	0.04
17A(H)-21B(H)-hopane	0.95	0.04

Table K-2. Calibration Ranges for PM Speciated Organic Compounds, Standard Suite #2

Compound	High Calibration Concentration µg/mL	Low Calibration Concentration µg/mL
n-decane (n-C10)	8.2	0.41
n-undecane (n-C11)	8.2	0.41
n-dodecane (n-C12)	8.2	0.41
n-tridecane (n-C13)	8.2	0.41
9h-fluoren-9-one	8.68	0.434
n-tetradecane (n-C14)	8.2	0.41
n-pentadecane (n-C15)	8.2	0.41
n-hexadecane (n-16)	8.2	0.41
n-heptadecane (n-C17)	8.2	0.41
1-octadecene	15.32	0.766
n-octadecane (n-C18)	8.2	0.41
2-methylnonadecane (*iso*-C20)	1.96	0.098
3-methylnonadecane (*anteiso*-C20)	1.96	0.098
n-nonadecane (n-C19)	8.2	0.41
n-eicosane (n-C20)	8.2	0.41
n-heneicosane (n-C21)	8.2	0.41
n-docosane (n-C22)	8.2	0.41
n-tricosane (n-C23)	8.2	0.41
iso-docosane (C23)	8.2	0.41
anteiso-docosane (C23)	8.2	0.41
pyrene	0.4	0.02
anthraquinone	4.72	0.236
naphthalic anhydride	8.16	0.408
methylfluoranthene	0.4	0.02
retene	1.96	0.098
acepyrene (cyclopenta[c,d]pyrene)	1.96	0.098
benzanthraquinone	8.28	0.414
1-methylchrysene	0.4	0.02
benzo[a]pyrene	3.92	0.196
n-tetracosane (n-C24)	8.2	0.41
iso-tricosane (C24)	8.2	0.41
anteiso-tricosane (C24)	8.2	0.41
n-pentacosane (n-C25)	8.2	0.41
iso-tetracosane (C25)	8.2	0.41
anteiso-tetracosane (C25)	8.2	0.41
n-hexacosane (n-C26)	8.2	0.41
iso-pentacosane (C26)	8.2	0.41

continued

Table K-2. (concluded)

Compound	High Calibration Concentration µg/mL	Low Calibration Concentration µg/mL
anteiso-pentacosane (C26)	8.2	0.41
heptacosane (*n*-C27)	8.2	0.41
iso-hexacosane (C27)	8.2	0.41
anteiso-hexacosane (C27)	8.2	0.41
iso-heptacosane (C28)	8.2	0.41
anteiso-heptacosane (C28)	8.2	0.41
iso-octacosane (C29)	8.2	0.41
anteiso-octacosane (C29)	8.2	0.41
octacosane (*n*-C28)	8.2	0.41
nonacosane (*n*-C29)	8.2	0.41
iso-nonacosane (C30)	8.2	0.41
anteiso-nonacosane (C30)	8.2	0.41
squalene	16.56	0.828
dibenzo[a,e]pyrene	0.4	0.02
hexatriacontane-d74	10.15	10.15
n-triacontane (n-C30)	17.2	0.86
n-hentriacontane (*n*-C31)	17.2	0.86
iso-triacontane (C31)	17.2	0.86
anteiso-triacontane (C31)	17.2	0.86
iso-hentriacontane (C32)	8.2	0.41
anteiso-hentriacontane (C32)	8.2	0.41
iso-dotriacontane (C33)	8.2	0.41
anteiso-dotriacontane (C33)	8.2	0.41
dotriacontane (*n*-C32)	8.2	0.41
tritriacontane (*n*-C33)	8.2	0.41
tetratriacontane (*n*-C34)	8.2	0.41
iso-tritriacontane (C34)	8.2	0.41
anteiso-tritriacontane (C34)	8.2	0.41
pentatriacontane (*n*-C35)	8.2	0.41
hexatriacontane (*n*-C36)	8.2	0.41
tetracontane (*n*-C40)	8.2	0.41

Table K-3. Calibration Ranges for Speciated PM Organic Compounds, Standard Suite #3

