The Newfoundland Offshore Burn Experiment - NOBE
Preliminary Results Of Emissions Measurement

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Summary

A group of over 25 agencies from Canada and the United States conducted a major offshore burn near Newfoundland, Canada. Two lots of oil, about 50 tons each, were released into a fire-proof boom. Each burn lasted over an hour and was monitored for emissions and physical parameters. Over 200 sensors or samplers were employed to yield data on over 2000 parameters or substances. The operation was extensive, over 20 vessels, 7 aircraft and 230 people were involved in the at-sea operation.

The quantitative analytical data show that the emissions from this in-situ oil fire were less than expected. All compounds and parameters measured are below health concern levels beyond about 150 metres from the fire, very little was detected beyond 500 metres. The fate and behaviour of oil components in fires, are still not fully understood and could be the subject of future experiments. Pollutants were found to be at lower values in the Newfoundland offshore burn than they were in previous pan tests. The reasons for this are not fully understood, but the offshore test appears to have resulted in more efficient combustion.

Polyaromatic Hydrocarbons (PAHs) were found to be lower in the soot than in the starting oil and were consumed by the fire to a large degree. Particulates in the air were measured by several means and found to be of concern only up to 150 metres downwind at sea level. Particulate matter may not be a concern past this distance except perhaps in the plume remnants. Combustion gases including carbon dioxide, sulphur dioxide and carbon monoxide did not reach levels of concern. These gases are emitted over a broad area around the fire and are not directly associated with the plume trajectory. Volatile organic compounds (VOCs) were abundant, however were less than emitted from the non-burning spill. Over 50 compounds were quantified, several at levels of concern up to 150 metres downwind.

Water under the burns was analyzed; no compounds of concern could be found at the detection level of the methods employed. Toxicity tests performed on this water did not show any adverse effect. The burn residue was analyzed for the same compounds as the air samples. PAHs were found at

Table 1 - Burn Summary

Burn 1
Oil volume discharged - 48.3 m³
Burn and Pump time - 1.5 hours
Residue in fireproof boom - 0.2 m³ (max.)
Residue in backup boom - 0.2 m³ (max.)
Efficiency - > 99%

Burn 2
Oil volume discharged - 28.9 m³
Burn and Pump time - 1.3 hours
Residue in fireproof boom - 0.1 m³ (max.)
Residue in backup boom - 0.3 m³ (max.)
Efficiency - >99%

Environment Canada. Arctic and Marine Oil Spill Program (AMOP) Technical Seminar, 17th Proceedings. Volume 2. June 8-10, 1994, Vancouver, British Columbia, Environment Canada, Ottawa, Ontario, 1099-1164 pp, 1994.

lower concentrations in the residue than in the starting oil. The overall mass of PAHs including that of the higher-molecular-weight species, was about 6 orders-of-magnitude lower after the burn. Overall, indications from these burn trials are that emissions from in-situ burning are low in comparison to other sources of emissions and result in acceptable concentrations of air contaminants.

SAMPLING

Sampling methodologies and target emissions are summarized in Table 2. Detailed methods are described in the literature. [1]

Table 2 **Summary of Analytical Methods**

Sample Taken	Sampler	Measurement Parameter	Secondary Parameters	Additional Parameters
Soot at Sea Level	High Volume Sampler	Dioxins and Dibenzofurans	Particulates	PAHs
	Sampling Pump medium volume	PAHs Metals	Particulates	
	RAM	Particulates		
	Cascade sampler	Particle size	PAHs	
Soot in Smoke	Sampling Pump low volume	PAHs	Particulates	Metals
	blimp, remote-controlled helicopter, research aircraft			
Gases	Summa Canister	Volatile Organic Compounds	CO_2	
	Impinger	Sulphur Dioxide		
	CO_2 Meter	Carbon Dioxide		
	SO_2 Meter	Sulphur Dioxide		
	NO_2 Meter	Nitrogen Dioxide		
	CO Meter	Carbon Monoxide		
Oil		PAHs	Metals	Full Analysis
Burn Residue		PAHs	Metals	Full Analysis
Water under Burn		PAHs	Organics	Toxicity

The instruments used during the NOBE experiment are listed in Table 3. The generalized layout of sampling platforms is shown in Figure 1.

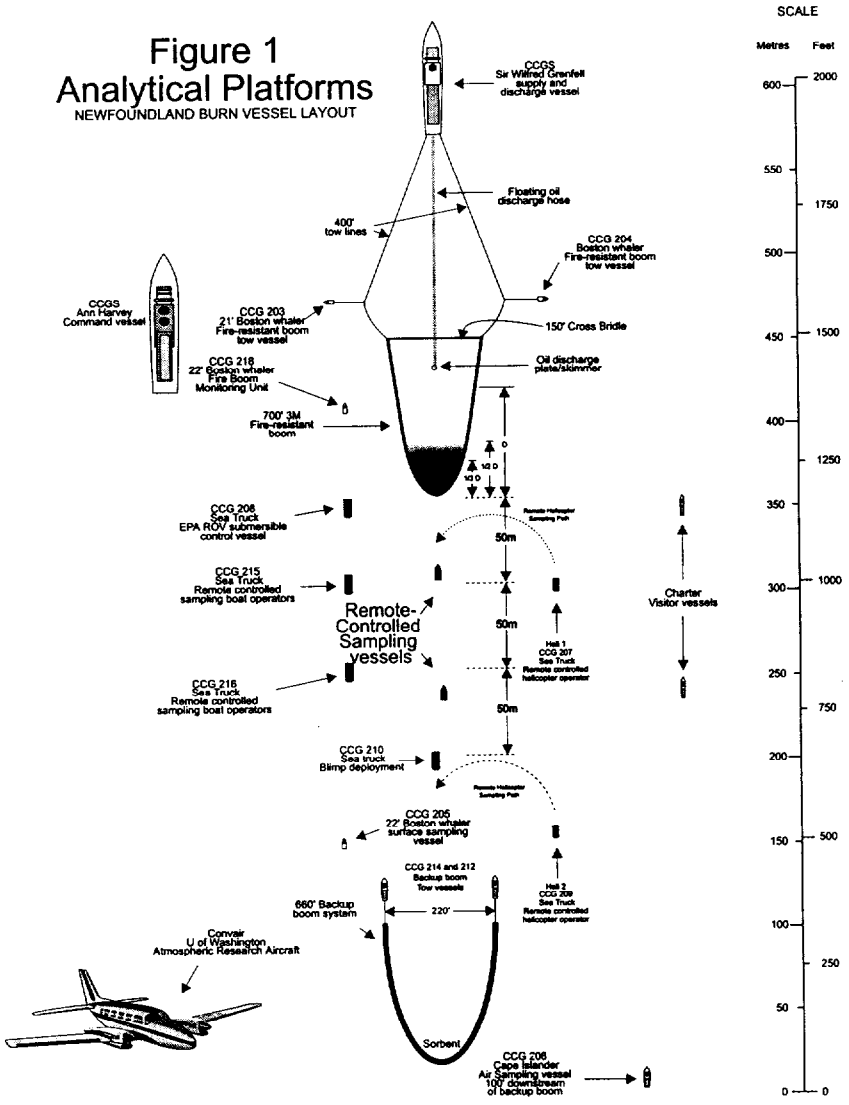


Figure 1
Analytical Platforms
NEWFOUNDLAND BURN VESSEL LAYOUT
SCALE
Metres
Feet
CCGS
Sir Wilfred Grenfell
supply and
discharge vessel
Floating oil
discharge hose
400'
tow lines
CCG 204
Boston whaler
Fire-resistant boom
tow vessel
CCGS
Ann Harvey
Command vessel
CCG 203
21' Boston whaler
Fire-resistant boom
tow vessel
150' Cross Bridle
CCG 218
22' Boston whaler
Fire Boom
Monitoring Unit
Oil discharge
plate/skimmer
700' 3M
Fire-resistant
boom
CCG 206
Sea Truck
EPA ROV submersible
control vessel
CCG 215
Sea Truck
Remote controlled
sampling boat operators
Remote-
Controlled
Sampling
vessels
50m
50m
50m
Charter
Visitor vessels
CCG 216
Sea Truck
Remote controlled
sampling boat operators
CCG 210
Sea truck
Blimp deployment
CCG 205
22' Boston whaler
surface sampling
vessel
CCG 214 and 212
Backup boom
Tow vessels
660' Backup
boom system
220'
Convair
U of Washington
Atmospheric Research Aircraft
Sorbent
CCG 208
Cape Islander
Air Sampling vessel
100' downstream
of backup boom
600
550
500
450
400
350
300
250
200
150
100
50
0
2000
1750
1500
1250
1000
750
500
250
0

Table 3	Instruments Used
Sensor	**Item Sampled**
PS-1 High volume sampler	PAHs, dioxins and dibenzofurans, total particulates
Cascade impactor	PAHs and particulates of 10 microns and less
RAM*	Real time monitoring of particulates
Gilian 513A pump and cyclone	Particulates of 5 microns and less
Summa canister	VOCs
Gilian Aircon 2	Metals
Gilian 513A pump and DNPH cartridge	Carbonyls
Armstrong CD-1*	Carbon dioxide
Cannonball*	Carbon monoxide and sulphur dioxide
Exotox 75*	Carbon monoxide, sulphur dioxide and nitrogen dioxide
Gilian 513A and impinger	Sulphur dioxide
Sigma 800SL	Water

*The items marked with an * indicate that the data is recorded on a data logger. The other sensors are physical samplers and are collected on filters or in special containers.*

The following is a more detailed description of the sampling and analysis procedures.

PAH and total particulates

Method 1

High-volume air sampling was performed using a General Metal Works model PS-1 instrument modified to be fitted on the deck of the sample boat. The PS-1 sampling heads were rinsed with hexane prior to loading the media The sampling media consisted of 3" diameter glass fibre filter and a polyurethane foam (PUF) filter - 3" thick, density 0.022 g/cm^3. The media was manipulated with powderless gloves. After collection, the filters were wrapped in aluminum foil and placed in the glass jar which contained the PUF filter wrapped in foil and refrigerated.

The flow rate varied between 128 and 279 L/min, the lower flow rates corresponding to older instruments. The volume of air going through the samplers during the experiment varied between 9200 and 13,600 L.

All glass fibre filters were pre-weighed and then weighed after the experiment. The PUF filter and fibre filter were then combined for extraction and subsequent GC-MSD analysis for PAHs.

Method 2

A 8-stage non-variable cascade impactor by Anderson was used to collect various fractions of particulates at a constant sampling rate of 28.3 L/min. The instrument was mounted on the mast of the remote-controlled sampling boat approximately 1 m above deck level. The filters consisted of quartz fibre. The inside of the sampling unit was rinsed with hexane prior to the experiment. After sampling was completed, these were wrapped in aluminum foil before being placed into an envelope and refrigerated. All filters were pre-weighed and then weighed after the experiment. The variations in weights were so small that all eight filters for each stack were combined for extraction and GC-MSD analysis for PAHs.

Particulates-real time

A MIE Ram-1 instrument was used to perform real-time aerosol monitoring and measure relative concentrations of airborne particulates. This instrument responds to a physical particle size of 0.1 to 10 microns. The flow rate of this instrument is 2 L/min and Tygon tubing was connected from the instrument to the mast to allow sampling at 1 m above deck level. The instrument was connected to a data logger which recorded the data every minute.

Particulates - less than 5 microns

A Cyclone sampler equipped with a Gilian 513A pump was used to collect particulates smaller than 5 microns on a PVC (37 mm) filter placed inside a cassette (Tygon tubing connections). Tygon tubing was connected from the instrument to the mast to allow sampling at 1 m above deck level. Flow rates varied between 1.7 and 2 L/min and collected air volumes between 57 and 122 L. The cassette was capped and refrigerated.

All filters were pre-weighed and then weighed after the experiment under the same conditions. The filters were extracted and analyzed for PAH content using GC-MSD.

VOC

Multiple 6 L SUMMA canisters pre-evacuated to 0.05 mm of Hg were used to collect air for analysis for VOCs, CO and CO_2. The flow controller (restricted orifice) was adjusted to 500 cc/min for evaporation period and to 100 cc/min for the burn.

Metals

A Gilian Aircon 2 was used to pump air through a tube on which a 37 mm canister containing a 0.8 μm pre-weighed cellulose ester filter was attached. Tygon tubing was connected from the instrument to the mast to allow sampling at 1 m above deck level. The elements to be measured included Mo, Zn, Pb, Ni, Fe, Cr, Mg, V, Cu, Ti, Ba. The flow rate of the pump was set at approximately 2 L/min yielding total volumes of 62 to 144 L. The cassette was capped and refrigerated after the experiment.

Carbonyls

A Gilian 513A was used to pump air through a DNPH (2,4-dinitrophenylhydrazine)-silica cartridge attached via a Tygon tube. Tygon tubing was connected from the instrument to the mast to allow sampling at 1 m above deck level. The cartridge contains 350 mg of silica coated with 1.0 mg of DNPH. The flow rate was set between 185-250 cc/min and the pumped air volumes was between 1.1 and 18 L. The sample was wrapped in aluminum, placed in a small amber vial and refrigerated.

CO_2

The CD-1 Armstrong carbon dioxide sampler was used at a sampling rate of 1 L/min. Tygon tubing was connected from the instrument to the mast to allow sampling

at 1 m above deck level. The data was logged every minute.

CO, SO_2, NO_2

The Exotox 75 was used to analyze all three gases. Its flow rate was 300 mL/minute. The Cannonball was used for carbon monoxide and sulphur dioxide only at a flow rate of 1 L/min. Tubing was connected from the instrument to the mast to allow sampling at 1 m above deck level. The data was logged every 30 seconds.

SO_2- Wet Precipitation

The concentration of sulphur dioxide in the air was also measured using the impinger method. A known volume of air was drawn through a Tygon tube attached to a filter (37 mm methyl cellulose ester, 0.8 μm) contained in a cassette and through a midget bubbler (25 mL) containing 15 mL of 0.3N hydrogen peroxide. Again the end of the tubing was connected to the mast to allow sampling at 1 m above deck level. The flow rate of the Gilian 513A pump was set between 90-200 cc/min and air volumes between 3 and 14 L passed through the impinger. Samples were transferred in amber vials and refrigerated. Subsequent analysis was performed using method NIOSH S308 and using the following materials.

-250 mL beaker, dropper, 100 mL graduated cylinder, burette
-pH meter
-0.3 N hydrogen peroxide
-isopropanol
-1.8 percent perchloric acid
-Thorin indicator
-0.005 M barium perchlorate
-magnetic stirrer and bar

Water Samples

Sigma 800SL samplers were used to collect water samples for both toxicity and organic compound analyses. One sampler contained 4 x 1 gallon sterile glass bottles with Teflon lined caps (for toxicity testing) and the other contained 24 x 350 mL (for organic measurements). The samplers were located on the deck of the boat and Teflon tubing was attached to a pole which was lowered into the water at approximately 1 m.

All samples were collected and placed in refrigerated coolers and shipped to the laboratory within 24 hours of collection. The smaller bottles were sent to the ETC for chemistry analysis and the larger bottles (although not full) were sent to EVS consultants in B.C. for toxicity analysis.

Not all planned samples were collected because of malfunction of the samplers. The instruments were factory set to contain 24 bottles and there was no problem to obtain those. Some of the samplers were modified to collect the 1 gallon jars. The volumes collected were much lower than expected. It seems that the shorter arms required to collect the larger jars were not adjusted properly.

Oil and Residue Sampling

The crude oil samples were manually collected prior to loading the oil on the Canadian Coast Guard vessels. Crude oil and residue samples were collected from the surface of the water before and after the burn experiments. The samples were stored in metal containers. Following the experiment the free water was removed from the oil and residue samples. Two representative 40 mL aliquots were taken from the samples in the metal containers and used for the chemical analysis.

Sample preparation and work up prior to chemical analysis

Starting oil and residuum samples

Analytes: Polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH) including bio-markers, and metals.

A 1-g aliquot of oil was diluted in 10 mL hexane to precipitate asphaltenes. An aliquot equivalent to 20 mg of the oil was then spiked with surrogate PAH and bio-marker standards and fractionated on an activated silica column. The hexane and benzene fractions that contained the saturates and aromatics respectively, were then analyzed separately using either GC/MSD or GC/FID. Internal standards for PAHs (d14-terphenyl) and TPH (5-α-androstane) were added to the final extract before analysis. The pre-injection volume was typically 1 mL.

For ICP analysis of metals, a 200-mg aliquot of oil was digested in a Teflon vessel in a CEM 630-watts microwave oven. Ten mL of nitric acid was added to the oil, which was digested for 10 min using an initial power setting of 50 %. After 10 min, 60% power was used to complete the digestion (total time, 200 min). Final volume was made up to 50 mL (typical) prior to analysis using an ICP spectrometer.

Water samples

Analytes: PAHs, and headspace volatile organics (VOC)

Water samples were stored at 4°C until analyzed. For the determination of PAHs, aliquots of 500-1000 mL were spiked with a mixture of PAH surrogate standards and extracted three times with dichloromethane. The combined raw extract was then concentrated to a small volume. In preparation for analysis, an internal standard of d14-terphenyl was added and the volume made up to 1 mL.

For headspace analysis, a 10-mL aliquot was placed in a 20-mL capped headspace vial and equilibrated for 45 min at 85°C. A 1-mL aliquot of the headspace was injected via a gas sampling loop into a GC/MSD.

Air/smoke samples

Analytes: PAHs, dioxin/furans (DX), metals, Summa VOCs, and carbonyls (aldehydes and ketones)

Filter, PUF, PUF/XAD, airborne particulate samples from the blimp and helicopters were individually wrapped in solvent-washed aluminum foil, placed inside a glass jar and were kept cool during transit. They were spiked with surrogate PAH and DX standards and extracted with 10% benzene with dichloromethane. The raw extract was concentrated and applied quantitatively to an activated silica column. The first fraction of hexane containing saturates was analyzed to ensure there was no carry-over. The second fraction, containing PAHs, was recovered using benzene. This fraction was concentrated, spiked with d14-terphenyl as an internal standard and made to 1 mL before GC/MSD analysis. For a few selected samples the hexane fraction was also retained and examined for the distribution of aliphatics and bio-marker compounds.

The DX samples were spiked with a mixture of carbon-13 surrogates of dioxins/furans and extracted by soxhlet using toluene. The raw extract was cleaned up using an acid/base silica column which removed the easily-oxidizable organics. This was followed by an activated alumina column which separated the dioxins/furans from interfering PCB, pesticides etc. A typical pre-injection sample volume was 20 μL.

For metal analysis on soot samples collected on the remote-controlled sample boats, the mixed cellulose ester filters were digested in the same manner as the oil samples for ICP analysis.

Up to 1.2 litre of the Summa VOC sample was cryogenically trapped using liquid

nitrogen on the Entec Summa concentrator. Perma Pure Dryers were used to dry the sample stream to prevent ice formation in the lines. After trapping for 30 min at a gas flow at 40 mL/min, the trap was heated to 100°C and the non-methane organic compounds were desorbed into a GC/MSD operated in selected ion monitoring (SIM) mode. Two other determinations of each Summa canister were also performed using two GC with optimized columns and conditions to determine C2 and C3-C12 hydrocarbons.

The carbonyl samples collected on the DNPH-silica Sep-pak were wrapped individually and shipped in a capped amber vial and kept cool to minimize degradation. The cartridge was extracted using 5 mL of acetonitrile and analyzed on an HP 1090 HPLC.

Analytical protocols

All organics

A HP 5890 GC was interfaced directly to a HP 5972 MSD. The GC was equipped with a HP 7673 auto sampler. Control of the entire system, data acquisition and data handling was by a HP ChemStation (DOS series). The column used for separation was a DB-5 30-m X 0.25 mm ID capillary column with 0.25-μm film. The GC temperature program used for PAH analysis was as follows: initial, 90°C for 1 min, first temperature ramp, 25°C/min to 180°C, second temperature ramp @ 5°C/min to a final temperature of 290°C for 15 min. A 1-μL aliquot was injected in the splitless mode (purge off: 1 min). Injector, interface and source temperature were 290°C, 300°C and 180°C respectively.

For PAH and bio-marker analysis, the MSD was operated in the SIM mode, monitoring 2-3 ions of each target analyte with a dwell time of 50 millisec for each ion. Autotune was used to tune the MSD daily to ensure day-to-day reproducibility.

Daily calibration was carried out by injecting a diluted solution of SRM 1491 (nominal concentration=0.7 ppm) which contained 26 compounds covering 2- to 6-ringed PAHs. The instrument detection limit was 0.1 ppm. Daily calibrations were performed to verify the column resolution and MS sensitivity. The response of the internal standard (d14-terphenyl) was used to correct for instrumentation drift and analytical variations.

TPH measurement was performed using GC/FID. Calibration was by means of an alkane mixture covering the range from C-8 to C-40.

Instrument detection limit: in SIM mode, 0.01-0.05 ng/μL (ppm) for target PAH.

Method detection limit: 0.1 ppb for 500 mL water; 1 ppm for 25 mg oil; 0.01 $\mu g/m^3$ for a 10-m^3 air/smoke sample volume.

Dioxins/Furans

Ultra-trace analysis of dioxins/furans was carried out on an HP 5890 GC coupled to the VG 70S, which is a double focusing high resolution MS operated in the electron impact mode. The MS was tuned using PKF to achieve a resolution of at least 10000 (10% valley). One μL of sample was injected in the splitless mode on a 60-m DB-5 capillary column, with 0.25-mm ID and 0.25-μm film thickness. The temperature program was as follows: 70°C for 1 min, 100°C to 200°C @ 40°C/min, 200°C to 235°C @ 3°C/min and hold for 10 min, 235°C to 310°C @ 8°C and held for 15 min. Injector and interface temperature were at 300°C and 290°C respectively.

The system was calibrated with a standard mixture of all 17 2,3,7,8-substituted DX/DF congeners, containing the same set of C13-labelled surrogates, C13-labelled 1,2,3,4-TCDD and 1,2,3,7,8,9-HCDD congeners which were added to the sample

extracts as internal and time reference standards.

Instrument detection limit: 0.2-1 pg/μL (ppb) operated at 10000 resolution. Method detection limit: 2 pg/m^3 for a 10-m^3 sample

Metals

Metals were measured on an ARL 3410 ICP-AE spectrometer. The 11 metals were Mg, Ti, Cr, Ni, Zn, Ba, V, Fe, Cu, Mo and Pb. Some typical operating parameters were as follows: incident wattage, 650; reflected wattage, 001; plate volts, 3300; plate current, 496 mA; grid current, 66 mA; drive voltage, 2580; spectrometer profile: zero 76160; Argon, 355.4475 nm.

Calibration standards were made by serial dilutions and combining commercial ICP stock solutions (SCP Science). Daily calibrations covering a concentration range 0-10 ppm were made to establish the sensitivity and linearity of each metal.

Instrument detection limit: 0.01 ppm for Co (typical); Method detection limit: 2 μg/m^3 for a 120-L sample volume. Note, at the time of this paper, metal analysis was not complete and therefore these data will not be included.

Carbonyls

A Hewlett-Packard HP1090 HPLC equipped with a diode-array detector and HPLC Chemstation was used to perform the carbonyl analysis. The monitoring wavelength was 360 nm. Two Zorbax ODS reverse phase columns (25-cm x 0.46-mm ID.) were used for compound separation. A 25-μl aliquot of sample was injected; the elution gradient was 60% to 75% acetonitrile (ACN) in water for 30 min, followed by 75% to 100% ACN in 2 min and held at 100% ACN for 5 min. Solvent flow was 1 mL/min.

Target aldehydes were formaldehyde, acetaldehyde, acrolein, propionaldehyde, benzaldehyde, hexanaldehyde; target ketones were acetone and methylethylketone.

Calibration standards were prepared from ACN and solid DNPH derivatives. Quantitation was by means of an external standard.

Instrument detection limit: 0.1 ppm, method detection limit: 5 μg/m^3 for a 120-L sample volume.

Headspace VOCs

The headspace analyzer system consisted of a HP 19395A headspace sampler coupled directly to the heated injection port of a HP 5890 GC with MSD, via a heated interface. The headspace in each sample vial, kept at 85°C, was swept through a 1-cc internal sample loop by first pressurizing the vial. The gas sampling valve, under the control of the concentrator, was rotated so that the contents of sampling loop was swept into the GC inlet operated in a split mode (split ratio 1:5). The GC was programmed from an initial 30°C (held for 5 min) to a final temperature of 200°C at the rate of 7.5°C/min. Injection and MSD source temperature were 200°C and 160°C respectively. A 30-m HP-1 capillary column (0.32 mm ID, 1-μm film) was used for compound separation.

A mixture of alkanes, alkenes and aromatics, including benzene, toluene, ethyl benzene o-,p- and m-xylene were used to establish response factors of each class of volatile compounds.

Instrument detection limit: 0.01 ppm.

Oil Component Analysis

Oil samples were dissolved in hexane at a concentration of 50 mg/mL, and spiked with the appropriate surrogate compounds. A portion of activated silica gel (3.0 g) was placed into a 30 mm long x 10.5 mm ID chromatographic column plugged with glass wool. The column was tapped to settle the silica gel, and 0.5 cm anhydrous sodium

sulphate was added. The column was pre-eluted with 20 mL of hexane, the eluent was discarded. Just prior to exposure of the sodium sulphate layer to the air, 0.4 mL (approximately 20 mg oil) was quantitatively transferred onto the column using an additional 3 mL of hexane to complete the transfer. This 3 mL eluent was also discarded. To avoid overloading the column, no more 40 mg of oil was placed on the column. Just prior to exposure of the sodium sulphate to the air, the column was eluted with 12 mL of hexane. The eluent was collected in a centrifuge tube and label this fraction "F1". F1, the saturated fraction, was used for analysis of the distribution of n-alkanes and isoprenoids including pristane and phytane, and of C_{30} 17α(H), 21β(H)-hopane and other biomarker triterpane and sterane compounds. The column was eluted with 15 mL of 1:1 (V:V) benzene/hexane, and the eluent collected in a centrifuge tube, and labelled as "F2". F2, the aromatic fraction, was used for analysis of the target PAHs, alkylated PAH and dibenzothiophene compounds. Half of F1 and F2 were combined and designated as "F3". This fraction was used for analysis of individual and total petroleum hydrocarbons (TPH). The fractions were concentrated to the appropriate pre-injection volume (PIV), 0.5 to 1.0 mL, using nitrogen blowdown. The extracts were then spiked with the appropriate quantitation internal standard (IS) compounds (the IS 5-androstane, for determination of the individual n-alkanes and TPH; the IS d14-terphenyl, for determination of the target PAH and alkylated PAH homologues; the IS C_{30} 17β(H), 21α(H)-hopane, for determination of the biomarker compounds). To achieve lower quantitation limits, the PIV was reduced to 0.25 mL, but the extract was not blown dry to prevent loss of the volatile compounds, and more importantly, to prevent the precipitation of the high molecular weight components.