Compound	High Calibration µg/mL	Low Calibration µg/mL
Caproic or Hexanoic acid, methyl ester	18.68	0.75
Succinic or Butanedioic acid, methyl ester	6.13	0.25
Caprylic or Octanoic acid, methyl ester	18.53	0.74
Glutaric or Pentanedioic acid, dimethyl ester	7.25	0.29
Nonanoic acid, methyl ester	14.66	0.59
Adipic or Hexanedioic acid, dimethyl ester	6.27	0.25
Capric or Decanoic acid, methyl ester	14.66	0.59
Undecanoic acid, methyl ester	14.66	0.59
Pimelic or Heptanedioic acid, dimethyl ester	6.32	0.25
Suberic or Octanedioic acid, dimethyl ester	6.32	0.25
Dodecanoic acid, methyl ester	17.16	0.69
Azelaic or Nonanedioic acid, dimethyl ester	5.64	0.23
Tridecanoic acid, methyl ester	17.16	0.69
Pinonic Acid, methyl ester	22.11	0.88
Dimethyl phthalate	6.18	0.25
1,4-Benzenedicarboxylic acid, methyl ester	6.08	0.24
1,3-Benzenedicarboxylic acid, methyl ester	6.42	0.26
1,2-Benzenedicarboxylic acid, 4-methyl,	6.27	0.25
1,2,4-Benzenetricarboxylic acid, trimethyl ester	6.03	0.24
Benzenetetracarboxylic acid, methyl ester	5.93	0.24
Abietic acid, methyl ester	17.16	0.71
Pimaric acid, methyl ester (secondary)	17.16	0.71
Sandaracopimaric acid, methyl ester (secondary std)	17.16	0.69
Isopimaric acid, methyl ester (secondary std)	17.16	0.71
6,18,11,13-Abetatetraen-18-oic acid, methyl ester	17.16	0.71
Dehydroabietic acid, methyl ester (secondary std)	17.16	0.71
Sebacic or Decanedioic Acid, dimethyl ester	5.74	0.23
Tetradecanoic acid, methyl ester	15.05	0.6
Pentadecanoic acid, methyl ester	15.05	0.6
Palmitoleic or 9-Hexadecenoic acid, methyl ester	15.74	0.63
Hexadecanoic acid, methyl ester	14.71	0.59
Heptadecanoic acid, methyl ester	14.71	0.59
Linoleic or 8,11-Octadecadienoic acid, methyl ester	14.07	0.56
Oleic or 9-Octadecenoic acid, methyl ester	16.52	0.66
Linolenic 9,12,15-Octadecatrienoic acid, methyl ester	17.6	0.7
Octadecanoic acid, methyl ester	11.67	0.47
Nonadecanoic acid, methyl ester	11.67	0.47
Eicosanoic acid, methyl ester	12.06	0.48

continued

Table K-3. (concluded)

Compound	High Calibration µg/mL	Low Calibration µg/mL
Heneicosanoic acid, methyl ester	12.06	0.48
Docosanoic acid, methyl ester	12.21	0.49
Tricosanoic acid, methyl ester	12.21	0.49
Tetracosanoic acid, methyl ester	13.73	0.55
Pentacosanoic acid, methyl ester	13.73	0.55
Hexacosanoic acid, methyl ester	13.73	0.55
Heptacosanoic Acid, methyl ester	14.85	0.59
Octacosanoic acid, methyl ester	14.85	0.59
Nonacosanoic acid, methyl ester	14.85	0.59
Triacontanoic acid, methyl ester	14.85	0.58

Table K-4. Emission Factors (mg/kg fuel) for *n*-Alkanoic Acids from Hogged Fuel Boiler #2 as Obtained from PUF Samples (WHP#1)