Analysis of the Water Fractions

The sample cleanup and analysis were performed according to published methods developed in our laboratory. Prior to analysis, water samples were stored at 4 °C. An aliquot of 500-1000 mL (depending on the sample volumes) was measured and transferred to a 2-litre separatory funnel, then spiked with 100 µL of deuterated PAH surrogate standards (mixture of d10-acenaphthene, d10-phenanthrene, d12-benz(a)anthracene and d12-perylene, 10 ppm each) and 100 µL of 200 ppm ortho-terphenyl in 1.0 mL acetone. Methylene chloride (DCM) (100 mL) was added to the separatory funnel. The separatory funnel was sealed and shaken vigorously for 2-3 minutes with periodic venting to release excess pressure. The organic layer was allowed to separate from the water phase for a minimum of 10 minutes, then the solvent extract was collected in an Erlenmeyer flask. (If the emulsion interface between layers was formed, mechanical techniques were employed to complete the phase separation.) The extraction was repeated two more times using fresh portions of solvent. The three solvent extracts were combined and concentrated by rotary evaporation. The concentrated extract was dried by passage through a drying funnel containing about 30 grams of anhydrous sodium sulphate. The solvent was then exchanged to hexane and reduced to 0.5 to 1.0 mL using nitrogen blowdown.

Results and Discussion

Oil Analysis

The oil was analyzed for physical properties and PAHs as well as for alkane proportions. The summary of these data is in Table 4. A most interesting result is that the residue appears to be an oil with an evaporative loss of about 45% by weight. The residue had a density of about 0.95 g/cc and a viscosity of about 100,000 cP. The

Table 4

ANALYSIS OF OIL AND RESIDUE SAMPLES

Sample	Hughenden, Truck # 3 Fresh Crude	Hughenden, Truck # 2 Fresh Crude	Hughenden, Truck # 2 Fresh Crude	Hughenden, Truck # 1 Fresh Crude	Hughenden, Truck # 1 Weathered Oil	St-John's, Truck # 3 + 1 Weathered Oil	St-John's, Truck # 3 + 2 Weathered Oil	Apex of fireboom before Burn # 1	Between fireboom and row boom during Burn # 1	Apex of fireboom after Burn # 1	Between fireboom and row boom during Burn # 2	Apex of row boom after Burn # 2	From side of R/C boats collected Aug 14, 93
	1	2A	2B	3	4	5A	5B	7	11	12	14	15	16
--- ANALYSIS ---													
Weathering (%)	Ref. Oil	5.6	6	6.5	9.2	6	6	8.1	48.6	44.3	48.9	47.5	49.5
Metals (µg/m³)													
PAH (µg/g)	12085	11563	11752	11933	11383	11603	11525	8467	4304	2985	2917	3468	2991
TPH (mg/g)	632	590	582	666	614	655	645	609	513	431	406	479	451
Sulfur Content (weight %)	0.15				0.16		0.15			0.37		0.4	
Wax Content (weight %)	11.3				7.3		10.1	9.3		13.1		13.8	
Asphaltene content (weight %)	0.6				0.7		0.7	0.6		1.8		2.3	
Emulsion Stability at 15 C (f_i)	0				0		0	0		0		0	
Emulsion formation at 15 C (f_f)	0				0		0	0		0		0	
Interfacial Tension (dynes/cm)													
Oil / Sea Water at 15 C	16.6				14.8		13.3	14.9					
Oil / Fresh Water at 15 C	19				14.8		13.9	16.9					
Air / Oil at 15 C	23.4				21.3		21.2	21.4					
Pour Point (deg C)	-21				-21		-21	-21		31		34	
Density at 0 C (g/ml)	0.8524				0.8565								
Density at 15 C (g/ml)	0.8384				0.8431		0.8437	0.8496		0.9508		0.9385	
Water Content (weight %)	0.07				0.21		0.54	0.26		15.01		14.01	
Viscosity (cP)													
@ 500/s Newtonian	8				10		11	13					
@ 1/s 30100 @ 10/s non-Newtonian										98600		13100	

distribution of n-alkanes is detailed in the Appendix in Table A-1; the distribution of alkylated PAHs in Table A-2; the relative composition of alkylated PAH homologes in Table A-3; and the details of the physical analysis in Table A-3.

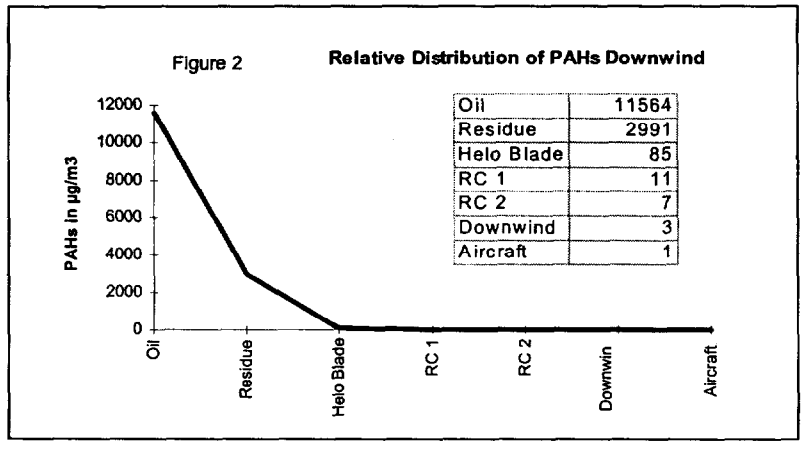
Particulates

Particulates were collected by a number of means. The real-time data collected on rams are summarized in Table 5 for burn 1 and in Table 6 for burn 2. Both show that particulates were at moderate levels under the plume at the locations sampled by the remote-controlled boats. Particulate levels dropped to background levels at the remote sampling station about 1 km downwind. Cascade samplers were used to determine the proportion of the particulate matter in various size ranges. The amount of material below the size of 10μ was not measurable. This experiment indicates that the amount of particulate material in the respirable size range is very small. Data will be available from aircraft measurements.

Polyaromatic Hydrocarbons (PAHs)

PAH analysis of particulate material and air itself was performed at several different sample locations and by several different means. Data for burn 1 are summarized in Table 7; those for burn 2 in Table 8. Details of this analysis are given in the Appendix in Tables A-5 to A-21. A comparison of the mass of PAHs in the starting oil, residues and soot at downwind points has been done and is shown in Figure 2. This comparison shows that the PAH's are largely consumed by the fire. The amounts of PAHs detected at the Newfoundland burn are a fraction of that detected in previous burn trials. This may be indicative of a more efficient burn.

Figure 2 **Relative Distribution of PAHs Downwind**



Oil	11564
Residue	2991
Helo Blade	85
RC 1	11
RC 2	7
Downwind	3
Aircraft	1

Aldehydes and Ketones

Aldehydes and ketones were measured using a specialized technique and the results are shown in Tables 9 and 10. These tables show that very little of these compounds is found in the plume. Data indicate that the concentrations are near background levels and actually are higher during the times when the oil is not burning.

Table 5

PARTICULATE ANALYSIS during BURN 1

Analysis	Background	Remote Station 1 (mg)	Remote Station 2 (mg)	Downwind Station (ppm)
Particulates < 10 microns				
RAM...Background (1.1) rep 1 (EPA)	0.02<0.04<4.50			
RAM...Background (1.1) rep 2 (EPA)	0.04<0.04<0.06			
RAM...Background (1.1)	0<0<0			
RAM .. Pre-ignition (1.2) rep 1				0.02<0.07<4.44
RAM .. Pre-ignition (1.2) rep 2				0.0<0.26<29.1
RAM .. Pre-ignition (1.2)		0.0<0.2<3.3	0.0<0.0<0.9	
RAM...Burn (1.6) rep 1		0.6<12.0<14.9	13.3<14.3<15.1	0.01<0.05<3.05
RAM...Burn (1.6) rep 2		0.0<9.2<96.9	0.0<14.0<15.7	0.02<0.13<22.5
RAM...Post-burn (1.7)	10.5<13.4<14.5			
Total Particulates (mg/m3)				
PS-1	0.0<0.12<0.23			

Table 6

PARTICULATE ANALYSIS during BURN 2

Analysis	Remote Station 1 (mg)	Remote Station 2 (mg)	Downwind Station (ppm)
Particulates < 10 microns			
RAM...Background (2.1)			0.02<0.03<4.2
RAM...Pre-ignition (2.2)	0.0<0.9<1.6	0.0<0.0<2.7	0.02<0.03<1.16
RAM...Burn (2.6)	0.0<10.3<29.9	0.0<12.3<35.0	0.0<0.07<14.1
RAM...Post-burn (2.7)	0		0.02<0.12<12.69
RAM...Post residue period (2.8)			0.02<0.04<3.43

PAH ANALYSIS of Air and Particulate Samples Burn 1

Table 7

Analysis ... µg/m3	R/C boat 4 RS - 1+0	R/C boat 2 RS - 2+1	R/C boat 1 RS - 0+2	Downwind Station	R/C Heli 1	R/C Heli 2	BLIMP	Corsair	Fresh crude oil	Weathered crude oil	Residue
Particulates < 5 µ ... Cyclone											
Burn (1.6)	1.56	2.83 & < 1.1	3.78 & < 1.1	3.37 & <1.0							
Background Aug 07, 93	12.74			2.03							
Trip blank	0.18										
Smoke Samples from Blimp							0.54				
PUF / Background (9:20 - 9:45)								0.42			
PUF / Burn (10:56 - 11:08)								1.36			
Background Aug 07, 93								3.09			
Blank, loaded								1.24			
Blank Trip								3.1			
Cascade Impactor											
Burn (1.6)	< 0.08	0.46	0.36	0.19							
Background Aug 07, 93	0.75			0.59							
Trip blank, Aug 07, 93	0.55										
PS-1 + PUF + XAD											
Burn (1.6)	7.45	11.05	11.34	3.3							
Background Aug 07, 93			6.26	7.99							
Trip blank	3.62			3.87							
Field blank	2.31										
Back + Pre-ign + burn (clean air / filter)					< 4.36						
Burn (plume / filter + XAD)					104.28	37.04					
Background Jun 30, 93					< 20						
Trip Blank (XAD)					0.43						
Blank Static (filter)					ND						
Helicopter Blade Wipe ..... (ug/g)											
Post-burn (1.7)					85.12	80.68					
Blank run (wipe after evaporation flight)					< 22	< 13					
Blank wipes					< 43	< 280					
Oil Samples ..... (ug/g)											
Background, Hughesden (Jul 22, 94)									11833	11383	
Background, St-John's (Aug 02, 94)										11564	
Apex of fireboom, pre-ignition (1.2)										8467	
Between fireboom and raw boom, burn (1.6)											4304
Apex of fireboom, post-burn (1.7)											2985
Post residue period (2.8)											2991

NOTE... R/C boat # 4 in position RS-1 for the first 17 minutes, it is then out of position for the remainder of the sampling time
R/C boat # 2 in position RS-2 for the first 17 minutes, it then moves up in position RS-1 for the remainder of the burn
R/C boat # 1 is sent out to position RS-2 and starts sampling 53 minutes into burn 1

Table 8

PAH ANALYSIS of Air and Particulate Samples Burn 2

Analysis ... µg/m3	Remote Station 1 R/C boat 1	Remote Station 2 R/C boat 2	Downwind Station	R/C Heli 1	R/C Heli 2	BLIMP	Convair	Fresh crude oil	Weathered crude oil	Residue
Particulates < 5 µ ... Cyclone										
Burn (2.6)	2.12 & < 1.0	9.77 & < 1.0	4.21 & < 0.8							
Smoke Samples from Blimp						1.65				
PUF / Burn (14:13 - 14:24)							1.02			
PUF / Post burn (15:28 - 16:23)							2.43			
PUF / Post residue period (16:27 - 16:38)							0.78			
Cascade Impactor										
Burn (2.6)		0.35	0.29							
PS-1 + PUF + XAD										
Burn (2.6)	12.35	11.22	4.11							
Burn (clean air / filter)				< 8.3						
Burn (plume / filter + XAD)				126.18	59					
Blank Static (filter)				< 20						
Helicopter Blade Wipe ..... (ug/g)										
Post-burn (2.7)				220.72	65.7					
Oil Samples ..... (ug/g)										
Background, Hugheden (Jul 22, 94)								11833	11383	
Background, St-John's (Aug 02, 94)									11564	
Between fireboom and row boom										2917
Apex of fireboom, post-burn (2.7)										3468
Post residue period (2.8)										2991

Table 9 **ALDEHYDE AND KETONE CONCENTRATIONS - Burn 1**

µg/m3

Description	Evap 1A	Evap 1B	Evap brn 1	Evap brn 1	Evap brn 1	Evap brn 1	Burn brn 1	Burn brn 1	Burn brn 1	Burn brn 1	Burn 1A	Burn 1B	Evap brn 1	Evap brn 1	Burn brn 1	Burn brn 1	Trip blank
Location	CCG 206	CCG 206	boat 2	boat 2	boat 4	boat 4	boat 4	boat 4	boat 2	boat 2	CCG 206	CCG 206	boat 1	boat 1	boat 1	boat 1	
volume (m^3)	0.0015	0.0012	0.00111	0.00114	0.00109	0.00114	0.00833	0.00833	0.00851	0.0087	0.012	0.0145	not done	not done	0.0092	0.0092	0
													ug				ng
Compounds	D-2	D-3	D-10	D-11	D-6	D-7	D-8	D-9	D-12	D-13	D-17	D-18	D-26	D-27	D-28	D-29	D-32
Formaldehyde	0.66	0.72	0.94	0.84	0.86	1.46	0.14	0.10	0.14	0.12	0.08	0.08	0.001004	0.000790	0.09	0.12	0.000561
Acetaldehyde	0.68	0.80	1.07	1.88	0.91	2.12	0.15	0.15	0.23	0.19	0.10	0.12	0.001969	0.001610	0.24	0.27	0.000234
Acetone	0.46	0.35	1.40	0.60	2.27	0.78	0.09	0.12	0.07	0.08	0.09	0.05	0.001313	0.002301	0.11	0.09	0.000193
Acrolein	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000	0.000000	0.00	0.00	0.000000
Propinaldehyde	0.08	0.11	0.15	0.35	0.13	0.37	0.03	0.02	0.04	0.04	0.01	0.02	0.000302	0.000259	0.04	0.04	0.000000
Crotonaldehyde	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000	0.000000	0.00	0.00	0.000000
2-Butanone	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000	0.000000	0.00	0.00	0.000000
iso/-Butylaldehyde	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.000346	0.000000	0.04	0.04	0.000000
Benzaldehyde	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000	0.000000	0.00	0.00	0.000000
2-Pentanone	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000	0.000000	0.00	0.00	0.000000
Isovaleraldehyde	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000	0.000000	0.00	0.00	0.000000
Valeraldehyde	0.24	0.10	0.34	0.13	0.21	0.15	0.01	0.02	0.01	0.01	0.01	0.00	0.000126	0.000096	0.02	0.02	0.000000
o/m/p-Tolualdehyd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000	0.000000	0.00	0.00	0.000000
MIBK	0.00	0.10	0.12	0.09	0.11	0.12	0.01	0.02	0.00	0.00	0.01	0.00	0.000123	0.000056	0.01	0.01	0.000000
Hexanal	0.44	0.06	0.08	0.05	0.06	0.06	0.00	0.00	0.01	0.00	0.01	0.00	0.000036	0.000032	0.00	0.00	0.000000
2,5-Dimethyl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000	0.000000	0.00	0.00	0.000000
TOTAL	2.56	2.24	4.11	3.93	4.55	5.37	0.44	0.43	0.49	0.45	0.31	0.27	0.01	0.01	0.55	0.59	0.000988

Table 10 **ALDEHYDE AND KETONE CONCENTRATIONS -Burn 2**

µg/m3

Description	Burn 2A	Burn 2B	Blank	Evap brn 2	Evap brn 2	Burn brn 2	Burn brn 2	Trip blank	Background	Background	Background	Background	Evap 2A	Evap 2B	Evap brn 2	Burn brn 2	Burn brn 2
Location	CCG 206	CCG 206	CCG 206	boat 1	boat 1	boat 1	boat 1		boat 1	boat 1	CCG 206	CCG 206	CCG 206	CCG 206	boat 2	boat 2	boat 2
volume (m^3)	0.0146	0.01825	0	0.00132	0.00132	0.0098	0.0098	0	0.0062	0.0062	0.002025	0.002025	0.0012	0.0015	0.001221	0.009065	0.009065
Compounds	D-19	D-20	D-21	D-22	D-23	D-24	D-25	D-1	D-30	D-31	D-33	D-34	D-4	D-5	D-14	D-15	D-16
Formaldehyde	0.10	0.07	0.000695	0.59	0.59	0.07	0.08	0.000619	0.10	0.09	0.42	0.44	1.00	0.80	0.85	0.11	0.11
Acetaldehyde	0.15	0.10	0.000381	1.12	1.12	0.11	0.08	0.000243	0.20	0.21	0.30	0.29	1.20	1.04	0.96	0.13	0.15
Acetone	0.06	0.04	0.000280	1.70	1.77	0.04	0.07	0.000172	0.06	0.10	0.78	0.73	1.38	0.76	0.30	0.04	0.07
Acrolein	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Propinaldehyde	0.02	0.01	0.000051	0.15	0.19	0.02	0.02	0.000052	0.05	0.04	0.08	0.07	0.16	0.19	0.14	0.02	0.02
Crotonaldehyde	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Butanone	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
iso/-Butylaldehyde	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzaldehyde	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Pentanone	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Isovaleraldehyde	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Valeraldehyde	0.01	0.00	0.000041	0.07	0.07	0.01	0.01	0.000000	0.01	0.01	0.03	0.04	0.14	0.09	0.07	0.01	0.01
o/m/p-Tolualdehyde	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIBK	0.00	0.00	0.000030	0.03	0.03	0.01	0.00	0.000000	0.01	0.01	0.01	0.01	0.07	0.07	0.24	0.00	0.00
Hexanal	0.00	0.00	0.000014	0.04	0.05	0.00	0.00	0.000000	0.01	0.00	0.01	0.02	0.06	0.03	0.04	0.01	0.00
2,5-Dimethyl	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	0.34	0.23	0.001493	3.70	3.82	0.25	0.26	0.001086	0.44	0.47	1.63	1.60	4.02	2.98	2.60	0.32	0.36

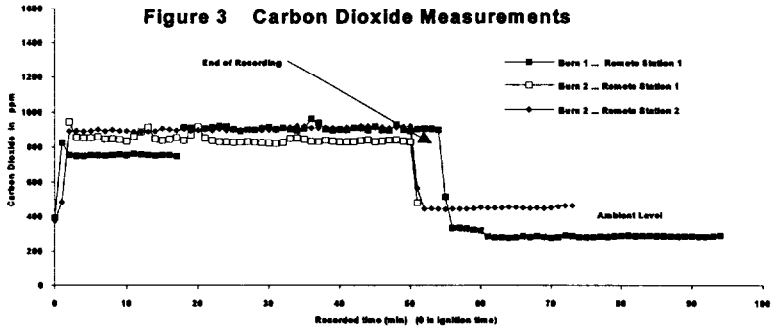
Dioxins and Dibenzofurans

The high-volume samples taken on the remote-controlled boats and on the downwind station were also analyzed for dioxins and dibenzofurans. The summary data are presented in Table 11. The values are at background levels. This confirms previous studies which show that dioxins and dibenzofurans are not produced by fires.

Combustion Gases

Tests were made for a number of gases, but CO, SO_2 and NO_X are not above the lower detection levels. Carbon dioxide is measured around the burn and is illustrated in Figure 3. The summary of carbon dioxide measurements is given in Table 12 for burn 1 and Table 13 for burn 2. Carbon dioxide was also measured in the SUMMA canisters which were placed on several of the vessels in the area. Details of this CO2 distribution are given in Table A-22 and A-23. The distribution of CO_2 over the test site during each burn is shown in Figures 4 and 5. These show that the CO_2 plume moves closer to the surface.

Figure 3 Carbon Dioxide Measurements



VOCs

Over 140 compounds were measured using SUMMA canisters. The results are summarized in Tables 14 and 15. Detailed results are given in the Appendix, Table A24. The levels of volatile organic compounds are well above concern levels within 150 metres of the fire. The levels of these compounds are even greater from an evaporating slick that is not burning. The list of analytes is in Table 16.

Metals

Crude oil contains several metals in the ppm range. The analysis from the Newfoundland tests is not complete, but in previous tank tests, metals could not be detected on soot particles.

Water-Borne Compounds

Water from under the burns was sampled and analyzed for a number of compounds. Detailed data are presented in Table A-25. No compounds were detected in the water once the oil was on the water, during the burn or after the burn, above the background levels.

Table 11 **Results of Dioxin and Dibenzofuran Analyses**

Sample	Burn 1	Burn2	Blank
Congener	pg		
2378-TCDD	ND	ND	ND
12378-P5CDD*	ND	ND	ND
123478-H6CDD*	ND	ND	ND
123678-H6CDD*	ND	ND	ND
123789-H6CDD*	ND	ND	ND
1234678-H7CDD	ND	ND	ND
OCDD	23	187	65
2378-TCDF*	52	11	ND
12378-P5CDF*	ND	ND	ND
23478-P5CDF*	ND	ND	ND
123478-H6CDF*	ND	ND	ND
123678-H6CDF*	ND	ND	ND
234678-H6CDF*	ND	ND	ND
123789-H6CDF*	ND	ND	ND
1234678-H7CDF	ND	ND	ND
1234789-H7CDF	ND	ND	ND
OCDF	ND	ND	ND

Homologue	Burn1 pg	Burn 2	Blank	DL	NP
TCDD	ND	ND	ND	4-5	0
P5CDD	ND	ND	ND	4-5	0
H6CDD	ND	ND	ND	8-10	0
H7CDD	ND	ND	ND	6-10	0
OCDD	23	23	65	10	1
Total PCDD	23	23	65		
Concentration - pg/m^3	1.9	15.5	na		
TCDF	336	53	ND	4	0-13
P5CDF	64	ND	ND	4	0-3
H6CDF	ND	ND	ND	6	0
H7CDF	ND	ND	ND	6-8	0
OCDF	ND	ND	ND	10	0
Total PCDF	400	53	ND		
Concentration - pg/m^3	32.3	4.4	na		

Surrogate	Amount Added, ng	Recovery %		Recovery %		Recovery %
13C12-TCDD	1.00	89	1.00	95	1.00	94
13C12-TCDF	1.00	107	1.00	114	1.00	116
13C12-P5CDD	1.00	93	1.00	89	1.00	105
13C12-P5CDF	1.00	109	1.00	118	1.00	120
13C12-H6CDD	1.00	95	1.00	106	1.00	110
13C12-H6CDF	1.00	104	1.00	127	1.00	128
13C12-H7CDD	1.00	106	1.00	95	1.00	125
13C12-H7CDF	1.00	99	1.00	104	1.00	117
13C12-OCDD	2.00	86	2.00	79	2.00	115

Note: (1) Results are corrected for surrogate recovery.
(2) DL = detection limit (ng/analyte peak); NP = number of analyte peaks.
(3) * Value represents maximum possible amount. This isomer could coelute with other isomer(s).
(4) ND = not detected; NDR = not detected due to incorrect ratio, the target analyte concentration, if present, is given in brackets.

Table 12

Carbon Dioxide Analysis of Air Samples Burn # 1

Analysis ... ppm	Blank	Background before August 12	R/C boat 4 1+0	RS-	R/C boat 2 2+1	RS-	R/C boat 1 0+2	RS	Downwind Station	Remote Heli-1	Remote Heli-2	BLIMP	Convair	Sir Wilfred Grenfell	Ann Harvey	Casaco	CCG 203	CCG 204	CCG 212	CCG 214
Summa																				
R/C Heli, team 1	276																			
R/C boats		274 & 360																		
EPA CCG 205		374 & 260																		
EPA CCG 205, Trip blank	397																			
Convair		387																		
Background (1.1)										396	348		386 & 364							
Pre-ignition (1.2)			360 & 378		406 & 352		410 & 365			368				370	387	410 & 280	523	367	365	375
Burn (1.6)			753 & 757		433 & 800		735 & 803		400 & 348		308 & 380			355	350	329 & 328				
R/C Heli, Burn, clean air sample (1.6)										310							385	355	399	402
R/C Heli, Burn, plume sample (1.6)										347										
Convair, above cloud (1.6)													406							
Convair, smoke 3mi DW (1.6)													380							
Convair, smoke 1mi DW at 1000ft													376							
Convair, smoke 20mi DW													374							
Tedlar Bag																				
Blimp, blank 1 & 2	390 & 389																			
Blimp, blank 3 & 4	385 & 380																			
Burn (1.6)												409 & 422								
Armstrong CD-1																				
R/C boat # 4		182<281<316																		
R/C boat # 2		282<292<308																		
Pre-ignition (1.2)			302<326<467		286<303<454															
Burn (1.6) (10:30)			391<737<826		423<888<882															
Burn (1.6) (10:48)			748<759<776		276<590<963		276<589<965													
Burn (1.6) (11:23)							1406<1559<1596													
Post-burn (1.7)					294<313<329		1329<1455<1512													
Metrosonics sq-501																				
EPA CCG 206		0<0<0																		
Background (1.1)									415<427<483											
Pre-ignition (1.2)									383<415<465											
Burn (1.6)									393<416<470											

values are given as minimum<average<maximum values in ppm

NOTE... R/C boat # 4 in position RS-1 for the first 17 minutes, it is then out of position for the remainder of the sampling time
R/C boat # 2 in position RS-2 for the first 17 minutes, it then moves into position RS-1 and keeps on sampling in this position
R/C boat # 1 , 53 minutes into the burn, is sent out to position RS-2 and start sampling

Table 13

Carbon Dioxide Analysis of Air Samples Burn # 2

Analysis ... ppm	Remote Station 1	Remote Station 2	Downwind Station	Remote Heli-1	Remote Heli-2	BLIMP	Convair	Sir Wilfred Grenfell	Ann Harvey	Casaco	CCG 203	CCG 204	CCG 212	CCG 214
Summa														
Pre-ignition (2.2)	412 & 297		370 & 385											
Convair, no ship exhaust (2.2)								325	363	423 & 265	410	407	355	455
Burn (2.6)	940 & 953	825 & 896	368 & 415		359		378							362
Burn, clean air sample (2.6)				373				387	412	355 & 310	402	392	316	
Burn, plume sample (2.6)														
Convair, 2mi DW at 1000ft (2.6)														
Convair, smoke 9mi DW							386 & 376 & 379							
Post-burn (2.7)							374							
Convair, background (2.7)														
Convair, cross section 6mi DW at 1400ft (2.7)							362							
Convair, cross section 9mi DW at 1700ft (2.7)							384							
Post residue collection period (2.8)														
Convair, background (2.8)							366							
Tedlar Bag														
Burn (2.6)						433 & 439								
Armstrong CD-1														
Pre-ignition (2.2)	564<690<760	277<366<491												
Burn (2.6) (14:06)	600<1081<1412	375<752<922												
Post-burn (2.7)	620<631<660													
Metrosonic aq-501														
Background (2.1)			417<426<444											
Pre-ignition (2.2)			412<421<460											
Burn (2.6)			413<436<461											
Post-burn (2.7)			421<434<444											

values are given as minimum<average<maximum values in ppm

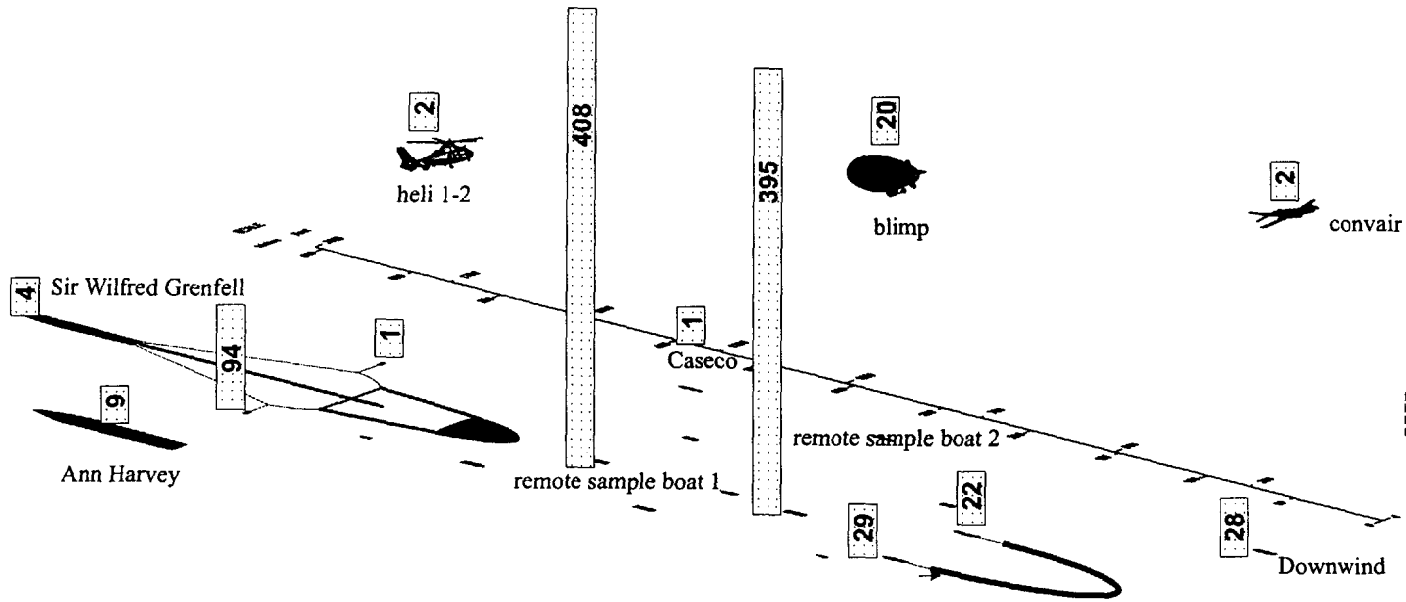


Figure 4 Relative Concentrations of Carbon Dioxide -Burn 1

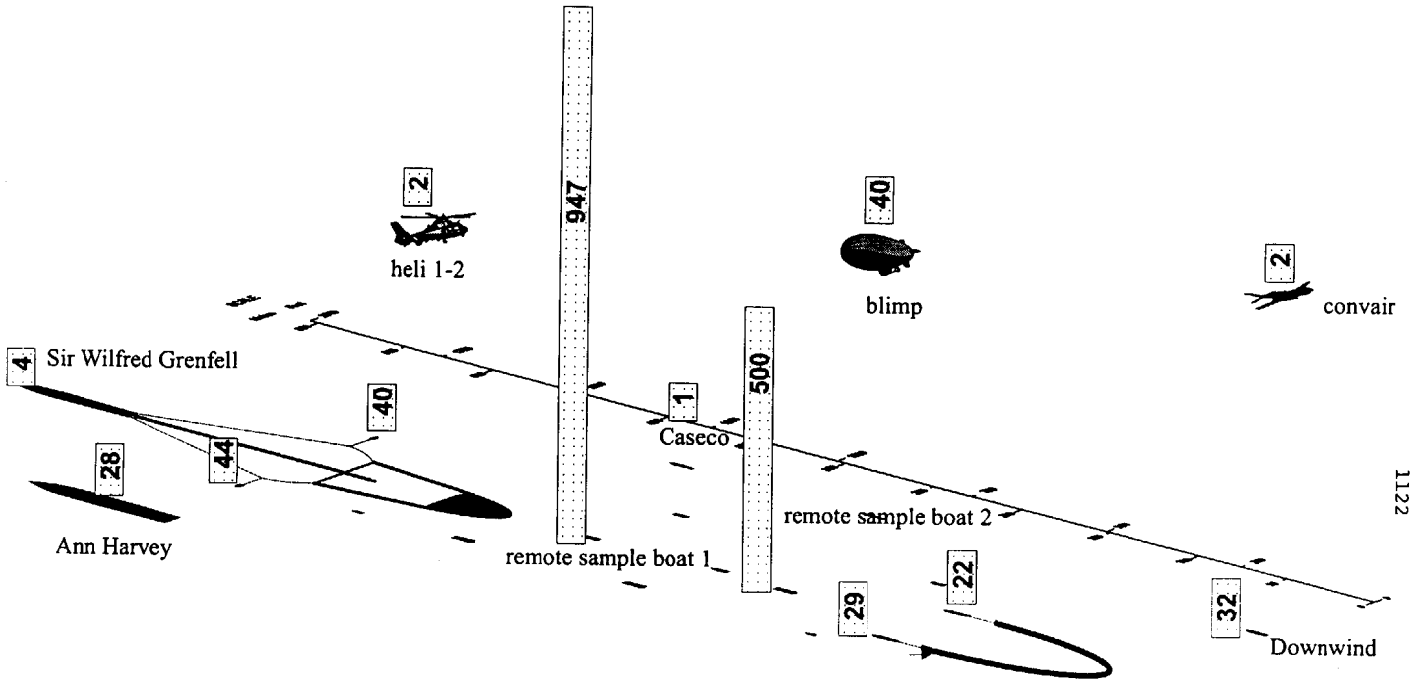


Figure 5 Relative Concentrations of Carbon Dioxide -Burn 2

Table 14

VOC ANALYSIS of Air Samples Burn # 1

Analysis µg/m3	R/C Boat 1	R/C Boat 2	R/C Boat 4	Downwind Station	Remote Heli-1	Remote Heli-2	Convair	Sir Wilfred Grenfell	Ann Harvey	CCG 203	CCG 204	CCG 212	CCG 214	Casaco
Summa canister ...														
Background (1.1)					325	271	80 & 609							
Pre-ignition (1.2)		971 & 1543	3675 & 960	48 & 198	254			239	111	3348	140	582	135	232
Burn (1.6)	1143	368	296	721				68	97	488	67	108	407	75
R/C Heli 1...Burn...in front of smoke plume					283									
R/C Heli 1...Burn...under smoke plume					2083									
R/C Heli 2...Burn..under plume...20m high						405								
R/C Heli 2...Burn..under plume...40m high						267								
Convair... 2 mi Dw ... ship exhaust														
Convair...Burn...above cloud layer							676							
Convair...Burn...1 mi DW at 1000 ft							759							
Convair...Burn...3 mi DW							577							
Convair...Burn...20mi DW							232							

Table 15

VOC ANALYSIS of Air Samples Burn # 2

Analysis µg/m3	Remote Station 1	Remote Station 2	Downwind Station	Remote Heli-1	Remote Heli-2	Convair	Sir Wilfred Grenfell	Ann Harvey	CCG 203	CCG 204	CCG 212	CCG 214	Casaco
Summa Canister...													
Pre-ignition (2.2)	177566 & 2158		61				208	78	3345	90	216	1406	133
Convair...pre-ignition...no ship exhaust						150							
Burn (2.6)	5388 & 19705	8661 & 1749	400				73	27	750	19	80	1189	62
R/C Heli...Burn...in front of smoke plume				43									
R/C Heli...Burn...under smoke plume				109									
R/C Heli...Burn...under plume...18m high					1005								
R/C Heli...Burn...under plume...20m high					96								
Convair...Burn...smoke 2mi DW at 1000ft (14:13)						515							
Convair...Burn...smoke 2mi DW at 1000ft (14:32)						171							
Convair...Burn...smoke 2mi DW at 1000ft						393							
Convair...Burn...smoke 9mi DW (14:58)						62							
Convair...Burn...smoke 15mi DW at 200ft (15:18)						47							
Post-burn (2.7)													
Convair...Post burn...old smoke 12mi DW at 1500ft						108							
Convair...Post burn...cross section 6mi DW at 1400ft						220							
Convair...Post burn...cross section 6mi DW at 1700ft						167							
Convair...Post burn...cross section 6mi DW at 1100ft						58							
Convair...Post burn...Background						621							
Post residue period (2.8)						414							

Table 16 **VOC Analytes**

Propene	2-Ethyl-1-Butene	1-Octene
Propane	t-3-Methyl-2-Pentene	Octane
Freon22 (Chlorodifluoromethane)	c-2-Hexene	t-1,2-Dimethylcyclohexane
Freon12 (Dichlorodifluoromethane)	c-3-Methyl-2-Pentene	t-2-Octene
Propyne	2,2-Dimethylpentane	Tetrachloroethene
Chloromethane	1,2-Dichloroethane	c-1,4/t-1,3-Dimethylcyclohexane
Isobutane (2-Methylpropane)	Methylcyclopentane	c-2-Octene
Freon114 (1,2-Dichlorotetrafluroethane)	2,4-Dimethylpentane	c-1,2-Dimethylcyclohexane
Vinylchloride (Chloroethene)	1,1,1-Trichloroethane	Chlorobenzene
1-Butene/2-Methylpropene	2,2,3-Trimethylbutane	Ethylbenzene
1,3-Butadiene	1-Methylcyclopentene	m/p-Xylene
Butane	Benzene	Bromoform
t-2-Butene	Carbontetrachloride	1,4-Dichlorobutane
2,2-Dimethylpropane	Cyclohexane	Styrene
Bromomethane	2-Methylhexane	1,1,2,2-Tetrachloroethane
1-Butyne	2,3-Dimethylpentane	o-Xylene
c-2-Butene	Cyclohexene	1-Nonene
Chloroethane	3-Methylhexane	Nonane
2-Methylbutane	Dibromomethane	iso-Propylbenzene
Freon11 (Trichlorofluoromethane)	1,2-Dichloropropane	3,6-Dimethyloctane
1-Pentene	Bromodichloromethane	n-Propylbenzene
2-Methyl-1-Butene	Trichloroethene	3-Ethyltoluene
Pentane	1-Heptene	4-Ethyltoluene
Isoprene (2-Methyl-1,3-Butadiene)	2,2,4-Trimethylpentane	1,3,5-Trimethylbenzene
Ethylbromide	t-3-Heptene	2-Ethyltoluene
t-2-Pentene	c-3-Heptene	1-Decene
1,1-Dichloroethene	Heptane	tert-Butylbenzene
c-2-Pentene	t-2-Heptene	1,2,4-Trimethylbenzene
Dichloromethane	c-2-Heptene	Decane
2-Methyl-2-Butene	c-1,3-Dichloropropene	1,3-Dichlorobenzene
Freon113 (1,1,2-Trichlorotrifluoroethane	2,2-Dimethylhexane	1,4-Dichlorobenzene
2,2-Dimethylbutane	Methylcyclohexane	iso-Butylbenzene
Cyclopentene	2,5-Dimethylhexane	sec-Butylbenzene
t-1,2-Dichloroethene	2,4-Dimethylhexane	1,2,3-Trimethylbenzene
4-Methyl-1-Pentene	t-1,3-Dichloropropene	p-Cymene
3-Methyl-1-Pentene	1,1,2-Trichloroethane	1,2-Dichlorobenzene
1,1-Dichloroethane	Bromotrichloromethane	Indane
Cyclopentane	2,3,4-Trimethylpentane	1,3-Diethylbenzene
2,3-Dimethylbutane	Toluene	1,4-Diethylbenzene
t-4-Methyl-2-Pentene	2-Methylheptane	n-Butylbenzene
2-Methylpentane	4-Methylheptane	1,2-Diethylbenzene
c-4-Methyl-2-Pentene	1-Methylcyclohexene	Undecane
3-Methylpentane	Dibromochloromethane	1,2,4-Trichlorobenzene
1-Hexene/2-Methyl-1-Pentene	3-Methylheptane	Naphthalene
c-1,2-Dichloroethene	c-1,3-Dimethylcyclohexane	Dodecane
Hexane	t-1,4-Dimethylcyclohexane	Hexachlorbutadiene
Chloroform	EDB (1,2-Dibromoethane)	Hexylbenzene
t-2-Hexene	2,2,5-Trimethylhexane	

OVERALL FINDINGS

The Newfoundland burn and the previous tank test burns have revealed several facts about the fate, behaviour and quantity of the basic emissions from burning:

Gases - combustion gases are very diffuse and do not have spatial relationship to the plume. A good model is to view gas dispersal as following a doughnut-like pattern around the burn. This pattern is deformed by increasing wind velocities. Generally gas concentrations downwind are very low. Gas concentrations, especially in low winds can be as high around the fire as downwind.

Particulate Matter/Soot - Particulate matter at ground level is only a matter of concern very close to the fire and under the plume. The concentration of particulates in the smoke plume may not be a concern past about 500 metres. The level of respirable particulates, those which have a size less than 10 μ, is poorly understood. Respirable particulates have not been detected at ground or sea level.

Water Emissions - No compounds have yet been detected in the water of the test tanks or under the water at sea. The aquatic toxicity of the water under a burn is either not measurable or not extant.

Organic Compounds - No exotic or highly-toxic compounds are generated as a result of the combustion process. Organic macro-molecules are in lesser concentration in the smoke and downwind than they are in the oil itself. Volatile organic compounds are released in large concentration by fires, but in lesser concentrations than the evaporating slick if not burning.

Residue - The residue is generally lighter than water. Density appears to relate to efficiency. If a burn is highly efficient (>99.9%), then the residue may be neutrally buoyant. The residue resembles high-weathered oil, measurements showed this to be about 40 to 50% weathered (% weight loss). The residue contains a lower amount of PAHs than the starting oil, although proportionately high amounts of multi-ringed PAHs are present.

PAHs - Additional Polyaromatic Hydrocarbons are not produced by in-situ oil fires. Oils contain significant quantities of PAHs. These are largely destroyed in combustion. The PAH concentrations in the smoke, both in the plume and the particulate precipitation at ground level are much less than the starting oil. This also includes the concentration of multi-ringed PAHs that are often created in other combustion processes such as low-temperature incinerators and diesel engines. This finding is very different from that noted in earlier laboratory experiments. It is suspected that re-precipitation of large soot particles occurs in large-scale tests which does not occur in laboratory tests. These large soot particles are conducive to the accumulation of large multi-ringed PAHs. The burn residue does, however, show a slight increase in the concentration of multi-ringed PAHs. However, when considering the mass balance of the burn, most of the five and six-ringed PAHs are destroyed by the fire.

Reference

1. Fingas, M.F., K. Li, F. Ackerman, P.R. Campagna, R.D. Turpin, S.J. Getty, M.F. Soleki, M.J. Trespalacios, J. Paré, M.C. Bissonnette and E.J. Tennyson, "Emissions From Mesoscale In-Situ Oil Fires: The Mobile 1991 and 1992 Tests", in Proceedings of The *Sixteenth Arctic and Marine Oil Spill Program Technical Seminar*, Environment Canada, Ottawa, Ontario, pp. 749-821, 1993.

APPENDIX

Table A-1 **TPH VALUES AND WEATHERING PERCENTAGES FOR OIL SAMPLES**

Sample No.	Total n-Alkanes	GCRTPH	TPH	GCRTPH/TPH	(C8+C10+C12+C14)/ (C22+C24+C26+C28)	Weathered Percent	C17/C18	Pris./Phy.
	(mg/g oil)	(mg/g oil)	(mg/g oil)			(%)		
2A	108	145	590	0.25	2.02	5.6	1.26	1.12
2B	106	152	582	0.26	2.00	6.0	1.24	1.15
3	103	181	666	0.27	1.98	6.5	1.25	1.16
4	100	158	614	0.26	1.86	9.2	1.22	1.15
5A	104	173	655	0.26	2.00	6.0	1.23	1.15
5B	101	166	645	0.26	2.00	6.0	1.23	1.16
7	99	161	609	0.26	1.91	8.1	1.24	1.14
11	50	74	513	0.14	0.11	48.6	0.99	0.97
12	49	62	431	0.14	0.30	44.3	0.99	1.15
14	39	51	408	0.13	0.10	48.9	0.88	0.97
15	51	65	479	0.14	0.16	47.5	0.96	0.99
16	48	57	451	0.13	0.07	49.5	0.90	1.00
Ref. oil	108	172	632	0.27	2.05		1.27	1.09

Legend: TPH: Total Petroleum Hydrocarbons
GCR TPH: GC Resolvable TPH
pris./phy.: Ratio of pristane/phytane

Table A-2 **n-Alkane Distributions of Oil Samples**

NOBE Oil	2A	2B	3	4	5A	5B	7	11	12	14	15	16
C8	4.75	4.85	4.11	4.09	4.13	4.36	3.83	0.03	0.19	0.02	0.05	-
C9	5.59	5.87	5.32	4.95	5.27	5.37	5.01	0.05	0.34	0.04	0.11	-
C10	5.49	5.55	5.25	4.88	5.11	5.17	4.97	0.11	0.48	0.09	0.19	0.02
C11	5.60	5.61	5.52	5.10	5.38	5.46	5.41	0.18	0.66	0.14	0.32	0.04
C12	5.67	5.58	5.63	5.32	5.81	5.70	5.52	0.29	0.82	0.21	0.47	0.12
C13	5.96	5.77	5.84	5.26	5.74	5.50	5.42	0.49	0.98	0.31	0.71	0.33
C14	6.29	6.04	5.90	5.59	6.06	5.75	5.72	0.79	1.34	0.52	1.03	0.67
C15	5.96	5.70	5.54	5.34	5.72	5.53	5.40	1.09	1.51	0.74	1.29	1.01
C16	5.75	5.54	5.35	5.15	5.51	5.31	5.27	1.45	1.77	1.05	1.62	1.39
C17	6.72	6.42	6.33	6.13	6.36	6.16	6.10	2.35	2.22	1.34	2.28	1.95
Pristane	2.98	2.96	2.80	2.68	2.86	2.76	2.68	1.04	1.27	0.71	1.08	1.08
C18	5.34	5.19	5.04	5.03	5.16	5.01	4.93	2.38	2.23	1.52	2.38	2.16
Phytane	2.60	2.58	2.43	2.34	2.50	2.38	2.34	1.07	1.10	0.73	1.10	1.09
C19	4.49	4.36	4.17	4.09	4.32	4.01	4.07	2.06	1.93	1.58	2.21	1.97
C20	4.07	3.93	3.94	3.79	3.92	3.71	3.71	2.33	2.08	1.83	2.31	2.27
C21	4.05	3.93	3.90	3.69	3.93	3.71	3.76	2.78	2.45	2.12	2.77	2.68
C22	3.54	3.67	3.41	3.47	3.43	3.39	3.50	2.87	2.39	2.26	2.90	2.84
C23	3.36	3.28	3.27	3.12	3.33	3.22	3.16	3.15	2.59	2.37	2.95	2.86
C24	3.47	3.21	3.06	3.01	3.15	3.12	2.99	3.14	2.58	2.49	3.06	3.06
C25	2.64	2.66	2.69	2.75	2.72	2.67	2.62	2.89	2.45	2.33	2.82	2.81
C26	2.40	2.42	2.40	2.44	2.44	2.40	2.35	2.79	2.35	2.23	2.69	2.65
C27	2.17	2.13	2.15	2.00	2.13	2.05	2.02	2.75	2.29	2.13	2.60	2.54
C28	1.88	1.78	1.78	1.67	1.78	1.57	1.60	2.24	2.14	1.95	2.37	2.26
C29	1.63	1.59	1.57	1.50	1.49	1.40	1.55	2.00	2.02	1.86	2.21	2.11
C30	1.22	1.24	1.28	1.28	1.25	1.16	1.21	1.71	1.64	1.61	1.86	1.91
C31	1.08	1.13	1.16	1.04	1.08	1.01	1.04	1.63	1.52	1.50	1.54	1.68
C32	0.81	0.80	0.86	0.79	0.78	0.70	0.81	1.32	1.16	1.13	1.26	1.27
C33	0.72	0.67	0.76	0.67	0.69	0.56	0.59	1.25	1.07	0.95	1.12	1.13
C34	0.54	0.53	0.58	0.56	0.54	0.45	0.52	0.91	0.87	0.77	0.90	0.86
C35	0.42	0.39	0.42	0.44	0.43	0.33	0.42	0.86	0.71	0.69	0.73	0.73
C36	0.32	0.30	0.34	0.36	0.35	0.28	0.32	0.59	0.57	0.56	0.62	0.65
C37	0.31	0.27	0.31	0.34	0.33	0.25	0.29	0.53	0.52	0.50	0.56	0.59
C38	0.21	0.17	0.25	0.25	0.26	0.17	0.24	0.37	0.39	0.40	0.43	0.50
C39	0.15	0.13	0.17	0.20	0.18	0.12	0.18	0.30	0.32	0.32	0.30	0.34
C40	0.12	0.10	0.15	0.18	0.15	0.10	0.15	0.26	0.28	0.27	0.24	0.29
TOTAL n-alkanes	108	106	103	100	104	101	100	50	49	39	51	48

Table A-3	Alkylated PAH Homologue Distribution of Oil Samples (µg/g oil)												
NOBE	FRESH	2A	2B	3	4	5A	5B	7	11	12	14	15	16
Naph.													
C0-N	307	313	313	308	307	297	278	206	79	42	66	67	18
C1-N	1662	1496	1569	1592	1519	1540	1529	1049	222	217	128	190	82
C2-N	3073	2783	2855	2915	2755	2864	2842	2246	586	570	323	494	312
C3-N	3013	2902	2972	3013	2850	2915	2902	1749	678	499	271	523	411
C4-N	1144	1295	1275	1283	1255	1236	1212	859	387	279	237	326	278
SUM	9199	8789	8984	9111	8686	8852	8763	6109	1952	1607	1025	1600	1101
Phen.													
C0-P	175	155	153	156	146	152	153	109	142	69	214	150	193
C1-P	481	535	542	540	513	541	535	407	378	224	303	298	296
C2-P	497	489	479	475	463	452	463	450	452	270	319	360	337
C3-P	369	345	335	350	328	344	339	342	385	213	280	276	270
C4-P	200	182	181	197	186	191	191	173	183	106	123	132	125
SUM	1722	1706	1690	1718	1636	1680	1681	1481	1540	882	1239	1216	1221
Diben.													
C0-D	16	17	17	17	16	15	16	14	10	6	12	10	9
C1-D	37	35	36	36	34	36	34	28	26	15	22	22	21
C2-D	60	50	49	51	47	47	48	46	45	28	34	40	33
C3-D	43	37	35	41	39	38	40	26	31	20	20	25	23
Sum	156	139	137	145	136	136	138	114	112	69	88	97	86
Fluo.													
C0-F	123	108	119	110	116	123	116	82	66	33	78	58	58
C1-F	250	218	216	217	218	210	210	176	115	89	91	83	74
C2-F	269	237	255	260	240	252	253	176	109	76	87	91	92
C3-F	174	187	172	181	175	169	180	144	122	67	77	69	78
Sum	816	750	762	768	749	754	759	578	412	245	333	301	302
Chry.													
C0-C	33	30	31	34	30	32	32	35	56	33	8	57	78
C1-C	55	51	48	49	48	48	50	45	72	44	73	56	68
C2-C	70	66	64	72	62	66	66	55	91	58	82	76	76
C3-C	34	32	36	36	36	35	36	50	89	47	69	65	59
Sum	192	179	179	191	176	181	184	185	288	182	232	254	281
TOTAL	12085	11563	11752	11933	11383	11603	11525	8467	4304	2985	2917	3468	2991