	Ports R4 & R8						Port R10						
***n*-Alkane**	**IB112701H**	**IB112801H**	**IB112901H**	**Average**	**S.D.[a]**	**RSD[b]**	**IB112701**	**IB112801**	**IB112901**	**Average**	**S.D.**	**RSD**	**[R4+R8]-R10**
n-C10	0.0034	0.0068	0.0013	0.0039	0.0028	71.46	0.0070	0.0100	ND[c]	0.0057	0.005	87.35	-0.0018
n-C11	0.0020	0.0030	0.0012	0.0021	0.0009	43.9412	0.0050	0.0070	ND	0.0040	0.004	88.39	-0.0020
n-C12	0.0016	0.1132	-0.0001	0.0382	0.0649	169.773	0.0190	0.0350	0.002	0.0187	0.012	64.4	0.0196
n-C13	0.0035	0.0010	-0.0003	0.0014	0.0019	140.068	0.0030	0.0020	0.0006	0.0019	0.002	90.91	-0.0005
n-C14	0.0006	0.0005	ND	0.0004	0.0003	81.6381	0.0007	0.0005	ND	0.0004	5×10^{-4}	115.6	-3.6×10^{-5}
n-C15	0.0003	0.0004	0.0001	0.0002	0.0002	63.6183	0.0002	0.0003	2×10^{-6}	0.0002	1×10^{-4}	83.67	8.19×10^{-5}
n-C16	0.0002	0.0003	ND	0.0002	0.0001	76.811	ND	0.0002	ND	6.7×10^{-5}	ND	ND	0.0001
n-C17	0.0014	0.0018	0.0001	0.0011	0.0009	83.2193	0.0040	0.0020	5×10^{-6}	0.0020	0.003	141.1	-0.0009
n-C18	0.0003	0.0002	0.0001	0.0002	0.0001	62.0077	0.0002	0.0005	ND	0.0002	1×10^{-4}	60.61	-6.5×10^{-5}
n-C19	0.0001	0.0002	-0.0001	0.0001	0.0001	166.278	0.0001	0.0002	0.0001	0.0001	3×10^{-5}	24.96	-3.4×10^{-5}
n-C20	0.0001	0.0001	ND	0.0001	ND	52.1756	0.0006	0.0001	ND	0.0002	4×10^{-4}	190	-0.0001
n-C21	0.0001	0.0007	0.0003	0.0003	0.0003	94.2338	0.0001	0.0004	ND	0.0002	7×10^{-5}	42.43	0.0002
n-C22	0.0007	0.0015	0.0001	0.0008	0.0007	87.9995	0.0003	0.0006	ND	0.0003	2×10^{-4}	70.71	0.0005
n-C23	0.0025	0.0060	-0.0023	0.0020	0.0042	203.391	0.0030	0.0060	0.002	0.0037	7×10^{-4}	19.28	-0.0016
n-C24	0.0003	0.0006	-0.0008	ND	0.0007	2722.13	0.0003	0.0006	0.0008	0.0006	4×10^{-4}	62.39	-0.0005
n-C25	0.0021	0.0111	-0.0097	0.0011	0.0104	919.877	ND	0.0130	0.008	0.0070	0.006	80.81	-0.0059
n-C26	0.0001	0.0044	-0.0054	-0.0003	0.0049	-1676.9	0.0070	0.0040	0.005	0.0053	0.001	26.52	-0.0056
n-C27	0.0015	0.0014	-0.0054	-0.0008	0.0040	-488.2	0.0030	0.0030	0.005	0.0037	0.001	38.57	-0.0045
n-C28	0.0012	0.0006	-0.0041	-0.0008	0.0029	-361.92	0.0020	0.0010	0.004	0.0023	0.001	60.61	-0.0031
n-C29	0.0018	0.0006	-0.0049	-0.0008	0.0036	-430.28	0.0010	0.0010	0.004	0.0020	0.002	106.1	-0.0028
n-C30	0.0001	ND	-0.0001	ND	0.0001	763.275	0.0020	ND	ND	0.0007	0.001	202.8	-0.0007
n-C31	0.0015	0.0001	-0.0011	0.0001	0.0013	876.404	ND	0.0002	0.0008	0.0003	5×10^{-4}	158.6	-0.0002
n-C32	0.0001	ND	ND	ND	0.0001	234.777	0.0006	ND	9×10^{-6}	0.0002	4×10^{-4}	202.5	-0.0002
n-C33	ND	ND	ND	ND	ND	335.069	ND	ND	1×10^{-7}	1.3×10^{-5}	3×10^{-5}	211.1	-1.3×10^{-5}

continued

Table K-4. (concluded)

	Ports R4 & R8						Port R10						
***n*-Alkane**	**IB112701H**	**IB112801H**	**IB112901H**	**Average**	**S.D.[a]**	**RSD[b]**	**IB112701**	**IB112801**	**IB112901**	**Average**	**S.D.**	**RSD**	**[R4+R8]-R10**
n-C34	0.0010	ND	-0.0001	0.0003	0.0006	211.985	ND	0.0001	ND	1.7×10^{-5}	ND	ND	0.0003
n-C35	ND	ND	ND	ND	ND	-3151.2	0.0004	ND	1×10^{-6}	0.0001	3×10^{-4}	211.1	-0.0001
n-C36	ND	ND	ND	ND	ND	173.205	ND	ND	ND	ND	ND		3×10^{-7}
n-C40	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND		ND
SUM	**0.0263**	**0.1543**	**-0.0312**									**SUM**	**-0.0101**

[a] S.D. = standard deviation.
[b] RSD = relative standard deviation.
[c] ND = not detected.