Table A-4 **Relative Composition and Ratios of Alkylated PAH Homologues**

Nobe	2A	2B	3	4	5A	5B	7	11	12	14	15	16
(% Composition) Naph.												
C0-N	3.56%	3.48%	3.38%	3.53%	3.36%	3.17%	3.37%	4.05%	2.61%	6.44%	4.19%	1.63%
C1-N	17.02%	17.46%	17.47%	17.49%	17.40%	17.45%	17.17%	11.37%	13.50%	12.49%	11.86%	7.45%
C2-N	31.66%	31.78%	31.99%	31.72%	32.35%	32.43%	36.77%	30.02%	35.47%	31.61%	30.88%	28.34%
C3-N	33.02%	33.08%	33.07%	32.81%	32.93%	33.12%	28.63%	34.73%	31.05%	28.44%	32.69%	37.33%
C4-N	14.73%	14.19%	14.08%	14.45%	13.96%	13.83%	14.06%	19.83%	17.36%	23.12%	20.38%	25.25%
(% Composition) Phen.												
C0-P	9.09%	9.05%	9.08%	8.92%	9.05%	9.10%	7.36%	9.22%	7.82%	17.27%	12.34%	15.81%
C1-P	31.36%	32.07%	31.43%	31.36%	32.20%	31.83%	27.48%	24.55%	25.40%	24.48%	24.51%	24.24%
C2-P	28.66%	28.34%	27.65%	28.30%	28.90%	27.54%	30.38%	29.35%	30.61%	25.75%	29.61%	27.60%
C3-P	20.22%	19.82%	20.37%	20.05%	20.48%	20.17%	23.09%	25.00%	24.15%	22.60%	22.70%	22.11%
C4-P	10.67%	10.71%	11.47%	11.37%	11.37%	11.36%	11.68%	11.88%	12.02%	9.93%	10.86%	10.24%
(% Composition) Diben.												
C0-D	12.23%	12.41%	11.72%	11.76%	11.03%	11.59%	12.28%	8.93%	8.70%	13.64%	10.31%	10.47%
C1-D	25.18%	26.28%	24.83%	25.00%	26.47%	24.64%	24.56%	23.21%	21.74%	25.00%	22.88%	24.42%
C2-D	35.97%	35.77%	36.17%	34.56%	34.56%	34.78%	40.35%	40.18%	40.58%	36.64%	41.24%	38.37%
C3-D	26.62%	25.55%	28.28%	28.68%	27.94%	28.99%	22.81%	27.68%	28.99%	22.73%	25.77%	26.74%
(% Composition) Fluo.												
C0-F	14.40%	15.62%	14.32%	15.49%	16.31%	15.28%	14.19%	18.02%	13.47%	23.42%	19.27%	19.21%
C1-F	29.07%	28.35%	28.26%	29.11%	27.85%	27.67%	30.45%	27.91%	28.16%	27.33%	27.57%	24.50%
C2-F	31.60%	33.46%	33.85%	32.04%	33.42%	33.33%	30.45%	26.46%	31.02%	26.13%	30.23%	30.46%
C3-F	24.93%	22.57%	23.57%	23.36%	22.41%	23.72%	24.91%	29.61%	27.35%	23.12%	22.92%	25.83%
(% Composition) Chry.												
C0-C	16.76%	17.32%	17.80%	17.05%	17.69%	17.39%	18.92%	19.44%	18.13%	3.45%	22.44%	27.76%
C1-C	28.49%	26.82%	26.68%	27.27%	26.82%	27.17%	24.32%	25.00%	24.18%	31.47%	22.06%	24.20%
C2-C	36.67%	35.75%	37.70%	35.23%	36.46%	35.67%	29.73%	31.60%	31.67%	35.34%	29.92%	27.05%
C3-C	17.88%	20.11%	18.85%	20.45%	19.34%	19.67%	27.03%	23.96%	25.02%	29.74%	25.59%	21.00%
Ratio Total Naph./Phen.	5.15	5.32	5.30	5.31	5.27	5.21	4.12	1.27	1.82	0.83	1.32	0.90
Ratio Total Naph/Chry.	74.79	81.38	75.50	82.83	74.86	71.97	75.64	74.56	29.56	48.70	13.14	27.59
Ratio Total Naph/Fluo.	11.27	11.72	11.79	11.86	11.60	11.74	11.55	10.57	4.74	6.56	3.08	5.32
Ratio Total Naph/Diben.	58.97	63.23	65.58	62.83	63.67	65.06	63.50	53.59	17.43	23.29	11.55	16.49
Ratio 2-/3-/1-D :2/3-M-D :1-M-D	1:054:0.26	1:0.52:0.23	1:2.51:0.25	1:2.51:0.25	1:0.51:0.24	1:0.51:0.24	1:0.52:0.25	1:0.51:0.25	1:0.51:0.26	1:0.52:0.27	1:0.52:0.26	1:0.51:0.27

Table A5 **PAH Analysis of Particulate Material**

Sample I.D.	C9	C10	C11	C12	C13	C14
Sample Size (m3)	0.086	0.0855	0.09			0.0620
Description	Burn 1,Boat 4	Burn 1,boat 4	Burn 1,boat 2	Trip Blank	Trip Blank	Background, Boat 1
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**	**Mass (µg)**	**Mass (µg)**
Naphthalene	1.40	1.76	<1.1	0.10	0.21	3.68
1-Methylnaphthalene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
2-Methylnaphthalene	<1.2	<1.2	<1.1	<0.1	<0.1	4.21
Biphenyl	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
2,6-Dimethylnaphthalene	<1.2	<1.2	<1.1	<0.1	<0.1	6.85
Acenaphthalene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Acenaphthene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
2,3,5-Trimethylnaphthalene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Fluorene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Phenanthrene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Anthracene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
1-Methylphenanthrene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Fluoranthene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Pyrene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Benz(a)anthracene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Chrysene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Benzo(b)fluoranthene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Benzo(k)fluoranthene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Benzo(e)pyrene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Benzo(a)pyrene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Perylene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Indeno(1,2,3-c,d)Pyrene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Dibenz(a,h)anthracene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Benzo(g,h,i)Perylene	<1.2	<1.2	<1.1	<0.1	<0.1	<1.6
Total:	**1.40**	**1.76**	**0.00**	**0.10**	**0.21**	**14.73**
Surrogates (percent recovery)						
d8-Naphthalene	64	72	61	46	57	60
d10-Acenaphthene	68	77	66	54	64	69
d10-Phenanthrene	87	91	82	75	80	82
d12-Chrysene	99	99	96	98	95	98
d12-Perylene	97	72	69	64	44	82
d14-Terphenyl(I.S. area *1000)	155	169	185	188	197	197

Table A-6 PAH Analysis of Particulate Material

Sample I.D.	P1F1	P2F2	P3F3	P4F4	P5F5	P6F6
Sample Size (m3)	9.216		7.424	11.95	9.106	11.5900
Description	Burn 2,boat 206	Trip blank,boat 206	Burn 1,boat 206	Burn 2,boat 206	Burn 1,boat 206	Burn 1,boat 1
Compound	Loading (µg/m3)	Mass (µg)	Loading (µg/m3)	Loading (µg/m3)	Loading (µg/m3)	Loading (µg/m3)
C4-Naphthalenes	0.099	<0.1	0.058	0.114	0.059	0.445
Benzothiophene	N/A	N/A	N/A	N/A	N/A	N/A
Dibenzofuran	0.02	0.11	0.02	0.02	0.01	0.04
Methylfluorenes	0.09	<0.1	<0.013	0.03	0.01	0.06
Dibenzothiophene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.009
Carbazole	<0.011	<0.1	<0.013	<0.008	<0.011	<0.009
4H-Cyclopenta[def]phenanthrene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.009
Acephenanthrylene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.009
4H-Cyclopenta[cd]pyrene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.009
Methylchrysenes	<0.011	<0.1	<0.013	<0.008	<0.011	<0.009
Picene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.009
Anthanthrene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.009
Coronene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.009
Total:	**0.21**	**0.11**	**0.07**	**0.16**	**0.08**	**0.54**

Table A7 **PAH Analysis of Particulate Material**

Sample I.D.	**C15**	**C16**	**C17**	**C18**	**C19**
Sample Size (m3)	0.062	0.058	0.09	0.09	0.088
Description	*Background,Boat 1*	*Background,Boat 206*	*Burn 1,boat 1*	*Burn 1,boat 1*	*Burn 1,boat 2*
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Lo Loading (µg/m3)**	**Loading (µg/m3)**
Naphthalene	2.88	2.03	<1.1	1.43	<1.1
1-Methylnaphthalene	<1.6	<1.7	<1.1	<1.1	<1.1
2-Methylnaphthalene	3.72	<1.7	<1.1	2.35	1.42
Biphenyl	<1.6	<1.7	<1.1	<1.1	<1.1
2,6-Dimethylnaphthalene	4.15	<1.7	<1.1	<1.1	1.42
Acenaphthalene	<1.6	<1.7	<1.1	<1.1	<1.1
Acenaphthene	<1.6	<1.7	<1.1	<1.1	<1.1
2,3,5-Trimethylnaphthalene	<1.6	<1.7	<1.1	<1.1	<1.1
Fluorene	<1.6	<1.7	<1.1	<1.1	<1.1
Phenanthrene	<1.6	<1.7	<1.1	<1.1	<1.1
Anthracene	<1.6	<1.7	<1.1	<1.1	<1.1
1-Methylphenanthrene	<1.6	<1.7	<1.1	<1.1	<1.1
Fluoranthene	<1.6	<1.7	<1.1	<1.1	<1.1
Pyrene	<1.6	<1.7	<1.1	<1.1	<1.1
Benz(a)anthracene	<1.6	<1.7	<1.1	<1.1	<1.1
Chrysene	<1.6	<1.7	<1.1	<1.1	<1.1
Benzo(b)fluoranthene	<1.6	<1.7	<1.1	<1.1	<1.1
Benzo(k)fluoranthene	<1.6	<1.7	<1.1	<1.1	<1.1
Benzo(e)pyrene	<1.6	<1.7	<1.1	<1.1	<1.1
Benzo(a)pyrene	<1.6	<1.7	<1.1	<1.1	<1.1
Perylene	<1.6	<1.7	<1.1	<1.1	<1.1
Indeno(1,2,3-c,d)Pyrene	<1.6	<1.7	<1.1	<1.1	<1.1
Dibenz(a,h)anthracene	<1.6	<1.7	<1.1	<1.1	<1.1
Benzo(g,h,i)Perylene	<1.6	<1.7	<1.1	<1.1	<1.1
Total:	**10.74**	**2.03**	**0.00**	**3.78**	**2.83**
Surrogates (percent recovery)					
d8-Naphthalene	59	42	3	53	21
d10-Acenaphthene	66	68	35	69	54
d10-Phenanthrene	96	91	85	95	76
d12-Chrysene	104	110	122	118	100
d12-Perylene	61	49	99	124	36
d14-Terphenyl(I.S. area *1000)	N/A	N/A	N/A	N/A	N/A

Table A8 **PAH Analysis of Particulate Material**

Sample I.D.	**C5**	**C6**	**C7**	**C8**
Sample Size (m3)	0.096	0.0931	0.0980	0.098
Description	Burn 2,boat 2	Burn 2,boat 2	Burn 2,boat 1	Burn 2,boat 1
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**
Naphthalene	<1.0	1.29	<1.0	<1.0
1-Methylnaphthalene	<1.0	<1.1	<1.0	<1.0
2-Methylnaphthalene	<1.0	<1.1	<1.0	<1.0
Biphenyl	<1.0	<1.1	<1.0	<1.0
2,6-Dimethylnaphthalene	<1.0	8.49	2.12	<1.0
Acenaphthalene	<1.0	<1.1	<1.0	<1.0
Acenaphthene	<1.0	<1.1	<1.0	<1.0
2,3,5-Trimethylnaphthalene	<1.0	<1.1	<1.0	<1.0
Fluorene	<1.0	<1.1	<1.0	<1.0
Phenanthrene	<1.0	<1.1	<1.0	<1.0
Anthracene	<1.0	<1.1	<1.0	<1.0
1-Methylphenanthrene	<1.0	<1.1	<1.0	<1.0
Fluoranthene	<1.0	<1.1	<1.0	<1.0
Pyrene	<1.0	<1.1	<1.0	<1.0
Benz(a)anthracene	<1.0	<1.1	<1.0	<1.0
Chrysene	<1.0	<1.1	<1.0	<1.0
Benzo(b)fluoranthene	<1.0	<1.1	<1.0	<1.0
Benzo(k)fluoranthene	<1.0	<1.1	<1.0	<1.0
Benzo(e)pyrene	<1.0	<1.1	<1.0	<1.0
Benzo(a)pyrene	<1.0	<1.1	<1.0	<1.0
Perylene	<1.0	<1.1	<1.0	<1.0
Indeno(1,2,3-c,d)Pyrene	<1.0	<1.1	<1.0	<1.0
Dibenz(a,h)anthracene	<1.0	<1.1	<1.0	<1.0
Benzo(g,h,i)Perylene	<1.0	<1.1	<1.0	<1.0
Total:	**0.00**	**9.77**	**2.12**	**0.00**
Surrogates (percent recovery)				
d8-Naphthalene	0	26	15	7
d10-Acenaphthene	4	49	57	47
d10-Phenanthrene	48	65	73	70
d12-Chrysene	103	96	99	104
d12-Perylene	84	21	56	49
d14-Terphenyl(I.S. area *1000)	N/A	N/A	N/A	N/A

*Biphenyl has been determined to be a solvent artifact

Table A9 **PAH Analysis of Particulate Material**

Sample I.D.	**C1**	**C2**	**C3**	**C4**	**Method Control**	**Method Control**
Sample Size (m3)	0.099	0.0986	0.1224	0.1224		0.816993
Description	Burn 1,boat 206	Burn 1,boat 206	Burn 2,boat 206	Burn 2,boat 206	For cyclone filters	PUF/XAD+Filter
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**	**Mass (µg)**
Naphthalene	<1.0	<1.0	<0.8	<0.8	<0.1	1.83
1-Methylnaphthalene	<1.0	<1.0	<0.8	<0.8	<0.1	0.68
2-Methylnaphthalene	<1.0	<1.0	<0.8	<0.8	<0.1	0.29
Biphenyl	3.37	<1.0	4.21	<0.8	0.62	0.41
2,6-Dimethylnaphthalene	<1.0	<1.0	<0.8	<0.8	<0.1	0.28
Acenaphthalene	<1.0	<1.0	<0.8	<0.8	<0.1	0.01
Acenaphthene	<1.0	<1.0	<0.8	<0.8	<0.1	0.01
2,3,5-Trimethylnaphthalene	<1.0	<1.0	<0.8	<0.8	<0.1	0.05
Fluorene	<1.0	<1.0	<0.8	<0.8	<0.1	0.11
Phenanthrene	<1.0	<1.0	<0.8	<0.8	<0.1	0.65
Anthracene	<1.0	<1.0	<0.8	<0.8	<0.1	0.05
1-Methylphenanthrene	<1.0	<1.0	<0.8	<0.8	<0.1	0.03
Fluoranthene	<1.0	<1.0	<0.8	<0.8	<0.1	0.15
Pyrene	<1.0	<1.0	<0.8	<0.8	<0.1	0.06
Benz(a)anthracene	<1.0	<1.0	<0.8	<0.8	<0.1	0.00
Chrysene	<1.0	<1.0	<0.8	<0.8	<0.1	0.00
Benzo(b)fluoranthene	<1.0	<1.0	<0.8	<0.8	<0.1	0.00
Benzo(k)fluoranthene	<1.0	<1.0	<0.8	<0.8	<0.1	0.00
Benzo(e)pyrene	<1.0	<1.0	<0.8	<0.8	<0.1	0.03
Benzo(a)pyrene	<1.0	<1.0	<0.8	<0.8	<0.1	0.00
Perylene	<1.0	<1.0	<0.8	<0.8	<0.1	0.00
Indeno(1,2,3-c,d)Pyrene	<1.0	<1.0	<0.8	<0.8	<0.1	0.00
Dibenz(a,h)anthracene	<1.0	<1.0	<0.8	<0.8	<0.1	0.00
Benzo(g,h,i)Perylene	<1.0	<1.0	<0.8	<0.8	<0.1	0.00
Total:	**3.37**	**<1.0**	**4.21**	**<0.8**	**0.62**	**4.64**
Surrogates (percent recovery)						
d8-Naphthalene	51	24	71	80	97	136
d10-Acenaphthene	63	47	61	67	84	86
d10-Phenanthrene	68	75	56	71	89	88
d12-Chrysene	58	60	60	61	92	93
d12-Perylene	45	44	42	45	79	69
d14-Terphenyl(I.S. area *1000)	183	173	145	194	206	245

Table A10 **PAH Analysis of Particulate Material**

Sample I.D.	**CIM-S2**	**CIM-S3**	**CIM-S6**	**CIM-S9**	**CIM-S10**
Sample Size (m3)	1.303	1.388	2.039	1.303	
Description	Burn 1,boat 2	Burn 2,boat 2	Burn 2,boat 206	Burn 1,boat 1	Trip blank
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**
Naphthalene	<0.08	<0.07	<0.05	<0.08	N/D
1-Methylnaphthalene	<0.08	<0.07	0.01	<0.08	N/D
2-Methylnaphthalene	<0.08	<0.07	0.00	<0.08	N/D
Biphenyl	0.32	0.21	0.15	0.36	0.55
2,6-Dimethylnaphthalene	<0.08	<0.07	0.00	<0.08	N/D
Acenaphthalene	<0.08	<0.07	0.00	<0.08	N/D
Acenaphthene	<0.08	<0.07	0.01	<0.08	N/D
2,3,5-Trimethylnaphthalene	<0.08	<0.07	0.01	<0.08	N/D
Fluorene	0.14	0.15	0.11	<0.08	N/D
Phenanthrene	<0.08	<0.07	<0.05	<0.08	N/D
Anthracene	<0.08	<0.07	<0.05	<0.08	N/D
1-Methylphenanthrene	<0.08	<0.07	<0.05	<0.08	N/D
Fluoranthene	<0.08	<0.07	<0.05	<0.08	N/D
Pyrene	<0.08	<0.07	<0.05	<0.08	N/D
Benz(a)anthracene	<0.08	<0.07	<0.05	<0.08	N/D
Chrysene	<0.08	<0.07	<0.05	<0.08	N/D
Benzo(b)fluoranthene	<0.08	<0.07	<0.05	<0.08	N/D
Benzo(k)fluoranthene	<0.08	<0.07	<0.05	<0.08	N/D
Benzo(e)pyrene	<0.08	<0.07	<0.05	<0.08	N/D
Benzo(a)pyrene	<0.08	<0.07	<0.05	<0.08	N/D
Perylene	<0.08	<0.07	<0.05	<0.08	N/D
Indeno(1,2,3-c,d)Pyrene	<0.08	<0.07	<0.05	<0.08	N/D
Dibenz(a,h)anthracene	<0.08	<0.07	<0.05	<0.08	N/D
Benzo(g,h,i)Perylene	<0.08	<0.07	<0.05	<0.08	N/D
Total:	**0.46**	**0.35**	**0.29**	**0.36**	**0.55**
Surrogates (percent recovery)					
d8-Naphthalene	89	121	94	92	94
d10-Acenaphthene	88	110	93	91	91
d10-Phenanthrene	90	104	92	93	94
d12-Chrysene	95	84	94	91	89
d12-Perylene	83	63	80	74	71
d14-Terphenyl(I.S. area*1000)	265	244	265	282	260

Table A11 **PAH Analysis of Particulate Material**

Sample I.D.	**CIM-S1**	**CIM-S4**	**CIM-S5**	**CIM-S7**	**method control**
Sample Size (m3)	1.2744	0.878	0.2832	1.643	8 blank filters
Description	Burn 1,boat 4	Background, boat 1	Background, boat 206	Burn 1,boat 206	spiked with surrogate
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**
Naphthalene	<0.08	<0.11	<0.35	<0.06	N/D
1-Methylnaphthalene	<0.08	<0.11	<0.35	<0.06	N/D
2-Methylnaphthalene	<0.08	<0.11	<0.35	<0.06	N/D
Bipheryl	<0.08	0.55	<0.35	0.19	0.81
2,6-Dimethylnaphthalene	<0.08	<0.11	<0.35	<0.06	N/D
Acenaphthalene	<0.08	<0.11	<0.35	<0.06	N/D
Acenaphthene	<0.08	<0.11	<0.35	<0.06	N/D
2,3,5-Trimethylnaphthalene	<0.08	<0.11	<0.35	<0.06	N/D
Fluorene	<0.08	0.20	0.59	<0.06	N/D
Phenanthrene	<0.08	<0.11	<0.35	<0.06	N/D
Anthracene	<0.08	<0.11	<0.35	<0.06	N/D
1-Methylphenanthrene	<0.08	<0.11	<0.35	<0.06	N/D
Fluoranthene	<0.08	<0.11	<0.35	<0.06	N/D
Pyrene	<0.08	<0.11	<0.35	<0.06	N/D
Benz(a)anthracene	<0.08	<0.11	<0.35	<0.06	N/D
Chrysene	<0.08	<0.11	<0.35	<0.06	N/D
Benzo(b)fluoranthene	<0.08	<0.11	<0.35	<0.06	N/D
Benzo(k)fluoranthene	<0.08	<0.11	<0.35	<0.06	N/D
Benzo(e)pyrene	<0.08	<0.11	<0.35	<0.06	N/D
Benzo(a)pyrene	<0.08	<0.11	<0.35	<0.06	N/D
Perylene	<0.08	<0.11	<0.35	<0.06	N/D
Indeno(1,2,3-c,d)Pyrene	<0.08	<0.11	<0.35	<0.06	N/D
Dibenz(a,h)anthracene	<0.08	<0.11	<0.35	<0.06	N/D
Benzo(g,h,i)Perylene	<0.08	<0.11	<0.35	<0.06	N/D
Total:	**<0.08**	**0.75**	**0.59**	**0.19**	**0.81**
Surrogates (percent recovery)					
d8-Naphthalene	40	93	50	80	59
d10-Acenaphthene	59	67	62	88	69
d10-Phenanthrene	73	74	77	102	81
d12-Chrysene	84	92	84	116	78
d12-Perylene	69	74	70	106	59
d14-Terphenyl(i.S. area*1000)	233	209	215	Not added	216

Table A12 **PAH Analysis of Particulate Material**

Sample I.D.	**FH1**	**FH2**	**FH3**	**FH4**	**Method Control**	**Method Control**
Sample Size (m3)	0.1938	0.1939	0.2243	0.224		
Description	Filter 1,Burn 1	Filter 2,Burn 1	Filter 3,Burn 2	Filter 4,Burn 2		PUF/XAD+Filter Blank
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**	**Mass (µg)**
Naphthalene	<0.5	<0.5	<0.45	<0.45	N/A	1.34
1-Methylnaphthalene	<0.5	<0.5	<0.45	<0.45	N/A	0.24
2-Methylnaphthalene	<0.5	<0.5	<0.45	<0.45	N/A	0.12
Biphenyl	<0.5	<0.5	<0.45	<0.45	N/A	0.23
2,6-Dimethylnaphthalene	<0.5	<0.5	<0.45	<0.45	N/A	0.06
Other Dimethylnaphthalenes	<0.5	<0.5	<0.45	<0.45	N/A	
Acenaphthalene	<0.5	<0.5	<0.45	<0.45	N/A	0.00
Acenaphthene	<0.5	<0.5	<0.45	<0.45	N/A	0.02
2,3,5-Trimethylnaphthalene	<0.5	<0.5	<0.45	<0.45	N/A	0.03
Other Trimethylnaphthalenes	<0.5	<0.5	<0.45	<0.45	N/A	
Fluorene	<0.5	<0.5	<0.45	<0.45	N/A	0.03
Phenanthrene	<0.5	0.58	0.80	0.70	N/A	0.13
Anthracene	<0.5	<0.5	<0.45	<0.45	N/A	0.01
1-Methylphenanthrene	<0.5	<0.5	<0.45	<0.45	N/A	0.01
Other Methylphenanthrenes	<0.5	<0.5	<0.45	<0.45	N/A	
Fluoranthene	<0.5	<0.5	0.58	0.45	N/A	0.03
Pyrene	0.50	<0.5	0.62	0.57	N/A	0.02
Benz(a)anthracene	<0.5	<0.5	<0.45	<0.45	N/A	0.00
Chrysene	<0.5	<0.5	<0.45	<0.45	N/A	0.00
Benzo(b)fluoranthene	<0.5	<0.5	<0.45	<0.45	N/A	0.00
Benzo(k)fluoranthene	<0.5	<0.5	<0.45	<0.45	N/A	0.00
Benzo(e)pyrene	<0.5	<0.5	<0.45	<0.45	N/A	0.04
Benzo(a)pyrene	<0.5	<0.5	<0.45	<0.45	N/A	0.00
Perylene	<0.5	<0.5	<0.45	<0.45	N/A	0.00
Indeno(1,2,3-c,d)Pyrene	<0.5	<0.5	<0.45	<0.45	N/A	0.01
Dibenz(a,h)anthracene	<0.5	<0.5	<0.45	<0.45	N/A	0.00
Benzo(g,h,i)Perylene	<0.5	<0.5	<0.45	<0.45	N/A	0.00
Total:	**0.50**	**0.58**	**1.99**	**1.72**	N/A	**2.34**
Surrogates (percent recovery)						
d8-Naphthalene	83	86	90	81	90	106
d10-Acenaphthene	87	88	92	82	94	79
d10-Phenanthrene	88	84	87	80	88	87
d12-Chrysene	81	72	75	71	75	103
d12-Perylene	59	55	56	54	54	82
d14-Terphenyl(I.S. area*1000)	173	181	167	189	169	263

Table A13 **PAH Analysis of Convair Collection Media**

Sample I.D.	**NFP6**	**NFP7**	**Trip Blank**	**method control**	**method control**
Sample Size (m3)	2.2 m3	2.932 m3			
Description	Cross section of plane 6 mi. downwind of ships	Background After Burn		For trip blank	For NFP6,7
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**	**Mass (µg)**	**Mass (µg)**
Naphthalene	0.34	0.11	0.79	N/D	N/D
1-Methylnaphthalene	0.49	0.19	0.75	N/D	N/D
2-Methylnaphthalene	0.24	0.10	0.37	N/D	N/D
Biphenyl	0.15	0.05	<0.1	N/D	N/D
2,6-Dimethylnaphthalene	0.19	0.09	0.17	N/D	N/D
Acenaphthalene	<0.05	<0.05	<0.1	N/D	N/D
Acenaphthene	<0.05	0.06	<0.1	N/D	N/D
2,3,5-Trimethylnaphthalene	0.09	<0.05	<0.1	N/D	N/D
Fluorene	0.10	<0.05	<0.1	N/D	N/D
Phenanthrene	0.52	0.07	0.49	N/D	N/D
Anthracene	0.05	<0.05	<0.1	N/D	N/D
1-Methylphenanthrene	<0.05	<0.05	<0.1	N/D	N/D
Fluoranthene	0.13	<0.05	0.15	N/D	N/D
Pyrene	0.06	<0.05	<0.1	N/D	N/D
Benz(a)anthracene	<0.05	<0.05	<0.1	N/D	N/D
Chrysene	<0.05	<0.05	<0.1	N/D	N/D
Benzo(b)fluoranthene	<0.05	<0.05	<0.1	N/D	N/D
Benzo(k)fluoranthene	<0.05	<0.05	<0.1	N/D	N/D
Benzo(e)pyrene	<0.05	<0.05	<0.1	N/D	N/D
Benzo(a)pyrene	<0.05	<0.05	<0.1	N/D	N/D
Perylene	<0.05	<0.05	<0.1	N/D	N/D
Indeno(1,2,3-c,d)Pyrene	<0.05	<0.05	<0.1	N/D	N/D
Dibenz(a,h)anthracene	<0.05	<0.05	<0.1	N/D	N/D
Benzo(g,h,i)Perylene	<0.05	<0.05	<0.1	N/D	N/D
Total:	**2.43**	**0.78**	**3.10**	**N/D**	**N/D**
Surrogates (percent recovery)					
d8-Naphthalene	63	46	46	37	37
d10-Acenaphthene	122	87	60	47	50
d10-Phenanthrene	93	79	75	62	56
d12-Chrysene	94	88	79	76	83
d12-Perylene	79	77	68	63	68