Table K-5. Emission Factors (mg/kg fuel) for *n*-Alkanoic Acids from Hogged Fuel Boiler #2 as Obtained from PUF Samples (WHP#3)

	Ports R4 & R8						R10					
***n*-Alkanoic Acid**	**11/27/01**	**11/28/01**	**11/29/01**	**Average**	**S.D.[a]**	**RSD[b]**	**11/27/01**	**11/28/01**	**11/29/01**	**Average**	**S.D.**	**RSD**
C8	0.0001	0.0003	ND[c]	0.0001	0.0001	119	0.0001	0.0003	0.0001	0.0002	0	63.5
C9	0.0004	0.0002	ND	0.0002	0.0002	99.638	0.0002	0.0022	ND	0.0008	0	151
C10	0.0003	0.0004	ND	0.0002	0.0002	73.469	0.0002	0.0026	0.0002	0.0010	0	140
C11	0.0001	0.0008	0.0001	0.0003	0.0004	131.87	0.0006	0.0009	0.0004	0.0006	0	32.8
C12	0.0007	0.0007	0.0001	0.0005	0.0004	74.153	0.0004	0.0006	0.0005	0.0005	0	23.1
C13	0.0017	0.0009	0.0001	0.0009	0.0008	87.684	0.0002	0.0006	0.0017	0.0008	0	92.7
C14	0.0002	0.0006	0.0001	0.0003	0.0003	94.651	0.0001	0.0001	0.0009	0.0003	0	132
C15	-0.0001	0.0021	ND	0.0007	0.0012	178.88	0.0020	0.0021	0.0003	0.0015	0	69
C16	ND	0.0003	ND	0.0001	0.0001	192.96	0.0001	0.0001	0.0001	0.0001	0	11.2
C17	-0.0004	0.0018	0.0003	0.0006	0.0011	195.1	ND	ND	0.0029	0.0010	0	173
C18	ND	0.0003	ND	0.0001	0.0002	178.53	ND	ND	0.0001	3.3×10^{-5}	0	173

[a] S.D. = standard deviation.

[b] RSD = relative standard deviation.

[c] ND = not detected.

Table K-6. Emission Factors (mg/kg fuel) for PAHs[a] from Hogged Fuel Boiler #2 as Obtained from PUF Samples (WHP#2)

	Ports R4&R8						Port R10						
	11/27/01	11/28/01	11/29/01				11/27/01	11/28/01	11/29/01				
PAH	IB121701	IB121801	IB121901	Average	S.D.[b]	RSD[c]	IB121701	IB121801	IB121901	Average	S.D.	RSD	[R4+R8]-R10
dimethyl phthalate	4×10^{-5}	3.7×10^{-5}	ND[d]	2.6×10^{-5}	2×10^{-5}	86.8	ND	ND	ND	ND	ND		3×10^{-5}
diethyl phthalate	0.0003	0.0002	0.0002	0.00024	6×10^{-5}	25.24	0.0005	0.0002	0.0001	0.0003	2×10^{-4}	98.99	-1×10^{-5}
naphthalene	2×10^{-5}	9.3×10^{-6}	-2.6×10^{-6}	8.9×10^{-6}	1×10^{-5}	127	ND	ND	ND	ND	1×10^{-5}	601	7×10^{-6}
2-methylnaphthalene	2×10^{-5}	ND	1.21×10^{-5}	1.1×10^{-5}	1×10^{-5}	94.14	ND	ND	ND	ND	ND		
1-methylnaphthalene	ND	ND	ND				ND	ND	ND	ND	ND		
dibutyl phthalate	0.0009	0.0004	0.0009	0.00074	3×10^{-4}	42.1	0.0009	0.0006	0.0017	0.0011	6×10^{-4}	53.86	-3×10^{-4}
butyl benzyl phthalate	0.0004	0.0001	0.0008	0.00045	4×10^{-4}	80.12	0.0003	0.0003	0.0098	0.0035	0.007	194.2	-0.003
bis-2-ethylhexyl phthalate	0.0017	0.0011	0.0021	0.00164	5×10^{-4}	31.56	0.0013	0.0013	0.0089	0.0038	0.005	139.3	-0.002

[a] PAH = polycyclic aromatic hydrocarbon.
[b] S.D. = standard deviation.
[c] RSD = relative standard deviation.
[d] ND = not detected.

Table K-7. Emission Factors (mg/kg fuel) for *n*-Alkanoic Acids from Hogged Fuel Boiler #2 as Obtained from Quartz Filters

n-Alkanoic Acid	Amount in Extract ng/μL		Total in Extract ng		Amount in Sample Air ng/L			Emission Factor mg/kg of Fuel Average
	DA[a] Port D1	RC[b] Ports R4 & R8	DA Port D1	RC Ports R4 & R8	DA Port D1	RC Ports R4 & R8	RC-DA	
C8	ND[c]	ND	1915	ND	0.0760	ND	-0.0760	-1.0198
C9	ND	ND	2280	ND	0.0905	ND	-0.0905	-1.2141
C10	2.41	4.84	668.75	605	0.0265	0.0246	-0.0020	-0.0265
C11	15.32	2.09	235	261.25	0.0093	0.0106	0.0013	0.0172
C12	18.24	2.49	112.5	311.25	0.0045	0.0126	0.0082	0.1096
C13	5.35	22.75	305	2843.75	0.0121	0.1154	0.1033	1.3867
C14	1.88	0.36	133.75	45	0.0053	0.0018	-0.0035	-0.0467
C15	0.9	1.13	850	141.25	0.0337	0.0057	-0.0280	-0.3757
C16	2.44	0.51	ND	63.75	ND	0.0026	0.0026	0.0347
C17	1.07	0.33	ND	41.25	ND	0.0017	0.0017	0.0225
C18	6.8	0.17	ND	21.25	ND	0.0009	0.0009	0.0116

[a] DA = dilution air.
[b] RC = residence chamber.
[c] ND = not detected.

Table K-8. Emission Factors (mg/kg fuel) for *n*-Alkanes from Hogged Fuel Boiler #2 as Obtained from Quartz Filters

	Amount in Extract ng/µL			Total in Extract (is=125 µL) ng			Amount in Air Sample ng/µL					Emission Factors mg/kg fuel		
n-Alkane	DA[a] Port D1	RC[b] Ports R4 & R8	RC Port R10	DA Port D1	RC Ports R4 & R8	RC Port R10	DA Port D1	RC Ports R4 & R8	RC Port R10	Ports R4 & R8 (RC-DA)	Port R10 (RC-DA)	Ports R4 & R8	Port R10	Average
n-C10	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-C11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-C12	ND	8.22	ND	ND	1027.5	ND	ND	0.0208	ND	0.0208	ND	0.0001	ND	0.0001
n-C13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-C14	0.13	ND	ND	16.25	ND	ND	0.0013	ND	ND	-0.0013	-0.0013	ND	ND	ND
n-C15	0.26	ND	ND	32.5	ND	ND	0.0026	ND	ND	-0.0026	-0.0026	ND	ND	ND
n-C16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-C17	ND	1.96	ND	ND	245	ND	ND	0.0050	ND	0.0050	ND	ND	ND	ND
n-C18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-C19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-C20	ND	1.97	ND	ND	246.25	ND	ND	0.0050	ND	0.0050	ND	ND	ND	ND
n-C21	0.41	1.31	ND	51.25	163.75	ND	0.0041	0.0033	ND	-0.0008	-0.0041	ND	ND	ND
n-C22	0.42	10.24	2.99	52.5	1280	373.75	0.0042	0.0260	0.0178	0.0217	0.0136	0.0001	0.0001	0.0001
n-C23	0.86	53.08	22.22	107.5	6635	2777.5	0.0087	0.1346	0.1325	0.1259	0.1238	0.0007	0.0007	0.0007
n-C24	1.13	106.57	54.92	141.25	13321.25	6865	0.0114	0.2702	0.3275	0.2588	0.3161	0.0015	0.0018	0.0016
n-C25	1.89	217.46	126.77	236.25	27182.5	15846	0.0191	0.5514	0.7560	0.5323	0.7369	0.0030	0.0042	0.0036
n-C26	2.4	212.41	126.27	300	26551.25	15784	0.0243	0.5386	0.7530	0.5143	0.7287	0.0029	0.0042	0.0036
n-C27	2.62	146.1	83.34	327.5	18262.5	10418	0.0265	0.3704	0.4970	0.3440	0.4705	0.0020	0.0027	0.0023
n-C28	1.89	58.18	33.87	236.25	7272.5	4233.8	0.0191	0.1475	0.2020	0.1284	0.1829	0.0007	0.0010	0.0009
n-C29	2.21	35.68	21.02	276.25	4460	2627.5	0.0223	0.0905	0.1253	0.0681	0.1030	0.0004	0.0006	0.0005
n-C30	0.06	0.71	0.26	7.5	88.75	32.5	0.0006	0.0018	0.0016	0.0012	0.0009	6.83×10^{-6}	5.4×10^{-6}	6.12×10^{-6}
n-C31	1.41	10.18	4.01	176.25	1272.5	501.25	0.0142	0.0258	0.0239	0.0116	0.0097	6.62×10^{-5}	5.53×10^{-5}	6.07×10^{-5}
n-C32	0.07	0.35	0.18	8.75	43.75	22.5	0.0007	0.0009	0.0011	0.0002	0.0004	1.03×10^{-6}	2.1×10^{-6}	1.56×10^{-6}
n-C33	ND	0.01	0.01	ND	1.25	1.25	ND	2.54×10^{-5}	5.96×10^{-5}	2.535×10^{-5}	5.96×10^{-5}	1.45×10^{-7}	3.41×10^{-7}	2.43×10^{-7}