Table A14 **PAH Analysis of Convair Collection Media**

Sample I.D.	**NFP1**	**NFP2**	**NFP3**	**NFP4**	**NFP5**	**method control**
Sample Size (m3)	1.522 m3		4.972 m3	2.655 m3	2.580 m3	
Description	Ship Exhaust 2 mi. downwind of ships	Loaded Blank No air sampled	Downwind from ships 2mi,400ft, before burn	During burn 1 Above cloud layer	Burn 2, 2mi. downwind 1000ft. altitude	Blank PUF
Compound	**Loading (µg/m3)**	**Mass (µg)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**
Naphthalene	0.46	0.43	0.14	0.41	0.22	N/D
1-Methylnaphthalene	0.66	0.40	0.16	0.36	0.27	N/D
2-Methylnaphthalene	0.34	0.17	0.08	0.18	0.15	N/D
Biphenyl	0.22	0.06	<0.05	0.06	0.08	N/D
2,6-Dimethylnaphthalene	0.25	0.10	0.05	0.12	0.13	N/D
Acenaphthalene	<0.05	<0.05	<0.05	0.05	<0.05	N/D
Acenaphthene	0.13	<0.05	<0.05	0.06	0.06	N/D
2,3,5-Trimethylnaphthalene	0.08	<0.05	<0.05	<0.05	<0.05	N/D
Fluorene	0.11	<0.05	<0.05	<0.05	<0.05	N/D
Phenanthrene	0.60	0.08	<0.05	0.12	0.11	N/D
Anthracene	0.05	<0.05	<0.05	<0.05	<0.05	N/D
1-Methylphenanthrene	<0.05	<0.05	<0.05	<0.05	<0.05	N/D
Fluoranthene	0.13	<0.05	<0.05	<0.05	<0.05	N/D
Pyrene	0.05	<0.05	<0.05	<0.05	<0.05	N/D
Benz(a)anthracene	<0.05	<0.05	<0.05	<0.05	<0.05	N/D
Chrysene	<0.05	<0.05	<0.05	<0.05	<0.05	N/D
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05	N/D
Benzo(k)fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05	N/D
Benzo(e)pyrene	<0.05	<0.05	<0.05	<0.05	<0.05	N/D
Benzo(a)pyrene	<0.05	<0.05	<0.05	<0.05	<0.05	N/D
Perylene	<0.05	<0.05	<0.05	<0.05	<0.05	N/D
Indeno(1,2,3-c,d)Pyrene	<0.05	<0.05	<0.05	<0.05	<0.05	N/D
Dibenz(a,h)anthracene	<0.05	<0.05	<0.05	<0.05	<0.05	N/D
Benzo(g,h,i)Perylene	<0.05	<0.05	<0.05	<0.05	<0.05	N/D
Total:	**3.08**	**1.24**	**0.42**	**1.36**	**1.02**	**N/D**
Surrogates (percent recovery)						
d8-Naphthalene	61	45	46	64	61	35
d10-Acenaphthene	93	59	58	95	100	63
d10-Phenanthrene	80	65	70	83	85	77
d12-Chrysene	76	63	68	91	96	78
d12-Perylene	64	52	58	81	88	65

Table A15 **PAH Analysis of PUF/XAD Composites Taken By High Volume Sampler**

Sample I.D.	**P7F7**	**P8F8**	**P9F9**	**P10F10**	**P11F11**	**P14F14**
Sample Size (m3)	11.55	12.240	12.74		12.65	
Description	Burn 1,boat 4	Burn 1,boat 1	Burn 2,boat1	Trip blank	Burn 1,boat 4	Field blank,Boat 206
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**	**Loading (µg/m3)**	**Mass (µg)**
C4-Naphthalenes	0.216	0.294	0.405	<0.1	0.024	<0.1
Benzothiophene	N/A	N/A	N/A	N/A	N/A	N/A
Dibenzofuran	0.04	0.05	0.12	<0.1	0.03	0.10
Methylfluorenes	0.06	0.05	0.10	<0.1	0.03	<0.1
Dibenzothiophene	0.01	0.02	0.02	<0.1	0.01	<0.1
Carbazole	<0.009	<0.008	<0.008	<0.1	<0.008	<0.1
4H-Cyclopenta[def]phenanthrene	<0.009	0.01	0.06	<0.1	<0.008	<0.1
Acephenanthrylene	<0.009	<0.008	0.06	<0.1	<0.008	<0.1
4H-Cyclopenta[cd]pyrene	<0.009	<0.008	0.02	<0.1	<0.008	<0.1
Methylchrysenes	<0.009	<0.008	<0.008	<0.1	<0.008	<0.1
Picene	<0.009	<0.008	<0.008	<0.1	<0.008	<0.1
Anthanthrene	<0.009	<0.008	0.01	<0.1	<0.008	<0.1
Coronene	<0.009	<0.008	0.03	<0.1	<0.008	<0.1
Total:	**0.33**	**0.42**	**0.82**	**0.00**	**0.09**	**0.10**

Table A16 **PAH Analysis of PUF/XAD Composites Taken By High Volume Sampler**

Sample I.D.	**P18F18**	**P19F19**	**P20F20**	**method control**
Sample Size (m3)	12.74	8.184	8.184	
Description	Burn 1,boat 2	Background,boat 1	Background,boat 1	Blank
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**
Naphthalene	1.11	0.50	0.94	1.83
1-Methylnaphthalene	2.00	0.58	1.02	0.68
2-Methylnaphthalene	2.75	0.30	0.50	0.29
Biphenyl	0.14	0.12	0.15	0.41
2,6-Dimethylnaphthalene	1.62	0.49	0.64	0.28
Other Dimethylnaphthalenes	0.77	1.30	1.68	<0.1
Acenaphthalene	0.71	0.02	0.03	<0.1
Acenaphthene	0.08	0.03	0.03	<0.1
2,3,5-Trimethylnaphthalene	0.36	0.22	0.24	<0.1
Other Trimethylnaphthalenes	1.84	1.00	1.04	<0.1
Fluorene	0.21	0.12	0.10	0.11
Phenanthrene	0.06	0.32	0.33	0.65
Anthracene	0.04	0.02	0.35	<0.1
1-Methylphenanthrene	0.02	0.05	0.05	<0.1
Other Methylphenanthrenes	0.04	0.10	0.11	<0.1
Fluoranthene	0.05	0.02	0.01	0.15
Pyrene	0.05	0.05	0.06	<0.1
Benz(a)anthracene	0.01	<0.012	<0.012	<0.1
Chrysene	0.06	<0.012	<0.012	<0.1
Benzo(b)fluoranthene	<0.008	<0.012	<0.012	<0.1
Benzo(k)fluoranthene	0.02	<0.012	<0.012	<0.1
Benzo(e)pyrene	0.01	<0.012	<0.012	<0.1
Benzo(a)pyrene	0.01	<0.012	<0.012	<0.1
Perylene	0.05	<0.012	<0.012	<0.1
Indeno(1,2,3-c,d)Pyrene	0.02	<0.012	<0.012	<0.1
Dibenz(a,h)anthracene	<0.008	<0.012	<0.012	<0.1
Benzo(g,h,i)Perylene	0.01	<0.012	<0.012	<0.1
Total:	**12.04**	**5.25**	**7.28**	**4.40**
Surrogates (percent recovery)				
d8-Naphthalene	N/A	78	89	136
d10-Acenaphthene	105	88	88	86
d10-Phenanthrene	82	95	94	88
d12-Benz(a)Anthracene	78	100	99	93
d12-Perylene	61	82	82	69
d14-Terphenyl(I.S. area *1000)	N/A	247	258	245

Table A17 **PAH Analysis of PUF/XAD Composites Taken By High Volume Sampler**

Sample I.D.	P6F6	P7F7	P8F8	P9F9	P10F10	P11F11	Method Control
Sample Size (m3)	11.590	11.55	12.240	12.74		12.65	
Description	Burn 1,boat 1	Burn 1,boat 4	Burn 1,boat 1	Burn 2,boat1	Trip blank	Burn 1,boat 4	
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**	**Loading (µg/m3)**	**Mass (µg)**
Naphthalene	2.07	1.25	2.26	1.74	1.27	1.22	1.83
1-Methylnaphthalene	2.10	1.73	2.09	1.88	0.37	1.75	0.68
2-Methylnaphthalene	1.33	1.01	1.19	1.86	0.17	0.99	0.29
Biphenyl	0.30	0.31	0.30	0.18	<0.1	0.13	0.41
2,6-Dimethylnaphthalene	1.00	0.67	0.87	1.41	<0.1	0.63	0.28
Other Dimethylnaphthalenes	2.95	1.91	2.52	1.47	<0.1	1.80	
Acenaphthalene	0.29	0.02	0.24	1.24	<0.1	0.02	0.01
Acenaphthene	0.05	0.03	0.05	0.07	<0.1	0.04	0.01
2,3,5-Trimethylnaphthalene	0.26	0.12	0.15	0.32	<0.1	0.01	0.05
Other Trimethylnaphthalenes	1.14	0.52	0.63	1.00	<0.1	0.06	
Fluorene	0.12	0.06	0.14	0.28	<0.1	0.05	0.11
Phenanthrene	0.12	0.14	0.19	0.06	0.23	0.10	0.65
Anthracene	0.12	0.15	0.02	0.11	0.26	0.10	0.05
1-Methylphenanthrene	0.01	0.01	0.01	0.03	<0.1	<0.008	0.03
Other Methylphenanthrenes	0.02	0.02	0.03	0.06	<0.1	<0.008	
Fluoranthene	0.02	0.03	0.04	0.31	<0.1	0.02	0.15
Pyrene	0.02	0.01	0.03	0.31	<0.1	0.01	0.06
Benz(a)anthracene	<0.009	<0.009	<0.008	0.06	<0.1	<0.008	0.00
Chrysene	<0.009	<0.009	<0.008	0.06	<0.1	<0.008	0.00
Benzo(b)fluoranthene	<0.009	<0.009	<0.008	0.20	<0.1	<0.008	0.00
Benzo(k)fluoranthene	<0.009	<0.009	<0.008	0.01	<0.1	<0.008	0.00
Benzo(e)pyrene	<0.009	<0.009	<0.008	0.06	<0.1	<0.008	0.03
Benzo(a)pyrene	<0.009	<0.009	<0.008	0.08	<0.1	<0.008	0.00
Perylene	<0.009	<0.009	<0.008	0.05	<0.1	<0.008	0.00
Indeno(1,2,3-c,d)Pyrene	<0.009	<0.009	<0.008	0.15	<0.1	<0.008	0.00
Dibenz(a,h)anthracene	<0.009	<0.009	<0.008	0.01	<0.1	<0.008	0.00
Benzo(g,h,i)Perylene	<0.009	<0.009	<0.008	0.10	<0.1	<0.008	0.00
Total:	**11.92**	**8.00**	**10.77**	**13.12**	**2.31**	**6.91**	**4.64**
Surrogates (percent recovery)							
d8-Naphthalene	92	105	121	N/A	56	94	136
d10-Acenaphthene	109	96	93	93	51	92	86
d10-Phenanthrene	90	89	80	80	63	87	88
d12-Chrysene	99	101	99	72	70	100	93
d12-Perylene	77	73	84	61	55	70	69
d14-Terphenyl(I.S. area *1000)	233	240	254	N/A	202	254	245

Table A18 **PAH Analysis of PUF/XAD Composites Taken By High Volume Sampler**

Sample I.D.	P12F12	P13F13	P14F14	P15F15	P16F16	P17F17
Sample Size (m3)	12.100			13.671	13.328	12.42
Description	Burn 2,Boat 1 Dioxin Sample	Trip Blank Dioxin Sample	Field blank, boat 206	Burn 2,boat 2	Burn 2,boat 2	Burn 1,Boat 2 Dioxin Sample
Compound	Loading (µg/m3)	Mass (µg)	Mass (µg)	Loading (µg/m3)	Loading (µg/m3)	Loading (µg/m3)
Naphthalene	1.91	2.28	6.33	2.55	2.77	1.41
1-Methylnaphthalene	1.39	0.30	0.41	3.07	2.88	1.64
2-Methylnaphthalene	1.97	0.55	0.19	1.81	1.56	2.27
Biphenyl	0.15	0.12	<0.1	0.17	0.20	0.17
2,6-Dimethylnaphthalene	0.94	0.19	0.13	0.93	0.88	0.94
Other Dimethylnaphthalenes	2.38	0.52	0.48	1.88	1.74	2.25
Acenaphthalene	0.71	<0.08	<0.1	0.14	0.14	0.14
Acenaphthene	0.01	<0.08	<0.1	0.03	0.03	0.01
2,3,5-Trimethylnaphthalene	0.24	<0.08	<0.1	0.14	0.12	0.21
Other Trimethylnaphthalenes	0.61	<0.08	<0.1	0.60	0.32	0.73
Fluorene	0.20	0.14	<0.1	0.08	0.07	0.14
Phenanthrene	0.00	0.51	0.34	0.08	0.10	<0.008
Anthracene	0.08	<0.08	<0.1	0.01	0.11	0.02
1-Methylphenanthrene	0.02	<0.08	<0.1	0.01	0.01	0.02
Other Methylphenanthrenes	0.03	<0.08	<0.1	0.02	0.02	0.01
Fluoranthene	0.23	0.12	<0.1	0.03	0.04	0.04
Pyrene	0.23	<0.08	<0.1	0.03	0.03	0.04
Benz(a)anthracene	0.05	<0.08	<0.1	<0.007	<0.008	0.01
Chrysene	0.00	<0.08	<0.1	<0.007	<0.008	<0.008
Benzo(b)fluoranthene	0.15	<0.08	<0.1	0.01	0.01	<0.008
Benzo(k)fluoranthene	0.01	<0.08	<0.1	0.01	<0.008	<0.008
Benzo(e)pyrene	0.04	<0.08	<0.1	<0.007	<0.008	0.01
Benzo(a)pyrene	0.07	<0.08	<0.1	<0.007	<0.008	0.01
Perylene	0.01	<0.08	0.10	<0.007	<0.008	<0.008
Indeno(1,2,3-c,d)Pyrene	0.10	<0.08	<0.1	<0.007	<0.008	<0.008
Dibenz(a,h)anthracene	0.01	<0.08	<0.1	<0.007	<0.008	<0.008
Benzo(g,h,i)Perylene	0.06	<0.08	<0.1	<0.007	<0.008	0.01
Total:	11.59	4.72	7.99	11.39	11.05	10.07
Surrogates (percent recovery)						
d8-Naphthalene	N/A	N/A	59	100	111	N/A
d10-Acenaphthene	4	N/A	51	103	98	N/A
d10-Phenanthrene	0	N/A	69	100	92	N/A
d12-Chrysene	0	N/A	79	97	94	N/A
d12-Perylene	3	N/A	56	84	85	N/A
d14-Terphenyl(I.S. area *1000)	N/A	240	203	248	235	N/A

Table A19 **PAH Analysis of PUF/XAD Composites Taken By High Volume Sampler**

Sample I.D.	**P1F1**	**P2F2**	**P3F3**	**P4F4**	**P5F5**	**method control**
Sample Size (m3)	9.216		7.424	11.95	9.106	
Description	Burn 2,boat 206	Trip blank,boat 206	Burn 1,boat 206	Burn 2,boat 206	Burn 1,boat 206	Blank
Compound	**Loading (µg/m3)**	**Mass (µg)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**
Naphthalene	2.42	0.84	2.12	1.04	1.31	1.34
1-Methylnaphthalene	0.88	0.48	0.55	0.67	0.39	0.24
2-Methylnaphthalene	0.46	0.22	0.28	0.32	0.20	0.12
Biphenyl	0.15	0.13	0.03	0.04	0.03	0.23
2,6-Dimethylnaphthalene	0.21	0.17	0.16	0.16	0.12	<0.1
Other Dimethylnaphthalenes	0.59	0.62	0.48	0.46	0.34	<0.1
Acenaphthalene	0.05	<0.1	0.03	0.04	0.02	<0.1
Acenaphthene	0.01	<0.1	0.01	0.01	0.01	<0.1
2,3,5-Trimethylnaphthalene	0.04	<0.1	0.03	0.05	0.03	<0.1
Other Trimethylnaphthalenes	0.19	<0.1	0.14	0.22	0.15	<0.1
Fluorene	0.02	<0.1	0.02	0.02	0.02	<0.1
Phenanthrene	0.06	0.53	0.03	0.07	0.02	<0.1
Anthracene	<0.011	0.56	0.03	<0.008	0.02	<0.1
1-Methylphenanthrene	<0.011	<0.1	<0.013	0.01	<0.011	<0.1
Other Methylphenanthrenes	<0.011	<0.1	<0.013	0.02	0.01	<0.1
Fluoranthene	<0.011	0.12	<0.013	0.01	<0.011	<0.1
Pyrene	<0.011	<0.1	<0.013	0.01	<0.011	<0.1
Benz(a)anthracene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.1
Chrysene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.1
Benzo(b)fluoranthene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.1
Benzo(k)fluoranthene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.1
Benzo(e)pyrene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.1
Benzo(a)pyrene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.1
Perylene	<0.011	<0.1	0.02	<0.008	<0.011	<0.1
Indeno(1,2,3-c,d)Pyrene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.1
Dibenz(a,h)anthracene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.1
Benzo(g,h,i)Perylene	<0.011	<0.1	<0.013	<0.008	<0.011	<0.1
Total:	**5.07**	**3.67**	**3.93**	**3.15**	**2.67**	**1.93**
Surrogates (percent recovery)						
d8-Naphthalene	124	98	117	105	106	106
d10-Acenaphthene	91	76	85	83	76	79
d10-Phenanthrene	99	87	87	87	80	87
d12-Chrysene	94	90	94	103	97	103
d12-Perylene	70	69	74	89	80	82
d14-Terphenyl(I.S. area *1000)	246	235	250	255	262	263

Table A20 **PAH Analysis of PUF/XAD Composites Taken By High Volume Sampler**

Sample I.D.	**P12F12**	**P13F13**	**P17F17**	**P19F19**	**P20F20**	**method control**
Sample Size (m3)	12.103		12.420	0.8184	0.8184	
Description	Burn 2,boat 1	Trip Blank	Burn 1,boat 2	Background,boat 1	Background,boat 1	Blank
Compound	**Loading (µg/m3)**	**Mass (µg)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**
C4-Naphthalenes	0.17	<0.1	0.192			
Benzothiophene	0.03	<0.1	0.03	0.00	0.00	0.00
Dibenzofuran	0.07	<0.1	0.04	1.29	1.20	0.01
Methylfluorenes	0.12	0.29	0.06			
Dibenzothiophene	0.02	<0.1	0.01	0.43	0.36	0.03
Carbazole	<0.008	0.10	<0.008	2.23	0.06	0.04
4H-Cyclopenta[def]phenanth	0.05	<0.1	0.01	0.01	0.01	0.00
Acephenanthrylene	0.05	<0.1	<0.008	0.06	0.06	0.01
4H-Cyclopenta[cd]pyrene	0.02	0.12	<0.008	0.14	0.11	0.01
Methylchrysenes	<0.008	<0.1	<0.008			
Picene	0.01	<0.1	<0.008	0.01	0.01	0.01
Anthanthrene	0.01	<0.1	<0.008	0.00	0.00	0.00
Coronene	0.03	<0.1	<0.008	0.01	0.01	0.00
Total:	**0.58**	**0.51**	**0.34**	**4.17**	**1.81**	**0.11**

Table A21 **PAH Analysis of PUF/XAD Composites Taken By High Volume Sampler**

Sample I.D.	**P15F15**	**P16F16**	**P18F18**	**P19F19**	**P20F20**	**method control**
Sample Size (m3)	13.671	13.328	12.742	8.184	8.184	
Description	Burn 2,boat 2	Burn 2,boat 2	Burn 1,boat 2	Background,boat 1	Background,boat 1	Blank
Compound	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Loading (µg/m3)**	**Mass (µg)**
C4-Naphthalenes	0.18	0.09	0.348	0.556	0.517	<0.1
Benzothiophene	N/A	N/A	N/A	N/A	N/A	N/A
Dibenzofuran	0.02	0.02	0.06	0.04	0.04	<0.1
Methylfluorenes	0.02	0.03	0.07	0.16	0.17	<0.1
Dibenzothiophene	<0.007	<0.008	0.01	0.08	0.07	<0.1
Carbazole	<0.007	<0.008	<0.008	<0.011	<0.011	<0.1
4H-Cyclopenta[def]phenanthrene	<0.007	<0.008	0.02	<0.011	<0.011	<0.1
Acephenanthrylene	<0.007	<0.008	0.01	<0.011	<0.011	<0.1
4H-Cyclopenta[cd]pyrene	<0.007	<0.008	<0.008	<0.011	<0.011	<0.1
Methylchrysenes	<0.007	<0.008	<0.008	<0.011	<0.011	<0.1
Picene	<0.007	<0.008	<0.008	<0.011	<0.011	<0.1
Anthanthrene	<0.007	<0.008	<0.008	<0.011	<0.011	<0.1
Coronene	<0.007	<0.008	<0.008	<0.011	<0.011	<0.1
Total:	**0.23**	**0.14**	**0.52**	**0.84**	**0.79**	**0.00**

Table A-22 Ground Summa CO_2 Results

Sample #	Cannister #	Event	Boat ID	CO2 , ppm
WG-1	REAC 173	Burn 1A	WG	370
WG-2	REAC 172	Burn 1B	WG	355
WG-3	REAC 191	Burn 2A	WG	325
WG-4	REAC 192	Burn 2B	WG	387
AH-1	REAC 141	Burn 1 (A)	AH	387
AH-2	REAC 166	Burn 1 (B)	AH	350
AH-3	REAC 66	Burn 2 (A)	AH	363
AH-4	ESD 1	Burn 2 (B)	AH	412
203-1	REAC 163	Burn 1 (A)	203	523
203-2	REAC 75	Burn 1 (B)	203	385
203-3	REAC 162	Burn 2 (A)	203	410
203-4	ESD 3	Burn 2 (B)	203	402
204-1	REAC 186	Burn 1 (A)	204	367
204-2	REAC 183	Burn 1 (B)	204	355
204-3	REAC 184	Burn 2 (A)	204	407
204-4	ESD 13	Burn 2 (B)	204	392
CV-1A	REAC 185	Burn 1 (A)	CV-1	410
CV-1B	REAC 211	Burn 1 (A)	CV-2	280
CV-2A	ESD 18	Burn 1 (B)	CV-1	329
CV-2B	REAC 214	Burn 1 (B)	CV-2	328
CV-3A	REAC 144	Burn 2 (A)	CV-1	423
CV-3B	REAC 168	Burn 2 (A)	CV-2	265
CV-4A	REAC 213	Burn 2 (B)	CV-1	355
CV-4B	REAC 165	Burn 2 (B)	CV-2	310
RC-1A	REAC 196	Burn 1-Boat 4-Summa C	215	360
RC-1B	REAC 198	Burn 1-Boat 4 (Summa D)	215	378
RC-2A	REAC 195	Burn 1-Boat 4 - Summa A	215	753
RC-2B	REAC 202	Burn 1-Boat 4-Summa B	215	757
RC-3A	REAC 160	Burn 1-Boat 2-evap Summa C	216	408
RC-3B	REAC 177	Burn1-Boat 2-Evap Summa D	216	352
RC-4A	ESD 16	Burn 1-Boat 2-Summa A	216	433
RC-4B	ESD 17	Burn 1-Boat 2-Summa B	216	800
RC-5A	ESD 7	Burn 1-Boat 1-Summa A	215	735
RC-5B	ESD 9	Burn 1-Boat 1-Summa B	215	803
RC-6A	REAC 179	Burn 2-Boat 1-Summa C	215	412
RC-6B	REAC 178	Burn 2-Boat 1-Summa D	215	297
RC-7A	REAC 167	Burn 2-Boat 1-Summa A	215	940
RC-7B	REAC 197	Burn 2-Boat 1-Summa B	215	953
RC-8A	REAC 212	Burn 2-Boat 2-Summa B	216	825
RC-8B	ESD 4	Burn 2-Boat 2-Summa A	216	896
RC-BLK1	REAC 220	Back 1-Boat 1	215	274
RC-BLK2	REAC 222	Back 2 - Boat 1	215	360
214-1	REAC 188	Burn 1A	214	375
214-2	REAC 187	Burn 1B	214	402
214-3	REAC 190	Burn 2A	214	455
214-4	REAC 189	Burn 2B	214	382
212-1	REAC 174	Burn 1A	212	365
212-2	REAC 171	Burn 1B	212	399
212-3	REAC 193	Burn 2A	212	355
212-4	REAC 194	Burn 2B	212	316
206-1A	REAC 182	Burn 1 - Evap 1 (A)	206	410
206-1B	REAC 123	Burn 1-Evap 2 (B)	206	365
206-2A	REAC 77	Burn 1-Ignition 1 (A)	206	348
206-2B	REAC 73	Burn 1-Ignition 2 (B)	206	400
206-3A	REAC 215	Burn 2A-evaporation	206	370
206-3B	REAC 72	Burn 2B-Evap	206	385
206-4A	REAC 200	Burn 2A-ignition	206	368
206-4B	REAC 219	Burn 2-Ignition 2	206	415
206-5	GRVD 431	Lot Blank	206	397
206-6A	REAC 180	Background 1 (1A)	206	374
206-6B	REAC 181	Background 2 (1B)	206	260