continued

Table K-8. (concluded)

	Amount in Extract ng/μL			Total in Extract (is=125 μL) ng			Amount in Air Sample ng/μL					Emission Factors mg/kg fuel		
n-Alkane	DA[a] Port D1	RC[b] Ports R4 & R8	RC Port R10	DA Port D1	RC Ports R4 & R8	RC Port R10	DA Port D1	RC Ports R4 & R8	RC Port R10	Ports R4 & R8 (RC-DA)	Port R10 (RC-DA)	Ports R4 & R8	Port R10	Average
n-C34	1.38	2.58	2.98	172.5	322.5	372.5	0.0139	0.0065	0.0178	-0.0074	0.0038	-4.2×10^{-5}	2.19×10^{-5}	-1×10^{-5}
n-C35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-C36	0.01	ND	ND	1.25	ND	ND	0.0001	ND	ND	-0.0001	-0.0001	-5.8×10^{-7}	-5.8×10^{-7}	-5.8×10^{-7}
n-C40	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sum										**2.0250**	**2.6821**			**0.0135**
stack flow, L/min		14034637					4113.69	16382	6502.496					
time, min		480					4114.097	16456.39	7239.6					
fuel mass, kg		1176992					4142.391	16461.93	7219.8					
							12370.18	49300.32	20961.9					

[a] DA = dilution air.
[b] RC = residence chamber.
[c] ND = not detected.

Table K-9. Emission Factors (mg/kg fuel) for PAHs[a] from Hogged Fuel Boiler #2 as Obtained from Quartz Filters

	Composite in Extract ng/µL			Total in Extract (is=125 µL) ng			Amount in Air Sample ng/µL					Emission Factors mg/kg fuel	
	DA[b] Port D1	RC[c] Ports R4 & R8	RC Port R10	DA Port D1	RC Ports R4 & R8	RC Port R10	DA Port D1	RC Ports R4 & R8	RC Port R10	Ports R4 & R8 (RC-DA)	Port R10 (RC-DA)	Ports R4 & R8	Port R10
dimethyl phthalate	ND[d]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
diethyl phthalate	0.26	1.45	ND	32.5	181.25	ND	0.0013	0.0074	ND	0.0061	-0.0013	0.0002	ND
naphthalene	0.18	0.03	ND	22.5	3.75	ND	0.0009	0.0002	ND	-0.0007	-0.0009	-2.0705×10^{-5}	-3.60551×10^{-5}
2-methylnaphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-2.49612×10^{-5}
1-methylnaphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dibutyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
butyl benzyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis-2-ethyl hexyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sum												**1.48937×10^{-4}**	**-6.10163×10^{-5}**

	L/min	Time min	total liters	L/min	Time min	total liters	L/min	Time min	total liters
IB112701H	17.188	478.67	8227.38	17.036	478.67	8154.622	16.588	392	6502.496
				17.188	478.67	8227.38			
IB112801H	16.088	480.17	7724.975	17.136	480.17	8228.193	16.088	450	7239.6
				17.136	480.17	8228.193			
IB112901H	19.242	480.5	9245.781	17.168	480.5	8249.224	16.044	450	7219.8
				17.092	480.5	8212.706			
			25198.14			**24632.04**			**20961.90**

[a] PAH = polycyclic aromatic hydrocarbons.
[b] DA = dilution air.
[c] RC = residence chamber.
[d] ND = not detected.