Table A23 **Airborne Summa CO_2 Results**

Sample #	Cannister #	Event	Site	Time	Description	ppm CO2
CON-1	EPS 233	Background	Convair	11:56	Taken on Aug 7, background sample	387
CON-2	EPS 53	Burn 1	Convair	08:27	Before burn	364
CON-3	EPS 132	Burn 1	Convair	08:40	Before burn	366
CON-4	EPS 27	Burn 1	Convair	10:39	Smoke, 1 mi DW, 1000' alt	376
CON-5	EPS 151	Burn 1	Convair	10:56	Above cloud layer	na
CON-6	EPS 6	Burn 1	Convair	11:08	Above cloud layer	406
CON-7	EPS 22	Burn 1	Convair	11:27	Smoke, 3 mi DW	380
CON-8	GVRD 430	Burn 1	Convair	11:43	Smoke, 20 mi DW	374
CON-9	EPS 223	Burn 2	Convair	14:00	Pre-burn, background, no ship exhaust	378
CON-10	EPS 226	Burn 2	Convair	14:13	Smoke, 2 mi DW, 1000' alt	379
CON-11	EPS 220	Burn 2	Convair	14:24	Smoke, 2 mi DW, 1000' alt	376
CON-12	AB02	Burn 2	Convair	14:32	Smoke, 2 mi DW, 1000' alt	386
CON-13	EPS 100	Burn 2	Convair	14:58	Smoke, 9 mi DW	374
CON-14	EPS 24	Burn 2	Convair	15:18	Below smoke, 15 mi DW, 200'	na
CON-15	GRVD 433	Burn 2	Convair	15:28	Cross-section of plume, 6 mi DW, 1100' alt	na
CON-16	EPS 163	Burn 2	Convair	15:32	Cross-section of plume, 6 mi DW, 1400' alt	384
CON-17	ESD 20	Burn 2	Convair	15:38	Cross-section of plume, 6 mi DW, 1700' alt	376
CON-18	REAC 223	Burn 2	Convair	16:10	Old smoke, 1500', 12 mi DW	na
CON-19	EPS 164	Burn 2	Convair	16:23	Background, after burn	362
CON-20	REAC 224	Burn 2	Convair	16:34	Background, after burn	366
Heli-1	13871	Burn 1	207		Team 1, flight 1, background before discharge, 6 min.	396
Heli-2	13875	Burn 1	207		Team 1, flight 2, evaporation, 5 min.	368
Heli-3	13876	Burn 1	207		Team 1, flight 3, in frt of plume, 6 min.	310
Heli-4	13377	Burn 1	207		Team 1, flight 4, under smoke, 6 min.	347
Heli-5	13872	Burn 1	209		Team 2, flight 1, background before discharge, 4 min	346
Heli-6	13877	Burn 1	209		Team 2, flight 2, under plume @20m high, 6.5 min	380
Heli-7	13870	Burn 1	209		Team 2, flight 3, under plume @40m high, 6 min	308
Heli-8	13869	Burn 2	207		Team 1, flight 1, in frt of plume, 6 min.	373
Heli-9	13868	Burn 2	207		Team 1, flight 2, under plume, 6 min	na
Heli-10	13376	Burn 2	209		Team 2, flight 1, under plume @18m high, 6 min.	359
Heli-11	13874	Burn 2	209		Team 2, flight 2, under plume @20m high, 8 min.	na
Heli-blk0	13873	Background			Team 1, taken on Aug 7, background sample	276
Heli-blk1	KC-09	Burn 2	207		Team 1, after burn, using 2-l summa, 6 min.	na
Heli-blk2	KC-14	Burn 2	207		Team 1, static blank after burn, using 2-l summa	na
Ted-1	16827-1	Burn 1	blimp			409
Ted-2	16831-1	Burn 1	blimp			422
Ted-3	16831-2	Burn 2	blimp			439
Ted-4	16823-2	Burn 2	blimp			433
Ted-blk1				8:54am		390
Ted-blk2				12:20pm		369
Ted-blk3				1:55pm		385
Ted-blk4				3:40pm		380

note:'na' denotes sample not analysed

Table A-24

Description	VOC Data background	background	background	background	background Downwind	background Downwind	background	background Conwair	background Conwair	pre-ignition RS-1
VOC CONCENTRATION (µg/m3)										
Compound Location	R/C boat 1	R/C boat 1	R/C boat 1	R/C boat 1	CCG 206	CCG 206	R/C Heli	2ml DW	2ml DW	R/C boat 4
Propene	26.92	11.66	18.45	12.17	2.23	2.26	26.02	25.85	1.20	94.96
Propane	15.93	12.38	0.30	19.31	1.50	0.69	1.95	0.00	0.00	0.00
Freon22 (Chlorodifluoromethane)	1.22	1.65	1.01	1.13	0.57	1.26	0.59	0.30	0.33	2.52
Propyne	0.00	0.36	0.00	0.20	0.00	0.00	0.52	0.00	0.00	0.00
Chloromethane	0.50	1.48	2.00	3.15	1.69	1.56	2.59	1.00	0.27	3.14
Isobutane (2-Methylpropane)	111.58	68.13	84.39	107.43	0.22	0.25	2.94	0.32	0.00	20.17
Freon114 (1,2-Dichlorotetrafluoroethane	0.82	0.36	0.94	0.84	0.75	0.38	0.44	0.23	0.48	2.99
1-Butene/2-Methylpropene	41.69	34.68	43.43	52.19	4.19	4.05	6.61	0.42	0.42	40.75
1,3-Butadiene	1.97	3.18	2.44	2.33	0.21	0.22	0.20	0.00	0.00	1.95
Butane	113.06	72.72	87.18	110.94	0.52	0.42	2.36	0.71	0.69	9.28
t-2-Butene	23.53	14.33	17.20	23.60	0.26	0.36	0.49	0.00	0.00	2.30
2,2-Dimethylpropane	0.32	0.27	0.29	0.36	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Butene	22.09	15.09	18.50	24.68	0.31	0.40	1.33	0.00	0.00	2.31
1-Pentene	6.32	5.99	6.91	8.25	0.68	0.80	0.57	0.00	0.00	12.11
Pentane	65.55	46.57	48.62	64.45	0.19	0.27	2.85	0.21	0.23	13.66
Isoprene (2-Methyl-1,3-Butadiene)	1.13	1.49	1.45	1.57	0.00	0.34	0.24	0.00	0.00	1.31
t-2-Pentene	9.31	5.99	6.52	9.43	0.00	0.12	0.32	0.00	0.00	0.97
c-2-Pentene	11.01	8.20	9.48	12.79	0.00	0.00	0.24	0.00	0.00	1.22
Dichloromethane	170.08		24.22	88.45	8.16	2.18	2.96	879.27	775.69	12.90
2,2-Dimethylbutane	4.01	4.26	2.52	2.93	0.00	0.00	0.40	0.00	0.00	0.83
Cyclopentane	6.08	4.89	4.58	6.23	0.00	0.00	0.44	0.00	0.00	1.93
2,3-Dimethylbutane	7.48	6.52	5.01	6.55	0.00	0.00	0.57	0.49	0.38	1.86
t-4-Methyl-2-Pentene	0.57	0.49	0.48	0.62	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylpentane	35.62	46.21	51.85	55.47	6.88	7.62	2.87	0.28	0.27	16.06
c-4-Methyl-2-Pentene	2.19	2.01	2.12	2.68	0.00	0.00	0.13	0.00	0.00	0.00
3-Methylpentane	21.21	20.84	15.27	19.91	0.00	9.67	2.60	0.28	0.19	7.70
1-Hexene/2-Methyl-1-Pentene	2.07	4.48	5.33	5.45	0.49	0.71	0.65	0.00	0.00	10.26
Hexane	26.72	76.42	23.26	25.23	1.71	183.84	23.45	0.23	0.22	26.07
t-2-Hexene	1.70	1.53	1.38	1.91	0.00	0.00	0.23	0.00	0.00	0.87
t-3-Methyl-2-Pentene	1.86	1.57	1.56	2.02	0.00	0.00	0.18	0.00	0.00	0.00
c-2-Hexene	1.25	1.04	1.02	1.26	0.00	0.00	0.20	0.00	0.00	0.78
c-3-Methyl-2-Pentene	2.31	2.17	2.07	2.72	0.00	0.00	0.21	0.00	0.00	0.52
2,2-Dimethylpentane	0.74	0.78	0.48	0.59	0.00	0.00	0.11	0.00	0.00	0.49
1,2-Dichloroethane	0.16	0.25	0.00	0.15	0.00	0.17	0.00	0.00	0.00	0.00
Methylcyclopentane	14.21	22.95	11.04	13.49	0.17	20.54	5.35	0.00	0.00	12.82
2,4-Dimethylpentane	2.29	2.26	1.54	1.79	0.00	0.00	0.38	0.46	0.40	1.30
1,1,1-Trichloroethane	1.13	1.19	1.28	1.04	0.70	0.78	1.06	0.83	0.74	4.09
2,2,3-Trimethylbutane	0.20	0.79	0.90	1.12	0.21	0.00	0.22	0.00	0.00	2.40
Benzene	10.42	11.44	8.56	10.43	0.18	0.24	3.97	0.18	0.19	2.96
Cyclohexane	4.54	4.63	3.77	4.59	0.00	0.17	0.99	0.00	0.16	20.14
2-Methylhexane	3.72	4.63	3.19	3.65	0.00	0.00	0.00	0.00	0.00	4.22
2,3-Dimethylpentane	3.33	3.45	2.18	2.60	0.00	0.00	0.78	0.30	0.25	2.78
Cyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylhexane	8.73	8.48	5.38	6.70	0.00	0.00	2.22	0.00	0.00	9.04
1-Heptene	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00
2,2,4-Trimethylpentane	1.57	2.37	1.60	1.57	0.00	0.34	0.53	6.01	4.85	2.92
t-3-Heptene	0.12	0.32	0.19	0.27	0.28	0.34	0.00	0.00	0.00	1.85
Heptane	7.05	7.72	6.12	6.20	0.18	0.18	2.81	0.03	0.05	29.31
t-2-Heptene	0.59	1.36	0.95	1.06	0.65	0.76	0.32	0.00	0.00	8.38
c-2-Heptene	0.89	2.41	2.03	2.48	0.50	0.66	0.29	0.00	0.00	10.49
2,2-Dimethylhexane	0.00	0.34	0.26	0.22	0.00	0.00	0.09	0.00	0.00	0.00
Methylcyclohexane	4.24	4.04	3.38	3.64	0.00	0.00	1.14	0.00	0.00	39.80
2,5-Dimethylhexane	0.91	1.24	0.93	0.73	0.00	0.00	0.31	0.62	0.49	1.30
2,4-Dimethylhexane	1.34	1.43	0.96	1.00	0.00	0.00	0.48	0.86	0.66	1.99
2,3,4-Trimethylpentane	0.69	0.84	0.39	0.42	0.00	0.00	0.28	1.81	1.47	0.49
Toluene	26.45	26.77	23.27	24.57	0.30	0.44	30.63	5.15	4.68	14.17
2-Methylheptane	3.48	4.34	3.72	3.34	0.00	0.00	1.32	0.00	0.00	12.15
4-Methylheptane	1.51	1.53	1.21	1.22	0.00	0.00	0.73	0.00	0.00	3.87
1-Methylcyclohexene	40.62	0.00	0.00	0.00	0.00	0.00	18.65	0.00	0.00	0.00
3-Methylheptane	4.30	5.28	3.56	3.82	0.00	0.00	2.07	0.00	0.00	9.03
c-1,3-Dimethylcyclohexane	1.36	1.37	1.32	1.45	0.00	0.00	0.39	0.00	0.00	10.80
t-1,4-Dimethylcyclohexane	0.69	0.68	0.66	0.71	0.00	0.00	0.12	0.00	0.00	5.60
2,2,5-Trimethylhexane	0.25	0.28	0.14	0.15	0.00	0.00	0.11	0.71	0.54	0.19
1-Octene	0.47	3.30	7.60	4.06	0.30	0.66	0.34	0.00	0.00	20.54
Octane	4.01	4.23	4.41	3.77	0.06	0.10	1.92	0.03	0.00	31.40
c-1,4/t-1,3-Dimethylcyclohexane	0.94	0.81	0.77	0.81	0.00	0.00	0.22	0.00	0.00	3.18
c-2-Octene	0.59	1.20	1.44	1.41	0.00	0.15	0.40	0.00	0.00	6.66
Ethylbenzene	15.37	15.22	14.33	16.43	0.06	0.09	8.54	0.42	0.37	5.61
m/p-Xylene	53.78	52.08	52.30	58.72	0.19	0.32	27.31	0.42	1.00	24.06
Styrene	0.79	3.48	0.48	0.47	0.08	0.00	0.85	41.75	44.94	0.68
o-Xylene	17.19	17.19	16.20	17.97	0.06	0.11	9.16	0.14	0.31	8.10
Nonane	4.42	5.88	5.65	4.34	0.12	0.12	1.44	0.00	0.09	41.50
Iso-Propylbenzene	0.60	0.92	0.62	0.57	0.00	0.00	0.57	0.00	0.00	1.64
3,6-Dimethyloctane	0.45	0.52	0.29	0.28	2.53	0.00	0.21	0.00	0.00	4.35
n-Propylbenzene	1.81	2.96	2.29	2.38	0.11	0.17	2.31	0.13	0.15	6.02
3-Ethyltoluene	6.18	8.60	6.16	6.07	0.05	0.07	7.62	0.08	0.30	16.10
4-Ethyltoluene	2.86	4.65	3.05	3.00	0.04	0.06	3.81	0.06	0.19	8.37
1,3,5-Trimethylbenzene	3.23	5.52	3.71	3.68	0.03	0.08	3.91	0.07	0.20	11.56
2-Ethyltoluene	2.31	3.79	2.24	2.27	0.03	0.04	2.39	0.04	0.12	6.51
1,2,4-Trimethylbenzene	11.09	19.00	15.63	12.03	0.64	0.16	12.06	0.24	1.19	36.22
Decane	6.87	15.15	9.22	7.41	0.14	0.19	1.24	0.28	0.34	55.56
Iso-Butylbenzene	0.19	0.35	0.21	0.20	0.00	0.00	0.15	0.00	0.00	0.83
sec-Butylbenzene	0.26	0.56	0.28	0.25	0.00	0.00	0.17	0.00	0.00	1.34
1,2,3-Trimethylbenzene	2.79	6.23	3.01	3.06	0.00	0.06	2.32	0.09	0.26	9.49
p-Cymene	0.54	2.05	0.65	0.65	0.26	0.00	1.17	0.00	0.49	2.45
1,2-Dichlorobenzene	0.10	0.18	0.14	0.11	0.00	0.00	0.00	0.00	0.00	0.00
Indane	0.92	1.61	0.90	0.94	0.00	0.00	1.19	0.00	0.00	1.51
1,3-Diethylbenzene	0.56	1.57	0.87	0.82	0.00	0.00	0.49	0.00	0.00	1.56
1,4-Diethylbenzene	1.57	5.66	3.17	3.21	0.00	0.00	1.36	0.00	0.21	5.83
n-Butylbenzene	0.46	1.75	0.91	0.91	0.00	0.00	0.37	0.00	0.00	1.86
1,2-Diethylbenzene	0.19	0.47	0.25	0.26	0.00	0.00	0.11	0.00	0.00	0.56
Undecane	8.24	29.89	15.68	15.09	0.15	0.23	1.38	0.53	0.80	55.46
Naphthalene	0.00	6.53	4.81	8.32	0.22	0.50	0.00	0.25	1.13	4.98
Dodecane	8.18	24.60	18.01	21.41	0.21	0.41	0.54	0.87	1.40	43.44
Hexylbenzene	0.00	5.01	7.03	12.43	0.32	1.55	0.00	0.00	2.58	0.00
TOTAL VOC	**1038.54**	**851.07**	**781.08**	**988.61**	**39.30**	**247.76**	**254.05**	**971.96**	**850.89**	**919.44**
Sample Volume (mL)	492.00	511.00	511.00	511.00	494.00	485.00	246.00	495.00	248.00	492.00

Table A-24

Description	pre-ignition	burn	burn	pre-ignition	pre-ignition	burn	burn	burn	burn	burn
VOC CONCENTRATION (µg/m3)	RS-1	RS-1+0	RS-1+8	RS-2	RS-2	RS-2+1	RS-2+1	RS-0+2	RS-0+2	RS-0+2
Compound Location	R/C boat 4	R/C boat 4	R/C boat 4	R/C boat 2	R/C boat 2	R/C boat 2	R/C boat 2	R/C boat 1	R/C boat 1	R/C boat 1
Propene	116.00	3.19	7.21	54.32	15.94	0.35	1.55	1.59	1.23	2.95
Propene	20.76	3.98	3.85	26.80	10.76	2.00	2.75	7.28	5.54	38.37
Freon22 (Chlorodifluoromethane)	2.53	0.00	0.74	2.76	1.96	1.14	1.20	0.61	0.54	0.00
Propyne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloromethane	8.92	1.43	1.53	0.71	2.40	0.85	0.65	0.66	0.70	0.92
Isobutane (2-Methylpropane)	29.16	12.92	11.82	21.11	13.72	8.73	7.25	32.80	36.27	51.05
Freon114 (1,2-Dichlorotetrafluoroethane	4.27	0.61	0.66	2.35	2.53	0.36	0.35	0.56	0.67	0.64
1-Butene/2-Methylpropene	52.68	10.19	9.40	8.72	22.54	3.18	1.11	4.57	4.78	2.40
1,3-Butadiene	2.85	0.44	0.00	0.84	1.36	0.60	0.40	0.82	0.89	0.93
Butane	11.56	11.50	10.76	9.99	7.63	10.13	6.02	76.80	85.46	135.86
t-2-Butene	2.58	2.37	2.15	0.69	1.49	0.93	1.00	1.99	2.14	0.42
2,2-Dimethylpropane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.35	0.54
c-2-Butene	2.83	2.18	2.22	0.62	1.37	0.82	0.82	1.75	1.77	0.31
1-Pentene	11.48	1.87	1.44	0.58	5.62	0.53	0.36	0.61	0.71	0.31
Pentane	14.76	9.26	8.52	14.17	11.43	13.90	5.77	96.00	104.21	164.08
Isoprene (2-Methyl-1,3-Butadiene)	1.66	0.00	0.00	0.38	0.00	0.28	0.00	0.33	0.34	0.28
t-2-Pentene	0.95	1.12	1.41	0.32	0.58	0.91	0.74	1.01	1.14	0.40
c-2-Pentene	1.17	0.93	0.88	0.39	0.00	0.50	0.44	0.83	0.89	0.22
Dichloromethene	17.73	4.57	1.44	33.03	12.53	83.37	81.21	58.78	59.59	1.33
2,2-Dimethylbutane	0.82	0.62	0.58	0.68	0.00	0.77	0.38	2.42	2.62	3.30
Cyclopentane	1.96	1.07	0.90	2.02	1.78	1.82	0.70	11.89	13.05	18.25
2,3-Dimethylbutane	1.97	1.20	0.95	1.73	1.31	1.65	0.68	7.50	8.33	11.97
t-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00
2-Methylpentane	11.40	19.39	6.09	12.57	16.45	12.05	4.71	55.82	61.56	86.14
c-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.23	0.00
3-Methylpentane	12.70	4.46	3.66	14.02	7.16	7.15	2.70	39.58	42.60	54.45
1-Hexene/2-Methyl-1-Pentene	11.52	1.70	1.31	0.00	5.02	0.50	0.30	0.54	0.63	0.38
Hexane	110.97	10.50	8.46	175.94	27.34	19.04	7.96	161.00	176.89	121.24
t-2-Hexene	0.80	0.30	0.26	0.00	0.36	0.23	0.15	0.26	0.30	0.14
t-3-Methyl-2-Pentene	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.19	0.24	0.00
c-2-Hexene	0.74	0.24	0.00	0.00	0.00	0.00	0.00	0.18	0.19	0.00
c-3-Methyl-2-Pentene	0.45	0.34	0.31	0.25	0.00	0.24	0.19	0.25	0.27	0.13
2,2-Dimethylpentane	0.55	0.22	0.00	0.50	0.45	0.36	0.14	1.74	1.95	2.55
1,2-Dichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.34	0.00
Methylcyclopentane	23.15	5.58	4.96	31.40	12.23	10.27	3.43	55.11	62.59	73.38
2,4-Dimethylpentane	1.23	0.64	0.59	1.25	1.13	0.93	0.34	3.99	4.43	6.12
1,1,1-Trichloroethane	2303.25	2.99	1.19	2.62	860.12	0.83	0.82	0.73	0.78	0.75
2,2,3-Trimethylbutane	1.97	0.47	0.95	0.00	0.00	0.14	0.00	0.42	0.46	0.62
Benzene	3.44	1.80	1.54	2.31	2.06	1.95	1.08	3.86	4.21	4.02
Cyclohexane	16.88	4.23	3.73	18.89	11.86	7.80	2.34	34.73	38.00	53.85
2-Methylhexane	3.70	1.78	1.41	3.42	3.55	2.94	0.88	9.88	11.46	16.22
2,3-Dimethylpentane	2.79	1.83	1.14	2.71	0.00	1.82	0.62	8.08	7.08	11.07
Cyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylhexane	10.65	4.17	3.72	9.63	8.60	5.66	1.85	20.06	22.86	33.49
1-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
2,2,4-Trimethylpentane	4.59	1.00	1.02	1.00	1.62	0.51	0.30	0.00		0.00
t-3-Heptene	1.10	0.14	0.35	0.00	1.27	0.00	0.00	0.03		0.00
Heptane	29.08	9.18	8.63	26.22	26.75	14.21	4.41	48.94		75.69
t-2-Heptene	6.53	0.54	0.48	0.00	4.71	0.00	0.00	0.00		0.00
c-2-Heptene	11.26	0.67	0.49	0.00	5.50	0.00	0.00	0.00		0.00
2,2-Dimethylhexane	0.00	0.34	0.00	0.00	0.00	0.00	0.17	0.00		0.00
Methylcyclohexane	38.05	12.42	11.29	38.01	35.12	21.17	6.40	63.65		105.37
2,5-Dimethylhexane	1.31	0.56	0.65	1.13	1.35	0.74	0.26	2.08		2.92
2,4-Dimethylhexane	1.92	0.71	0.69	1.66	1.57	0.94	0.34	2.35		3.81
2,3,4-Trimethylpentane	0.54	0.27	0.27	0.47	0.39	0.26	0.11	0.69		0.92
Toluene	26.74	7.15	6.38	9.97	8.65	5.69	3.34	8.68		8.73
2-Methylheptane	11.45	3.85	4.06	10.29	11.62	5.41	1.85	14.07		19.06
4-Methylheptane	3.81	0.00	1.05	3.32	0.00	1.73	0.57	0.00		5.64
1-Methylcyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
3-Methylheptane	8.70	3.23	2.83	7.78	8.60	4.69	1.70	10.74		15.25
c-1,3-Dimethylcyclohexane	10.32	3.39	2.83	11.73	0.00	4.74	1.54	9.35		16.36
t-1,4-Dimethylcyclohexane	5.11	1.75	1.48	4.83	0.00	2.53	0.81	3.52		9.05
2,2,5-Trimethylhexane	0.21	0.08	0.00	0.15	0.00	0.09	0.00	0.22		0.25
1-Octene	33.82	3.85	1.29	0.00	7.96	0.00	0.00	0.00		0.00
Octane	30.39	8.80	8.21	25.19	27.64	11.66	4.09	22.63		32.89
c-1,4/t-1,3-Dimethylcyclohexane	3.11	0.97	0.88	2.86	2.37	1.32	0.47	2.32		4.03
c-2-Octene	8.20	0.54	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Ethylbenzene	7.42	2.25	2.07	4.20	3.74	2.28	1.34	2.74		2.82
m/p-Xylene	31.74	9.01	8.48	17.44	15.80	7.87	4.67	9.17		9.51
Styrene	1.98	0.32	0.00	0.88	0.00	0.51	0.43	0.22		0.14
o-Xylene	10.89	2.69	2.63	6.24	4.94	2.89	1.76	2.90		2.98
Nonane	45.12	11.84	11.41	31.54	33.42	13.82	6.04	14.64		19.77
iso-Propylbenzene	2.25	0.43	0.37	1.37	0.96	0.51	0.28	0.45		0.60
3,6-Dimethyloctane	2.42	0.00	0.56	3.56	2.72	1.63	0.78	1.20		1.63
n-Propylbenzene	10.19	1.24	1.19	4.31	2.81	1.47	0.88	1.02		1.05
3-Ethyltoluene	25.30	3.12	2.82	14.48	6.12	4.36	2.69	2.88		2.87
4-Ethyltoluene	13.77	1.52	1.40	7.43	2.95	2.18	1.28	1.27		1.27
1,3,5-Trimethylbenzene	18.10	2.39	2.26	11.06	4.96	3.21	1.89	1.77		1.75
2-Ethyltoluene	10.37	1.29	1.14	6.23	2.63	2.18	1.35	1.20		1.20
1,2,4-Trimethylbenzene	63.57	9.38	7.10	38.00	14.13	11.54	7.66	5.57		5.19
Decene	73.21	15.01	14.40	44.99	38.24	20.94	11.24	11.93		14.24
iso-Butylbenzene	1.30	0.20	0.18	0.85	0.52	0.41	0.18	0.17		0.18
sec-Butylbenzene	1.97	0.33	0.29	1.29	0.79	0.62	0.31	0.28		0.32
1,2,3-Trimethylbenzene	16.52	2.38	2.10	10.55	4.94	4.47	2.86	1.90		1.71
p-Cymene	4.62	0.80	0.68	2.28	0.00	1.26	0.69	0.33		0.46
1,2-Dichlorobenzene	0.63	0.00	0.00	0.31	0.00	0.34	0.12	0.00		0.00
Indane	2.69	0.46	0.38	1.69	0.81	0.96	0.58	0.40		0.37
1,3-Diethylbenzene	2.95	0.50	0.45	1.88	1.06	1.30	0.58	0.31		0.27
1,4-Diethylbenzene	11.10	0.00	1.92	5.98	0.00	5.22	3.00	0.00		0.00
n-Butylbenzene	3.37	0.72	0.58	1.82	1.57	1.63	0.81	0.50		0.40
1,2-Diethylbenzene	0.88	0.16	0.00	0.61	0.46	0.90	0.23	0.14		0.13
Undecane	86.77	19.85	14.62	55.42	56.81	30.18	17.71	14.54		13.87
Naphthalene	8.93	2.33	1.17	5.77	5.46	3.59	4.37	1.75		1.00
Dodecane	86.09	21.23	11.59	56.33	56.94	24.07	18.61	15.05		13.02
Hexylbenzene	12.77	0.00	1.43	0.00	34.21	1.68	1.42	0.50		0.00
TOTAL VOC	**3615.96**	**299.49**	**249.90**	**938.86**	**1513.65**	**432.31**	**261.03**	**988.13**	**768.81**	**1298.81**
Sample Volume (mL) :	492.00	502.00	506.00	492.00	520.00	490.00	490.00	520.00	520.00	504.00

Table A-24

Description	pre-ignition	pre-ignition	burn	burn	pre-ignition	burn	pre-ignition	burn	pre-ignition	pre-ignition
VOC CONCENTRATION (µg/m3)	Downwind	Downwind	Downwind	Downwind						
Compound Location	CCG 206	CCG 206	CCG 206	CCG 206	SWG	SWG	Ann Harvey	Ann Harvey	Casaco	Casaco
Propane	1.11	14.49	2.04	2.69	58.50	21.23	7.55	1.64	9.51	17.58
Propane	1.29	1.47	31.66	30.52	0.00	0.00	0.00	0.00	0.00	1.20
Freon22 (Chlorodifluoromethane)	0.00	13.98	0.72	0.00	1.34	0.58	2.74	1.25	3.15	1.29
Propyne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloromethene	1.22	2.60	1.03	1.06	3.08	0.91	2.75	1.00	3.05	2.07
Isobutane (2-Methylpropane)	1.06	2.25	30.44	31.00	0.80	0.00	1.18	0.53	0.49	1.75
Freon114 (1,2-Dichlorotetrafluoroethane	1.18	2.08	0.68	0.79	2.44	0.72	2.56	0.68	1.88	2.46
1-Butene/2-Methylpropene	2.39	17.22	1.82	2.42	25.67	8.01	7.32	5.29	22.16	28.08
1,3-Butadiene	0.00	0.00	0.36	0.36	0.00	0.58	0.00	0.00	0.98	0.00
Butane	2.31	4.95	90.62	92.17	2.24	0.46	2.26	1.04	3.09	2.21
t-2-Butene	0.00	1.32	0.45	0.43	0.00	0.00	0.00	0.36	1.19	1.29
2,2-Dimethylpropane	0.00	0.00	0.35	0.34	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Butene	0.00	1.10	0.35	0.36	1.29	0.34	0.00	0.35	1.35	1.34
1-Pentene	0.28	3.93	0.27	0.32	6.39	1.61	2.54	1.24	4.35	5.91
Pentane	2.14	3.51	91.93	95.00	1.67	0.35	2.04	0.92	1.20	1.21
Isoprene (2-Methyl-1,3-Butadiene)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-2-Pentene	0.00	0.98	0.59	0.59	0.00	0.00	0.00	0.00	0.32	0.00
c-2-Pentene	0.00	0.00	0.33	0.34	0.00	0.00	0.00	0.00	0.00	0.00
Dichloromethane	5.41	16.63	17.89	8.66	2.31	0.85	10.96	25.13	6.00	14.23
2,2-Dimethylbutane	0.00	0.00	2.34	2.41	0.00	0.00	0.00	0.00	0.00	0.00
Cyclopentane	0.00	0.00	9.42	9.52	0.00	0.00	0.00	0.00	0.00	0.00
2,3-Dimethylbutane	0.25	0.45	6.09	6.22	0.00	0.00	0.00	0.00	0.00	0.00
t-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylpentane	1.09	26.75	44.46	45.71	5.88	3.19	0.99	1.26	33.84	61.09
c-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylpentane	0.85	1.33	26.58	26.89	0.37	0.00	1.15	0.50	0.00	0.00
1-Hexene/2-Methyl-1-Pentene	0.00	3.91	0.00	0.00	5.13	1.71	2.46	0.91	3.61	5.84
Hexane	2.77	5.37	55.48	55.04	1.64	0.39	5.54	5.88	3.36	1.49
t-2-Hexene	0.00	0.44	0.22	0.20	0.00	0.00	0.00	0.00	0.00	0.00
t-3-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Hexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-3-Methyl-2-Pentene	0.00	0.00	0.15	0.18	0.00	0.00	0.00	0.00	0.00	0.00
2,2-Dimethylpentane	0.00	0.00	1.10	1.13	0.00	0.00	0.00	0.00	0.00	0.00
1,2-Dichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Methylcyclopentane	0.82	1.23	31.38	32.04	0.00	0.00	1.03	0.85	0.61	0.54
2,4-Dimethylpentane	0.00	0.00	2.50	2.58	0.00	0.00	0.00	0.00	0.00	0.00
1,1,1-Trichloroethane	0.81	0.83	0.68	0.69	3.49	0.94	3.26	3.15	1.10	2.40
2,2,3-Trimethylbutane	0.00	2.19	0.26	0.28	1.33	0.94	0.00	0.00	0.92	2.04
Benzene	0.72	0.76	3.12	3.26	0.75	0.23	1.08	0.43	0.79	0.90
Cyclohexane	0.57	0.80	20.03	20.31	0.00	0.00	0.00	1.68	1.03	0.70
2-Methylhexane	0.00	0.00	6.13	6.33	0.00	0.00	0.00	0.00	0.00	0.00
2,3-Dimethylpentane	0.00	0.00	3.65	3.85	0.00	0.00	0.00	0.00	0.65	0.00
Cyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylhexane	0.00	0.00	11.40	11.60	0.00	0.00	0.00	0.00	1.42	0.00
1-Heptene	0.00	3.62	0.00	0.00	5.65	1.34	1.81	1.06	4.48	0.00
2,2,4-Trimethylpentane	0.20	0.87	0.83	0.87	1.82	0.65	0.00	0.00	1.82	2.15
t-3-Heptene	0.00	1.08	0.00	0.00	2.22	0.55	0.00	0.52	0.95	0.54
Heptane	0.99	1.42	23.92	24.71	1.86	0.38	1.21	0.55	1.79	3.29
t-2-Heptene	0.00	2.75	0.00	0.00	5.95	0.97	0.00	1.18	4.07	1.83
c-2-Heptene	0.00	2.51	0.00	0.00	7.11	0.98	0.00	1.32	5.47	3.24
2,2-Dimethylhexane	0.00	0.00	0.76	0.79	0.00	0.00	0.00	0.00	0.00	0.00
Methylcyclohexane	0.98	0.99	30.57	31.76	0.00	0.00	0.00	0.32	1.51	1.19
2,5-Dimethylhexane	0.00	0.00	0.94	0.93	0.00	0.00	0.00	0.00	0.00	12.50
2,4-Dimethylhexane	0.00	0.00	1.21	1.23	0.00	0.00	0.00	0.00	0.00	0.00
2,3,4-Trimethylpentane	0.00	0.00	0.35	0.36	0.00	0.00	0.00	0.00	0.30	0.00
Toluene	2.09	1.65	9.57	9.98	1.85	0.50	2.86	1.41	3.58	1.89
2-Methylheptane	0.29	0.40	4.93	5.11	0.00	0.00	0.00	0.21	0.94	0.00
4-Methylheptane	0.00	0.00	1.52	1.53	0.00	0.00	0.00	0.00	0.00	0.00
1-Methylcyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylheptane	0.29	7.01	4.39	4.49	0.00	0.00	0.00	0.00	0.00	0.00
c-1,3-Dimethylcyclohexane	0.25	0.00	3.75	3.78	0.00	0.00	0.00	0.00	0.51	0.00
t-1,4-Dimethylcyclohexane	0.00	0.00	1.73	2.03	0.00	0.00	0.00	0.00	0.00	0.00
2,2,5-Trimethylhexane	0.00	0.00	0.10	0.11	0.00	0.00	0.00	0.00	0.00	0.00
1-Octene	0.00	3.30	0.00	0.00	7.43	1.59	1.01	1.31	6.29	7.46
Octane	0.68	0.90	7.57	7.70	1.01	0.19	0.89	0.41	1.06	1.15
c-1,4/t-1,3-Dimethylcyclohexane	0.00	0.00	0.92	0.97	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Octene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ethylbenzene	0.42	0.35	2.40	2.55	0.72	0.17	0.71	0.34	0.64	0.82
m/p-Xylene	1.35	1.23	7.51	7.93	2.83	0.59	2.44	1.15	1.98	2.80
Styrene	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.00
o-Xylene	0.48	0.41	2.46	2.59	0.91	0.21	0.90	0.44	0.75	0.97
Nonane	0.49	1.02	3.19	3.25	3.44	0.36	0.86	0.50	1.72	3.20
iso-Propylbenzene	0.14	0.00	0.23	0.24	0.00	0.00	0.00	0.00	0.26	0.00
3,6-Dimethyloctane	0.00	0.00	0.28	0.34	0.00	0.00	0.00	0.00	0.00	0.00
n-Propylbenzene	0.10	0.64	0.52	0.54	0.80	0.44	0.67	0.40	0.87	0.71
3-Ethyltoluene	0.25	0.33	1.42	1.61	0.87	0.19	1.47	0.74	0.80	0.86
4-Ethyltoluene	0.14	0.26	0.57	0.72	0.46	0.28	0.98	0.37	0.41	0.47
1,3,5-Trimethylbenzene	0.22	0.41	0.49	0.69	0.70	0.17	1.13	0.51	0.58	0.63
2-Ethyltoluene	0.16	0.25	0.58	0.66	0.36	0.16	0.91	0.37	0.38	0.47
1,2,4-Trimethylbenzene	0.64	0.76	1.75	2.27	19.70	0.58	3.76	6.52	9.25	4.63
Decane	0.56	0.84	1.19	1.50	3.32	0.42	1.27	0.97	2.36	3.34
iso-Butylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00
sec-Butylbenzene	0.00	0.00	0.07	0.09	0.00	0.11	0.37	0.00	0.00	0.00
1,2,3-Trimethylbenzene	0.22	0.33	0.44	0.56	0.78	0.25	1.29	0.56	0.65	0.78
p-Cymene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,2-Dichlorobenzene	0.00	0.00	0.00	0.00	0.00	0.37	0.83	0.00	0.00	0.00
Indane	0.00	0.00	0.18	0.22	0.00	0.18	0.51	0.13	0.00	0.00
1,3-Diethylbenzene	0.00	0.00	0.00	0.22	0.00	0.22	0.63	0.00	0.00	0.00
1,4-Diethylbenzene	0.00	0.66	0.00	0.27	0.00	0.55	1.57	0.57	0.72	0.00
n-Butylbenzene	0.00	0.00	0.00	0.11	0.00	0.31	0.00	0.00	0.00	0.00
1,2-Diethylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.00	0.00
Undecane	0.77	1.25	1.02	1.31	4.94	0.44	1.58	1.75	3.01	2.42
Naphthalene	0.00	4.86	0.00	0.70	2.80	0.00	0.00	1.86	1.12	0.00
Dodecane	1.14	4.42	0.83	1.80	11.81	0.74	1.63	3.97	1.80	1.17
Hexylbenzene	0.00	2.15	0.51	3.75	0.00	0.00	0.00	4.63	0.00	0.00
TOTAL VOC	**39.11**	**177.23**	**615.20**	**625.82**	**213.65**	**56.94**	**89.91**	**88.19**	**166.13**	**234.15**
Sample Volume (mL) :	485.00	485.00	494.00	494.00	507.00	507.00	490.00	490.00	507.00	502.00

Table A-24

Description	burn	burn	pre-ignition	pre-ignition	burn	pre-ignition	burn	pre-ignition	pre-ignition	burn
VOC CONCENTRATION (µg/m3)										
Compound Location	Casaco	Casaco	CCG 203	CCG 203	CCG 203	CCG 204	CCG 204	CCG 212	CCG 212	CCG 212
Propene	0.76	3.75	53.59	77.55	7.53	0.00	2.68	51.77	167.72	23.06
Propane	0.00	0.00	7.97	0.32	0.00	0.00	0.98	0.00	0.00	0.00
Freon22 (Chlorodifluoromethane)	0.49	0.41	0.57	0.36	0.33	0.72	0.62	6.62	7.26	0.62
Propyne	0.00	0.00	2.02	1.64	0.00	0.00	0.00	0.00	0.00	0.00
Chloromethane	1.43	1.08	1.36	0.99	0.96	1.65	1.37	4.12	3.95	1.15
Isobutene (2-Methylpropene)	2.72	0.53	59.03	60.28	10.58	1.24	0.38	6.19	6.61	0.38
Freon114 (1,2-Dichlorotetrafluoroethane	0.98	0.54	1.36	1.42	0.78	1.83	0.46	0.88	2.06	0.61
1-Butene/2-Methylpropene	3.71	5.96	53.36	56.02	7.41	16.03	5.64	17.28	5.25	7.13
1,3-Butadiene	0.00	0.00	17.59	16.26	2.17	0.91	0.45	1.18	0.00	0.60
Butane	2.27	1.31	115.37	121.16	19.43	2.52	1.07	10.90	11.33	0.89
t-2-Butene	0.28	0.46	15.54	15.45	2.75	0.85	0.93	2.96	3.28	0.40
2,2-Dimethylpropane	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Butene	0.27	0.38	13.74	14.22	2.56	0.84	1.15	2.82	2.92	0.52
1-Pentene	0.34	1.56	10.82	10.95	1.55	3.38	0.73	3.95	4.01	1.33
Pentane	1.63	1.37	175.35	182.22	27.68	2.22	0.77	8.53	9.72	1.01
Isoprene (2-Methyl-1,3-Butadiene)	0.00	0.00	11.45	11.76	1.67	0.00	0.00	0.84	0.00	0.00
t-2-Pentene	0.15	0.36	21.21	22.09	3.33	0.39	0.12	1.41	3.11	0.12
c-2-Pentene	0.00	0.00	18.96	18.96	2.85	0.00	0.00	1.65	1.60	0.00
Dichloromethane	4.97	11.64	18.13	18.99	3.31	3.33	1.34	214.32	278.16	3.14
2,2-Dimethylbutane	0.00	0.00	34.18	35.79	3.61	0.00	0.00	0.00	0.00	0.00
Cyclopentane	0.21	0.00	25.08	26.41	4.01	0.00	0.00	0.89	1.06	0.00
2,3-Dimethylbutane	0.28	0.29	45.52	46.81	5.44	0.38	0.12	0.68	0.84	0.13
t-4-Methyl-2-Pentene	0.00	0.00	1.65	1.59	0.24	0.00	0.00	0.00	0.00	0.00
2-Methylpentane	2.55	3.38	177.19	182.64	24.60	26.36	14.49	5.03	5.92	2.06
c-4-Methyl-2-Pentene	0.00	0.00	8.13	8.56	1.34	0.00	0.00	0.00	0.00	0.00
3-Methylpentane	1.33	0.74	130.30	132.44	15.57	0.00	0.34	3.21	3.77	0.51
1-Hexene/2-Methyl-1-Pentene	0.00	1.51	13.96	14.18	2.13	2.80	0.54	3.03	2.92	1.25
Hexane	1.32	3.14	416.99	435.72	23.76	2.47	4.76	25.36	30.46	1.76
t-2-Hexene	0.00	0.21	9.65	10.38	1.48	0.00	0.08	0.60	0.96	0.00
t-3-Methyl-2-Pentene	0.00	0.00	10.29	10.07	1.43	0.00	0.00	0.00	0.00	0.00
c-2-Hexene	0.00	0.00	6.53	6.54	1.06	0.00	0.00	0.00	0.00	0.00
c-3-Methyl-2-Pentene	0.00	0.00	13.21	13.50	1.95	0.00	0.00	0.49	1.03	0.00
2,2-Dimethylpentane	0.00	0.00	5.68	6.03	0.63	0.00	0.00	0.00	0.00	0.00
1,2-Dichloroethane	0.00	0.00	0.66	0.64	0.00	0.00	0.00	0.00	0.00	0.00
Methylcyclopentane	0.84	0.95	120.28	124.48	12.11	0.82	0.23	4.31	5.28	0.79
2,4-Dimethylpentane	0.16	0.00	20.23	20.94	2.38	0.00	0.00	0.38	0.00	0.00
1,1,1-Trichloroethane	1.40	1.19	0.97	1.00	1.01	1.25	0.78	1.88	1.96	0.77
2,2,3-Trimethylbutane	0.00	0.00	1.47	1.47	0.22	0.86	0.29	0.62	0.67	0.28
Benzene	0.96	0.86	62.08	64.78	15.00	1.16	0.34	3.90	4.54	0.39
Cyclohexane	0.76	1.24	33.79	35.06	4.38	0.58	0.13	1.27	1.95	0.87
2-Methylhexane	0.32	0.30	37.15	39.86	4.61	0.00	0.00	0.56	0.00	0.27
2,3-Dimethylpentane	0.42	0.29	31.85	32.47	3.77	0.00	0.00	0.53	0.00	0.19
Cyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylhexane	1.05	1.19	72.64	74.47	8.67	1.26	0.46	1.13	1.38	0.58
1-Heptene	0.00	2.03	0.00	0.00	0.00	3.53	1.94	3.35	0.00	2.70
2,2,4-Trimethylpentane	0.28	0.00	22.67	23.18	2.42	0.98	0.00	6.38	7.25	0.40
t-3-Heptene	0.00	0.60	1.17	1.29	0.18	0.85	0.18	0.68	1.98	0.28
Heptane	1.17	1.67	57.86	59.82	6.79	1.47	0.39	1.99	2.09	1.82
t-2-Heptene	0.00	1.21	4.05	4.44	0.64	3.18	0.69	3.14	4.21	1.29
c-2-Heptene	0.00	1.01	0.00	0.00	0.89	3.48	0.75	3.99	2.55	1.87
2,2-Dimethylhexane	0.00	0.00	2.50	2.56	0.30	0.00	0.00	0.00	0.00	0.00
Methylcyclohexane	1.64	1.49	34.13	34.85	4.55	0.82	0.14	0.72	0.81	2.18
2,5-Dimethylhexane	0.00	0.00	9.65	10.17	1.09	0.36	0.00	0.00	0.00	0.00
2,4-Dimethylhexane	0.00	0.00	12.22	12.29	1.37	0.00	0.00	0.00	0.00	0.00
2,3,4-Trimethylpentane	0.00	0.00	10.76	11.33	1.07	0.00	0.00	0.00	0.00	0.00
Toluene	2.72	2.81	191.91	196.32	43.42	2.72	0.74	15.81	19.08	1.12
2-Methylheptane	0.53	0.92	28.00	28.40	3.15	0.93	0.00	0.50	0.64	0.88
4-Methylheptane	0.00	0.00	12.16	12.58	1.42	0.00	0.00	0.17	0.00	0.24
1-Methylcyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylheptane	0.47	0.48	43.43	44.08	4.63	0.37	0.11	0.60	0.61	0.58
c-1,3-Dimethylcyclohexane	0.39	0.39	6.41	7.20	0.80	0.37	0.00	0.00	0.00	0.62
t-1,4-Dimethylcyclohexane	0.00	0.00	2.63	2.42	0.42	0.00	0.00	0.00	0.00	0.31
2,2,5-Trimethylhexane	0.00	0.00	3.67	3.63	0.32	0.00	0.00	0.00	0.00	0.00
1-Octene	0.00	1.98	0.00	0.00	0.00	3.95	0.40	3.48	1.49	1.94
Octane	0.78	0.96	21.00	21.59	2.33	0.80	0.21	0.95	1.01	1.61
c-1,4/t-1,3-Dimethylcyclohexane	0.00	0.00	4.18	4.23	0.60	0.00	0.00	0.00	0.00	0.00
c-2-Octene	0.00	0.00	4.28	3.82	0.00	0.00	0.00	0.00	0.00	0.00
Ethylbenzene	0.75	0.73	52.77	52.90	10.90	0.67	0.23	2.26	2.70	0.48
m/p-Xylene	2.16	2.12	163.18	164.72	34.17	2.16	0.74	7.45	8.96	1.87
Styrene	0.00	0.00	3.69	3.60	0.50	0.00	0.10	0.00	0.96	0.00
o-Xylene	0.81	0.78	55.17	54.80	11.86	0.73	0.24	2.36	2.70	0.70
Nonane	0.97	1.23	9.42	9.49	1.30	0.99	0.23	1.16	1.32	1.95
iso-Propylbenzene	0.14	0.14	3.40	3.43	0.67	0.18	0.05	0.00	0.00	0.12
3,8-Dimethyloctane	0.00	0.00	2.00	2.03	0.28	0.00	0.00	0.00	0.00	0.00
n-Propylbenzene	0.32	0.49	13.73	13.80	2.48	0.60	0.17	0.59	0.75	0.54
3-Ethyltoluene	0.58	0.71	46.66	47.11	8.85	0.72	0.24	1.10	1.62	1.02
4-Ethyltoluene	0.30	0.34	22.90	22.99	3.88	0.37	0.13	0.52	0.80	0.47
1,3,5-Trimethylbenzene	0.24	0.42	24.39	24.38	3.97	0.46	0.15	0.67	0.90	0.69
2-Ethyltoluene	0.31	0.33	16.72	16.69	3.21	0.33	0.11	0.46	0.64	0.42
1,2,4-Trimethylbenzene	0.97	1.91	75.38	73.76	13.63	6.53	2.32	2.19	15.55	3.47
Decane	0.88	1.22	6.24	6.66	0.97	1.29	0.32	1.43	1.86	2.30
iso-Butylbenzene	0.00	0.00	1.12	1.12	0.17	0.00	0.00	0.00	0.00	0.00
sec-Butylbenzene	0.11	0.09	1.07	1.06	0.19	0.00	0.00	0.00	0.00	0.09
1,2,3-Trimethylbenzene	0.33	0.43	15.62	14.95	2.84	0.46	0.17	0.60	0.87	0.62
p-Cymene	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00
1,2-Dichlorobenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Indane	0.11	0.12	7.70	7.81	1.36	0.00	0.00	0.00	0.00	0.22
1,3-Diethylbenzene	0.00	0.00	4.36	4.07	0.66	0.00	0.00	0.00	0.00	0.18
1,4-Diethylbenzene	0.21	0.00	22.76	21.54	0.00	0.00	0.00	0.00	0.78	0.60
n-Butylbenzene	0.00	0.00	3.02	2.92	0.38	0.00	0.00	0.00	0.00	0.21
1,2-Diethylbenzene	0.00	0.00	0.96	0.87	0.19	0.00	0.00	0.00	0.00	0.00
Undecane	0.59	0.94	4.40	4.76	1.13	1.98	0.58	1.56	1.90	2.99
Naphthalene	0.00	0.00	12.11	11.76	3.81	0.00	1.16	0.00	1.19	0.00
Dodecane	0.85	1.40	4.77	3.61	1.23	4.28	1.47	1.44	1.81	3.43
Hexylbenzene	0.00	3.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL VOC	**50.21**	**77.40**	**2923.09**	**3012.24**	**419.31**	**119.44**	**55.59**	**454.88**	**656.72**	**91.04**
Sample Volume (mL) :	495.00	490.00	490.00	490.00	490.00	495.00	502.00	502.00	495.00	502.00