Appendix L

List of ERG SOPs and EPA MOPs by Title

Contents

Table L-1. ERG Standard Operating Procedures by Title

SOP No.	SOP Title
1	Documentation of Field Recovery Activities
2	Gravimetric Determination for Particulate Emissions Measurements
3	Field Procedure for Collecting Ambient Air Toxics and Carbonyl Compounds Samples using the ERG:AT/C Sampling System
3B	Field Procedure for Collecting Ambient Air Toxics and Carbonyl Compounds Samples using the ERG:AT/C Sampling System
4	SOP for Preventive Maintenance in the Gas Chromatography/Mass Spectrometry Laboratory
5	SOP for the Concurrent GC/FID/MS Analysis of Canister Air Toxic Samples
6	SOP for the Analysis of Tenax® Tubes According to EPA Method TO-1/TO-17
7	SOP for the Preparation of Review Packages for Mass Spectrometry Data Sets
8	Procedure for Preparation of Standard Operating Procedures
9	SOP for the Operation of the Documentation System
10	SOP for the Determination of Method Detection Limits in the GC/MS Air Toxics Laboratory
11	SOP for Sample Storage and Checkout from Freezers/Refrigerators at the Laboratory
12	SOP for Basic Training Requirements for Sample Preparation Laboratory Personnel
13	Field Procedure for Collecting Ambient Air Hexavalent Chromium Samples Using the ERG:CR6 Sampling System
14	SOP for Sample Preparation Quality Control
15	SOP for Documentation Procedures for the Sample Preparation Laboratory
16	SOP for the Varian 9000 Series High Performance Liquid Chromatograph (HPLC)
17	SOP for Developing, Documenting, and Evaluating the Accuracy of Spreadsheet Data
18	Maintaining and Recording Data Records
19	SOP for Transferring, Storing, and Using Confidential Business Information (CBI)
20	SOP for Conducting a Laboratory Systems Audit
21	Calibration and Operation of Analytical Balances
22	SOP for the Preparation of Standards in the ERG Organic Preparation Laboratory
23	SOP for the Use of Significant Figures and Rounding Off Numbers When Reporting Data
24	SOP for Preparing Aldehyde Derivatizing Reagents and Extracting Derivatized Samples
25	SOP for the Operation of the Rainin High Performance Liquid Chromatography System
26	SOP for Documentation: Labeling of Samples and Standards Prepared in the Laboratory
27	SOP for the Operation of a Gas Chromatograph
28	SOP for Quality Assurance/Quality Control in Gas Chromatography/Mass Spectrometry
29	SOP for Concentration of Sample Extracts Using the Kuderna-Danish Concentrator
30	SOP for Canister Sampling System Certification Procedures
31	SOP for Cleaning Glassware and Syringes for Organic Analysis
32	Statistical Manual Standard Operating Procedure
33	SOP for Solid and Hazardous Waste Disposal

continued

Table L-1. (continued)

SOP No.	SOP Title
34	Analytical Chemistry Training at PPK Laboratory
35	SOP for Quality Assurance/Quality Control
36	SOP for Laboratory Security
37	SOP for Chemical Inventory
38	SOP for Personal Protective Equipment Program
39	SOP for Maintaining Laboratory Notebooks
40	SOP for Chemical Storage Facilities
41	SOP for Tracer Gas Release and Integrated Bag Sampling for Analysis by FTIR Spectroscopy
42	SOP for the Dionex-300 Ion Chromatograph
43	SOP for the Analysis of Semivolatile Organic Compounds in Gaseous Emissions using the SemiVOST Method
44	SOP for Method 8270C - GC/MS Analysis of Semivolatile Organics
45	SOP for Sample Log-in at the ERG Chemistry Laboratory
46	Field Procedure for Collecting Speciated and/or Total Nonmethane Organic Compounds Ambient Air Samples Using the ERG:S/NMOC Sampling System
47	Field Procedure for Collecting Ambient Carbonyl Compounds Samples Using the ERG:C Sampling System
47B	Field Procedure for Collecting Ambient Carbonyl Compounds Samples Using the ERG:C Sampling System
48	SOP for Cleaning XAD-2® with Quality Control Measures to Assure Cleanliness
49	SOP for the Extraction and Analysis of PAHs from XAD-2® Traps
50	SOP for Separatory Funnel Liquid-Liquid Extraction by EPA SW-846 Method 3510C
51	SOP for Continuous Liquid-Liquid Extraction by EPA SW-846 Method 3520C
52	SOP for Acid-Base Partition Cleanup by EPA SW-846 Method 3650B
53	SOP for Soxhlet Extraction by EPA SW-846 Method 3540C
54	SOP for Preparation, Evaluation, and Shipping of Performance Evaluation Samples for Method 24
55	SOP for Maintenance of NANOPure-A Deionized Water System
56	SOP for Daily Maintenance of Cold Storage Units
57	SOP for Project Peer Review
58	SOP for Preparing Method 25 Audit Samples Using the Transfill System
59	SOP for High Performance Liquid Chromatography
60	SOP for PDFID Sample Analysis
61	SOP for Standard Preparation Using Dynamic Flow Dilution System
62	SOP for UATMP and NMOC Canister Cleaning
63	SOP for the Analysis of Ambient Air for Hexavalent Chromium by IC
64	SOP for Shipping Method 6, 7, 8, and 26 Audit Samples
65	SOP for the ERG Sample Database
66	Cylinder Recycling

continued

Table L-1. (concluded)

SOP No.	SOP Title
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68	SOP for Refrigerator and Freezer Temperature Monitoring
69	SOP for Shipping Method 23 Audit Samples
70	SOP for Storing and Shipping Method 13A, 13B, and 29 Audit Samples
71	SOP for Documentation Requirements for the GC/MS Laboratory and for GC/MS Systems in the VOC Laboratory
72	SOP for Stack Sampling Using FTIR Spectroscopy
73	SOP for the ECD Wipe Test
74	SOP for the Preparation of Spiked Sorbent Samples Using Liquid Spiking into Tenax-GC® Tubes
75	SOP for the Preparation of Spiked Sorbent Samples Using Liquid Spiking onto XAD-2®
76	SOP for the Preparation of Spiked Sorbent Samples Using Flash Evaporation Spiking onto XAD-2®
77	SOP for Method 624
78	SOP for Method 625
79	SOP for Method 1624C
80	SOP for Method 1625C
81	SOP for the Preparation of Spiked Method 8 Samples as Stationary Source Audit Materials

Table L-2. EPA Method Operating Procedures by Title

MOP No.	MOP Title
2501	Preparation of Clean Substrates, Glassware, and Other Materials
2502	Purification of Benzene Solvent
2503	Mass Measurements of Blank and Exposed Sampling Substrates
2504	Solvent Extraction of Samples and Extract Concentration
2505	Diazomethane Preparation and Extract Methylation
2506	Silylation of Methylated Extracts
2507	GC/MS Calibration and Analysis of Extracts
2508	Denuder Coating, Cleanup, and Extraction
2509	PUF Cleanup and Extraction
NIOSH Method 5040	Elemental/Organic Carbon Analysis

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16. ABSTRACT

The report provides a profile of the chemical composition of particulate matter (PM) with aerodynamic diameter 2.5 μm or less ($PM_{2.5}$) emitted from an auxiliary boiler at a pulp and paper facility using the Kraft pulping process. The auxiliary boiler was fired with a mixture of wood bark (hogged wood waste) and bituminous coal and was rated to generate a maximum of 889 Mbtu/hour. It was equipped with a control system that included a multicyclone-electroscrubber system installed on the flue gas duct and bag filters installed on the vents of the coal bins, scrubber ash silo, and boiler ash silo. The data obtained during this research will assist States in determining the major sources of $PM_{2.5}$ so they can devise and institute a control strategy to attain the ambient concentrations set by the National Ambient Air Quality Standard for $PM_{2.5}$ that was promulgated in July 1977 by the U.S. EPA. Along with the $PM_{2.5}$ emission profile, data are also provided for gas-phase emissions of several organic compounds. Data are provided in a format suitable to be included in the EPA source profile database, SPECIATE.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Pollution	Pollution Control	13B
Paper Industry	Stationary Sources	11L
Wood Pulp		
Fine Particulate Matter		14G
Chemical Composition		07D
Organic Compounds		07C
Volatility		20M

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