Table A-24

Description	burn	pre-ignition	burn	background	pre-ignition	burn	burn	background	burn	burn
VOC CONCENTRATION (µg/m3)				R/C H1-CA	R/C H1-CA	R/C H1-CA	R/C H1-CA	R/C H2-CA	R/C H2-CA	R/C H2-CA
Compound Location	CCG 212	CCG 214	CCG 214							
Propene	30.81	0.00	175.41	125.49	16.57	0.87		22.79	38.57	19.76
Propane	0.00	0.00	0.00	2.56	2.44	60.86	0.00	3.75	9.69	0.59
Freon22 (Chlorodifluoromethane)	1.45	0.78	2.05	0.74	0.56	0.26	0.00	0.33	0.49	0.61
Propyne	0.00	0.00	0.00	4.73	0.22	0.00	0.00	0.18	0.35	0.00
Chloromethane	1.10	1.52	2.58	0.79	1.35	0.73	1.73	0.77	0.79	0.63
Isobutane (2-Methylpropane)	0.57	0.41	1.36	3.87	7.62	83.63	4.00	1.79	8.45	1.07
Freon114 (1,2-Dichlorotetrafluoroethane	0.67	0.38	2.80	1.03	0.53	0.37	0.46	0.39	0.48	0.46
1-Butene/2-Methylpropene	7.37	5.42	30.38	10.28	8.34	3.45	10.63	5.85	3.34	3.14
1,3-Butadiene	0.60	0.35	1.85	8.87	1.29	1.48	1.09	0.63	0.30	0.22
Butane	1.01	0.94	2.18	6.90	15.33	251.59	9.67	4.26	26.17	3.23
t-2-Butene	0.51	0.46	1.11	1.19	0.00	0.23	1.85	0.47	0.26	0.21
2,2-Dimethylpropane	0.00	0.00	0.00	0.00	0.00	1.02	0.00	0.00	0.12	0.00
c-2-Butene	0.50	0.71	1.41	1.31	1.96	0.29	2.79	0.72	0.38	0.36
1-Pentene	1.34	0.95	5.41	1.47	1.03	0.68	0.51	0.67	0.46	0.37
Pentane	1.25	1.22	2.06	8.56	15.91	260.28	11.77	6.11	27.36	3.61
Isoprene (2-Methyl-1,3-Butadiene)	0.00	0.17	0.76	0.76	0.76	0.46	0.40	0.35	0.17	0.19
t-2-Pentene	0.00	0.07	0.37	0.83	1.44	0.16	0.17	0.47	0.47	0.11
c-2-Pentene	0.00	0.11	0.52	1.29	1.27	0.21	0.00	0.42	0.31	0.09
Dichloromethane	2.44	1.35	7.56	0.67	0.52	0.93	1.79	1.12	2.30	6.65
2,2-Dimethylbutane	0.00	0.09	0.00	1.59	2.41	5.14	0.24	0.80	1.25	0.14
Cyclopentane	0.00	0.16	0.00	1.20	1.75	27.90	1.13	0.91	2.72	0.40
2,3-Dimethylbutane	0.00	0.16	0.18	2.00	3.13	18.18	0.57	1.08	2.30	0.32
t-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00
2-Methylpentane	3.68	2.39	12.40	9.64	16.54	125.93	7.80	5.16	17.54	2.42
c-4-Methyl-2-Pentene	0.00	0.00	0.00	0.37	0.43	0.00	0.00	0.15	0.11	0.00
3-Methylpentane	0.60	0.78	0.76	5.71	9.35	81.46	5.03	3.93	9.08	4.60
1-Hexene/2-Methyl-1-Pentene	1.21	0.98	6.00	3.53	1.30	0.99	0.00	1.06	0.55	0.55
Hexane	2.02	1.97	2.46	6.05	11.66	182.19	91.60	11.69	22.81	90.62
t-2-Hexene	0.00	0.06	0.26	0.39	0.58	0.00	0.12	0.28	0.27	0.08
t-3-Methyl-2-Pentene	0.00	0.00	0.00	0.50	0.65	0.00	0.36	0.26	0.22	0.08
c-2-Hexene	0.00	0.07	0.23	0.32	0.52	0.00	0.00	0.22	0.18	0.06
c-3-Methyl-2-Pentene	0.00	0.04	0.17	0.66	0.80	0.00	0.43	0.32	0.28	0.11
2,2-Dimethylpentane	0.00	0.06	0.00	0.26	0.45	3.90	0.00	0.19	0.41	0.07
1,2-Dichloroethane	0.00	0.00	0.00	0.00	0.00	0.64	0.00	0.00	0.00	0.09
Methylcyclopentane	0.86	1.18	0.80	3.81	6.69	109.29	11.21	4.74	10.32	10.80
2,4-Dimethylpentane	0.00	0.15	0.00	0.86	1.53	8.67	0.33	0.56	1.07	0.18
1,1,1-Trichloroethane	0.78	0.80	0.95	0.49	0.64	0.56	1.74	0.63	0.59	0.35
2,2,3-Trimethylbutane	0.35	0.31	1.86	0.18	0.43	0.95	0.28	0.43	0.40	0.42
Benzene	0.47	0.38	0.70	9.25	2.17	6.32	1.03	3.33	2.72	0.97
Cyclohexane	1.03	1.00	0.72	1.59	3.14	76.15	2.39	2.46	8.60	2.62
2-Methylhexane	0.33	0.47	0.24	1.94	2.47	0.00	0.88	1.47	2.18	0.49
2,3-Dimethylpentane	0.00	0.30	0.00	1.43	2.48	14.24	0.49	1.08	1.82	0.37
Cyclohexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylhexane	0.62	1.09	0.62	3.47	5.95	44.61	1.86	3.15	5.00	1.25
1-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,2,4-Trimethylpentane	0.00	0.41	0.00	1.13	1.73	2.27	0.34	0.71	0.94	0.30
t-3-Heptene	0.81	0.11	0.72	0.05	0.06	0.07	0.09	0.13	0.13	0.04
Heptane	1.99	2.73	2.59	2.77	6.39	97.08	5.04	4.97	8.63	2.29
t-2-Heptene	1.59	0.45	3.00	0.21	0.32	0.18	0.25	0.29	0.33	0.17
c-2-Heptene	0.88	1.15	4.91	0.00		0.00	0.00	0.45	0.00	0.00
2,2-Dimethylhexane	0.00	0.10	0.00	0.14	0.23	3.42	0.00	0.00	0.28	0.00
Methylcyclohexane	2.45	3.64	1.78	1.57	5.11	139.36	3.87	4.94	10.16	2.21
2,5-Dimethylhexane	0.00	0.19	0.00	0.46	0.72	3.56	0.15	0.38	0.51	0.14
2,4-Dimethylhexane	0.00	0.25	0.00	0.61	1.08	5.19	0.00	0.58	0.78	0.22
2,3,4-Trimethylpentane	0.00	0.12	0.14	0.49	0.76	0.95	0.00	0.29	0.47	0.11
Toluene	1.70	2.69	2.03	11.55	7.57	12.12	10.85	25.81	58.45	35.35
2-Methylheptane	1.40	1.28	0.77	1.20	2.15	21.99	0.97	1.91	2.23	0.73
4-Methylheptane	0.00	0.42	0.00	0.00	1.09	0.00	0.00	0.73	0.92	0.32
1-Methylcyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.06	0.00	10.76
3-Methylheptane	0.67	1.11	0.50	1.83	3.02	17.36	0.85	2.26	2.65	0.82
c-1,3-Dimethylcyclohexane	0.70	0.98	0.65	0.24	0.90	20.26	0.69	1.00	1.74	0.40
t-1,4-Dimethylcyclohexane	0.34	0.53	0.28	0.00	0.40	11.52	0.27	0.45	0.71	0.20
2,2,5-Trimethylhexane	0.00	0.06	0.00	0.19	0.22	0.24	0.00	0.15	0.29	0.07
t-Octene	0.88	3.96	12.75	1.29	0.84	0.00	0.00	1.00	0.19	0.63
Octane	1.76	2.82	1.82	0.96	2.14	34.40	2.27	3.14	3.66	1.20
c-1,4/t-1,3-Dimethylcyclohexane	0.00	0.31	0.25	0.21	0.47	4.88	0.17	0.36	0.58	0.16
c-2-Octene	0.00	0.54	2.27	0.00	0.39	0.00	0.00	0.00	0.32	0.00
Ethylbenzene	0.60	1.49	0.64	2.86	2.07	2.59	2.53	5.41	4.71	2.65
m/p-Xylene	2.28	5.60	2.20	9.55	6.38	8.67	9.59	17.60	14.92	8.67
Styrene	0.31	0.08	0.00	0.48	0.25	0.62	1.53	0.55	0.29	0.30
o-Xylene	0.83	2.04	0.81	3.08	2.08	2.53	3.19	6.19	5.26	3.08
Nonane	2.11	3.64	3.04	0.55	1.17	14.37	2.82	2.69	3.34	1.21
iso-Propylbenzene	0.13	0.25	0.19	0.19	0.18	0.51	0.46	14.47	0.42	0.31
3,6-Dimethyloctane	0.00	0.00	0.23	0.00	0.00	1.39	0.62	0.19	0.47	0.10
n-Propylbenzene	0.59	0.92	1.18	0.66	0.72	0.87	1.16	2.07	1.51	1.05
3-Ethyltoluene	1.23	2.37	1.21	2.08	1.99	2.20	3.45	6.36	4.29	2.83
4-Ethyltoluene	0.61	1.14	0.64	0.95	0.98	0.99	1.74	3.16	2.02	1.34
1,3,5-Trimethylbenzene	0.82	1.47	1.04	1.04	1.08	1.51	2.19	3.43	2.44	1.59
2-Ethyltoluene	0.50	0.96	0.68	0.68	0.70	0.90	1.49	2.18	1.57	1.01
1,2,4-Trimethylbenzene	7.88	4.79	5.41	3.23	3.42	4.38	8.87	11.63	7.66	5.14
Decane	2.79	5.39	4.71	0.58	0.78	8.33	8.34	3.73	4.30	2.46
iso-Butylbenzene	0.00	0.12	0.00	0.08	0.09	0.13	0.19	0.19	0.13	0.10
sec-Butylbenzene	0.11	0.21	0.22	0.09	0.09	0.25	0.39	0.23	0.22	0.13
1,2,3-Trimethylbenzene	0.76	1.40	1.23	0.68	0.76	1.45	3.06	2.84	1.93	1.30
p-Cymene	0.00	0.44	0.00	0.00	0.77	0.00	2.60	0.42	0.77	0.44
1,2-Dichlorobenzene	0.00	0.06	0.00	0.00	0.19	0.00	0.00	0.07	0.07	0.06
Indane	0.27	0.45	0.29	0.30	0.37	0.30	0.71	1.20	0.68	0.47
1,3-Diethylbenzene	0.21	0.41	0.26	0.23	0.27	0.26	0.60	0.70	0.36	0.25
1,4-Diethylbenzene	0.00	1.69	1.05	1.00	0.71	1.62	0.00	2.45	1.07	0.89
n-Butylbenzene	0.28	0.56	0.49	0.24	0.26	0.40	0.71	0.70	0.36	0.30
1,2-Diethylbenzene	0.00	0.15	0.00	0.00	0.13	0.00	0.25	0.18	0.14	0.08
Undecane	3.22	10.97	9.83	0.55	0.96	7.20	7.95	4.05	3.29	2.15
Naphthalene	0.61	2.47	0.00	2.03	1.49	1.42	1.24	1.84	0.00	0.69
Dodecane	2.24	17.17	10.67	1.55	1.97	5.57	1.70	1.62	2.84	0.87
Hexylbenzene	0.00	8.55	0.00	6.31	2.47	3.90	0.00	0.00	0.00	0.00
TOTAL VOC	**105.15**	**125.92**	**346.66**	**300.46**	**220.36**	**1821.84**	**267.57**	**255.76**	**369.90**	**253.87**
Sample Volume (mL):	495.00	511.00	511.00	249.00	246.00	248.00	256.00	270.00	246.00	270.00

Table A-24

Description	backg (8:27)	backg (8:27)	backg (8:40)	backg (8:40)	burn (10:39)	burn (10:56)	burn (10:56)	burn (11:08)	(11:27)
VOC CONCENTRATION (µg/m3)	Convair	Convair	Convair	Convair	Convair/plume	Convair	Convair	Convair	Convair/plume
Compound Location					1ml DW/100ß'	above clouds	above clouds	above clouds	3ml DW
Propene	0.00	0.00	17.11	6.58	1.06	18.61	2.75	9.26	33.15
Propane	0.00	0.00	0.00	0.00	14.23	0.00	0.12	5.67	2.44
Freon22 (Chlorodifluoromethane)	0.31	0.20	0.54	0.20	0.16	0.69	0.40	0.00	0.59
Propyne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloromethane	0.94	0.71	0.83	0.43	0.53	0.85	0.91	0.86	0.49
Isobutane (2-Methylpropane)	0.24	0.00	0.20	0.00	9.81	0.43	0.29	5.08	2.27
Freon114 (1,2-Dichlorotetrafluoroethane	0.23	0.20	0.00	0.35	0.21	0.22	0.34	0.24	0.22
1-Butene/2-Methylpropene	0.41	0.39	0.68	0.36	1.01	0.82	0.67	1.57	1.12
1,3-Butadiene	0.00	0.00	0.00	0.00	0.41	0.30	0.27	0.53	0.30
Butane	1.47	1.35	0.62	0.70	47.25	1.19	1.45	16.39	7.84
t-2-Butene	0.00	0.00	0.00	0.00	0.21	0.00	0.05	0.12	0.51
2,2-Dimethylpropane	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00
c-2-Butene	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.40
1-Pentene	0.00	0.00	0.00	0.00	0.19	0.00	0.11	0.00	0.22
Pentane	0.22	0.19	0.12	0.00	53.72	1.12	1.16	15.65	7.83
Isoprene (2-Methyl-1,3-Butadiene)	0.21	0.20	0.00	0.00	0.16	0.21	0.23	0.16	0.00
t-2-Pentene	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.40
c-2-Pentene	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.47
Dichloromethane			539.32	547.66	350.77	639.76	655.31	387.66	421.27
2,2-Dimethylbutane	0.00	0.00	0.00	0.00	1.36	0.00	0.07	0.27	0.14
Cyclopentane	0.06	0.06	0.00	0.00	5.58	0.17	0.19	1.42	0.74
2,3-Dimethylbutane	1.17	1.14	0.48	0.54	3.94	0.57	0.58	1.17	1.22
1-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylpentane	0.61	0.54	0.27	0.29	24.18	1.04	1.07	6.61	3.66
c-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylpentane	0.41	0.30	0.15	0.20	14.77	0.73	0.75	3.84	2.20
1-Hexene/2-Methyl-1-Pentene	0.00	0.00	0.00	0.00	0.18	0.00	0.13	0.37	0.45
Hexane	1.00	0.39	0.14	0.21	28.39	1.43	1.37	8.33	5.25
t-2-Hexene	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.16
t-3-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.23
c-2-Hexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
c-3-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.15	0.07	0.00	0.24	0.31
2,2-Dimethylpentane	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.15	0.07
1,2-Dichloroethane	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00
Methylcyclopentane	0.14	0.06	0.00	0.00	17.28	0.94	0.96	4.67	2.28
2,4-Dimethylpentane	1.29	1.20	0.58	0.62	1.76	0.81	0.62	0.72	1.05
1,1,1-Trichloroethane	0.73	0.68	0.72	0.79	0.69	0.93	0.76	0.75	1.05
2,2,3-Trimethylbutane	0.05	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00
Benzene	0.13	0.12	0.13	0.13	5.45	2.71	2.57	5.58	3.16
Cyclohexane	0.08	0.12	0.00	0.00	11.33	0.82	0.77	2.89	1.22
2-Methylhexane	0.07	0.07	0.00	0.00	3.14	0.32	0.27	0.78	0.57
2,3-Dimethylpentane	0.72	0.72	0.34	0.39	2.35	0.49	0.49	0.70	0.77
Cyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylhexane	0.20	0.09	0.00	0.00	5.91	0.56	0.59	1.60	1.01
1-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,2,4-Trimethylpentane	15.12	14.67	7.61	8.64	4.27	7.02	7.15	5.53	11.83
t-3-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heptane	0.08	0.04	0.02	0.02	11.56	1.46	1.47	3.15	1.56
t-2-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,2-Dimethylhexane	0.00	0.00	0.00	0.00	0.35	0.06	0.00	0.00	0.05
Methylcyclohexane	0.07	0.02	0.00	0.00	15.15	2.38	2.43	4.42	1.81
2,5-Dimethylhexane	1.98	1.93	1.02	1.10	1.10	1.02	1.01	0.83	1.57
2,4-Dimethylhexane	2.38	2.37	1.36	1.45	1.39	1.34	1.34	1.08	2.11
2,3,4-Trimethylpentane	5.19	5.12	2.82	3.07	1.80	2.63	2.62	1.94	3.93
Toluene	11.38	10.97	7.08	8.07	9.77	8.35	7.24	4.61	11.65
2-Methylheptane	0.09	0.07	0.00	0.00	2.19	0.54	0.55	0.57	0.37
4-Methylheptane	0.00	0.00	0.00	0.00	0.72	0.00	0.18	0.00	0.00
1-Methylcyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylheptane	0.08	0.07	0.06	0.06	1.94	0.47	0.48	0.47	0.34
c-1,3-Dimethylcyclohexane	0.00	0.00	0.00	0.00	1.61	0.47	0.50	0.50	0.24
t-1,4-Dimethylcyclohexane	0.00	0.00	0.00	0.00	0.85	0.22	0.26	0.25	0.12
2,2,5-Trimethylhexane	2.05	1.91	1.26	1.39	0.68	1.10	1.09	0.81	1.60
1-Octene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Octane	0.09	0.07	0.02	0.02	3.02	0.97	1.02	0.84	0.45
c-1,4/t-1,3-Dimethylcyclohexane	0.00	0.00	0.00	0.00	0.39	0.14	0.15	0.12	0.00
c-2-Octene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ethylbenzene	0.33	0.25	0.50	0.37	1.01	0.67	0.32	0.40	0.72
m/p-Xylene	0.34	0.29	0.29	0.45	2.72	0.81	0.83	0.49	1.60
Styrene	21.00	20.92	16.18	17.57	22.65	21.05	25.17	9.90	19.78
o-Xylene	0.11	0.11	0.10	0.14	0.85	0.29	0.30	0.17	0.45
Nonane	0.16	0.08	0.00	0.00	1.03	0.65	0.67	0.35	0.26
iso-Propylbenzene	0.00	0.00	0.00	0.00	0.08	0.05	0.06	0.00	0.04
3,6-Dimethyloctane	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00
n-Propylbenzene	0.00	0.00	0.00	0.00	0.19	0.10	0.06	0.06	0.00
3-Ethyltoluene	0.09	0.06	0.07	0.09	0.44	0.23	0.23	0.10	0.21
4-Ethyltoluene	0.05	0.03	0.05	0.00	0.20	0.11	0.17	0.05	0.10
1,3,5-Trimethylbenzene	0.06	0.04	0.06	0.08	0.24	0.14	0.18	0.07	0.12
2-Ethyltoluene	0.04	0.02	0.03	0.04	0.17	0.10	0.12	0.04	0.08
1,2,4-Trimethylbenzene	0.31	0.14	0.23	0.23	0.66	0.51	0.58	0.44	0.40
Decane	0.24	0.12	0.10	0.00	0.57	0.66	0.52	0.26	0.33
iso-Butylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00
sec-Butylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00
1,2,3-Trimethylbenzene	0.08	0.05	0.07	0.00	0.18	0.17	0.23	0.09	0.12
p-Cymene	0.15	0.00	0.00	0.00	0.00	0.21	0.37	0.00	0.27
1,2-Dichlorobenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00
Indane	0.00	0.00	0.00	0.00	0.06	0.06	0.10	0.00	0.00
1,3-Diethylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00
1,4-Diethylbenzene	0.09	0.00	0.00	0.00	0.16	0.09	0.21	0.00	0.11
n-Butylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,2-Diethylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00
Undecane	0.34	0.26	0.08	0.00	0.57	0.88	0.69	0.48	0.51
Naphthalene	0.68	0.60	0.12	0.00	1.21	0.57	0.00	0.86	0.46
Dodecane	0.68	0.78	0.30	0.00	1.54	0.87	1.17	0.77	0.72
Hexylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL VOC	**73.94**	**69.74**	**801.88**	**602.23**	**699.53**	**732.02**	**735.28**	**523.13**	**569.07**
Sample Volume (mL) :	494.00	504.00	497.00	248.00	504.00	497.00	246.00	511.00	497.00

Table A-24

Description	burn (11:27)	burn (11:43)	pre-ignition	pre-ignition	pre-ignition	pre-ignition	burn	burn	burn
VOC CONCENTRATION (µg/m3)	Convair/plume	Convair/plume	RS-1	RS-1	RS-1	RS-1	RS-1	RS-1	RS-1
Compound Location	3ml DW	20ml DW	R/C boat 1	R/C boat 1	R/C boat 1	R/C boat 1	R/C boat 1	R/C boat 1	R/C boat 1
Propene	4.00	0.00	4.82	0.00	4.66	13.02	11.76	0.00	8.64
Propane	0.00	0.00	38.16	67.10	35.11	2463.76	143.09	428.94	231.58
Freon22 (Chlorodifluoromethane)	0.28	0.33	0.91		1.00	2.35	0.37		0.35
Propyne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloromethane	0.40	0.94	1.40	0.00	1.52	3.04	0.58	0.00	2.53
Isobutane (2-Methylpropane)	2.59	0.43	49.10	52.73	45.95	3931.81	413.18	547.67	526.05
Freon114 (1,2-Dichlorotetrafluoroethane	0.48	0.22	0.38	0.00	0.37	5.02	0.72	0.00	0.55
1-Butene/2-Methylpropene	1.14	0.35	7.69	6.51	7.73	19.18	8.93	0.00	13.19
1,3-Butadiene	0.00	0.00	1.27	0.00	1.29	2.00	2.87	0.00	3.06
Butane	8.99	1.16	122.59	151.41	121.25	13787.58		2070.62	
t-2-Butene	0.59	0.00	1.88	0.00	1.93	0.00	0.00	0.00	0.00
2,2-Dimethylpropane	0.00	0.00	0.52	0.00	0.51	65.35	6.97	8.66	9.59
c-2-Butene	0.47	0.00	1.76	0.00	1.77	3.32	0.96	0.00	1.69
1-Pentene	0.25	0.00	1.18	0.00	1.26	3.18	1.49	0.00	1.89
Pentane	9.11	1.10	150.15	200.02	156.27	23327.61		3303.79	
Isoprene (2-Methyl-1,3-Butadiene)	0.00	0.00	0.46	0.00	0.49	0.00	0.64	0.00	0.85
t-2-Pentene	0.46	0.00	1.23	0.00	1.34	4.24	1.08	0.00	1.82
c-2-Pentene	0.54	0.00	0.66	0.00	0.69	1.93	0.55	0.00	1.00
Dichloromethane	428.55	188.42	198.03	252.30	207.66	144.27	1.94	25.96	35.00
2,2-Dimethylbutane	0.00	0.00	3.39	0.00	3.37	510.13	44.37	63.68	64.24
Cyclopentane	0.83	0.14	17.06	22.00	18.08	3081.02	237.94	386.10	273.61
2,3-Dimethylbutane	1.31	0.31	11.82	14.21	11.88	1959.53	151.62	233.83	176.33
t-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylpentane	4.05	0.69	85.48	107.54	89.51	13212.87		1740.25	887.08
c-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylpentane	2.39	0.51	74.65	97.05	79.23	8691.79	651.19	1103.94	829.56
1-Hexene/2-Methyl-1-Pentene	0.00	0.00	1.00	0.00	1.07	3.95	1.45	0.00	1.86
Hexane	5.71	0.73		1016.04		19288.25		2521.19	
t-2-Hexene	0.17	0.00	0.32	0.00	0.35	2.64	0.58	0.00	0.63
t-3-Methyl-2-Pentene	0.00	0.00	0.21	0.00	0.21	0.00	0.26	0.00	0.39
c-2-Hexene	0.00	0.00	0.24	0.00	0.27	1.40	0.40	0.00	0.00
c-3-Methyl-2-Pentene	0.19	0.00	0.24	0.00	0.24	1.12	0.29	0.00	0.48
2,2-Dimethylpentane	0.00	0.00	2.54	3.30	2.71	446.97	36.55	50.49	51.14
1,2-Dichloroethane	0.00	0.00	0.96	0.00	0.98	0.00	6.19	0.00	7.24
Methylcyclopentane	2.49	0.37	147.07	205.80	154.83	11522.32		1472.17	1070.24
2,4-Dimethylpentane	1.18	0.29	6.03	7.92	6.37	961.99	78.96	113.10	107.94
1,1,1-Trichloroethane	1.40	0.71	0.84	0.00	0.87	0.00	0.78	0.00	1.11
2,2,3-Trimethylbutane	0.00	0.00	0.80	0.00	0.86	97.98	8.66	11.25	12.05
Benzene	3.35	0.52	4.80	6.67	5.12	271.99	30.94	44.33	38.65
Cyclohexane	1.23	0.25	51.90	67.97	54.88	8111.27	614.55	1043.40	747.21
2-Methylhexane	0.56	0.11	15.90	19.55	16.96	0.00	187.79	287.54	0.00
2,3-Dimethylpentane	0.84	0.23	10.22	12.71	11.05	1484.03	133.82	183.57	174.33
Cycloheexene	0.00	0.00	0.00	0.00	0.00	0.00	3.98	0.00	0.00
3-Methylhexane	0.92	0.17	32.10	45.43	34.28	4851.52	378.54	583.07	480.06
1-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,2,4-Trimethylpentane	13.10	3.40	0.00	10.74	0.00	164.00	0.00	0.00	24.91
t-3-Heptene	0.00	0.00	0.39	0.00	0.38	0.00	0.00	0.00	0.00
Heptane	1.73	0.30	75.55	97.19	80.06	9903.91		1359.57	986.52
t-2-Heptene	0.00	0.00	0.90	0.00	0.90	0.00	1.99	0.00	0.64
c-2-Heptene	0.00	0.00	0.64	0.00	0.63	0.00	0.73	0.00	0.44
2,2-Dimethylhexane	0.00	0.00	2.67	0.00	2.82	355.01	30.93	0.00	19.74
Methylcyclohexane	1.97	0.35	106.84	141.43	113.86	13884.90		1938.00	1368.53
2,5-Dimethylhexane	1.64	0.49	3.04	3.50	3.24	358.41	35.99	47.11	36.09
2,4-Dimethylhexane	2.20	0.63	4.16	5.83	4.33	520.24	49.42	68.48	67.00
2,3,4-Trimethylpentane	4.25	1.21	0.97	0.00	1.03	88.96	10.08	13.22	12.94
Toluene	14.88	3.04	9.90	14.25	10.42	743.51	73.76	106.71	94.72
2-Methylheptane	0.38	0.09	20.32	25.86	20.90	1943.50	212.11	294.14	206.19
4-Methylheptane	0.00	0.00	6.35	0.00	6.52	435.24	68.55	0.00	90.67
1-Methylcyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylheptane	0.31	0.10	16.23	18.28	17.00	1620.12	177.29	246.25	199.63
c-1,3-Dimethylcyclohexane	0.26	0.00	17.64	21.17	18.79	1711.73	175.38	263.38	0.00
t-1,4-Dimethylcyclohexane	0.00	0.00	10.30	10.56	10.63	772.88	105.62	109.74	0.00
2,2,5-Trimethylhexane	1.69	0.46	0.26	0.00	0.27	17.97	2.47	0.00	2.84
1-Octene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Octane	0.48	0.12	36.00	38.46	36.97	2926.14	347.36	499.98	358.92
c-1,4/t-1,3-Dimethylcyclohexane	0.00	0.00	4.58	5.76	4.80	444.11	50.04	66.54	64.39
c-2-Octene	0.00	0.00	0.15	0.00	0.15	0.00	0.00	0.00	0.00
Ethylbenzene	0.78	0.12	3.67	2.84	3.77	170.65	24.93	26.88	30.47
m/p-Xylene	1.78	0.29	12.30	10.94	12.67	557.28	83.35	95.30	101.92
Styrene	21.16	11.04	0.94	0.00	0.87	0.00	0.71	0.00	0.88
o-Xylene	0.52	0.11	4.06	3.66	4.17	151.37	24.55	27.87	29.70
Nonane	0.24	0.12	23.95	17.27	24.54	928.07	167.47	200.81	195.66
iso-Propylbenzene	0.00	0.00	0.76	0.00	0.78	27.45	5.23	5.75	6.05
3,6-Dimethyloctane	0.00	0.00	1.76	0.00	1.79	70.16	15.08	17.03	0.00
n-Propylbenzene	0.00	0.05	1.69	11.83	1.72	33.23	7.81	4.99	9.11
3-Ethyltoluene	0.19	0.08	4.38	2.98	4.46	79.14	19.61	11.27	21.46
4-Ethyltoluene	0.09	0.05	2.07	1.83	2.11	30.95	8.66	3.95	9.82
1,3,5-Trimethylbenzene	0.13	0.05	3.10	3.59	3.16	50.72	13.53	12.72	15.18
2-Ethyltoluene	0.09	0.04	1.92	2.67	1.97	29.28	7.61	6.88	8.56
1,2,4-Trimethylbenzene	0.43	0.26	9.59	7.68	9.59	105.65	31.32	26.17	32.78
Decane	0.38	0.28	20.57	12.74	20.89	200.17	80.13	60.51	87.31
iso-Butylbenzene	0.00	0.00	0.27	0.00	0.28	0.00	1.19	0.00	1.23
sec-Butylbenzene	0.00	0.00	0.50	0.00	0.50	7.49	2.18	0.00	2.44
1,2,3-Trimemylbenzene	0.14	0.11	3.42	3.16	3.42	31.21	10.38	9.53	11.87
p-Cymene	0.00	0.25	1.07	0.00	1.10	0.00	3.11	0.00	3.62
1,2-Dichlorobenzene	0.00	0.00	0.08	0.00	0.08	0.00	0.18	0.00	0.00
Indane	0.00	0.00	0.74	0.00	0.73	6.87	2.07	0.00	2.43
1,3-Diethylbenzene	0.00	0.00	0.64	0.00	0.64	0.00	1.52	0.00	1.76
1,4-Diethylbenzene	0.00	0.18	3.57	0.00	3.58	0.00	8.74	0.00	9.87
n-Butylbenzene	0.00	0.00	0.98	0.00	0.97	0.00	2.58	0.00	2.90
1,2-Diethylbenzene	0.00	0.00	0.22	0.00	0.22	0.00	0.58	0.00	0.59
Undecane	0.51	1.11	24.33	16.25	24.94	59.84	61.57	43.96	55.33
Naphthalene	0.00	0.99	5.31	0.00	6.01	0.00	12.02	0.00	7.30
Dodecane	0.71	1.71	28.44	15.50	30.11	25.57	49.95	34.15	38.84
Hexylbenzene	0.00	0.00	1.31	0.00	1.25	0.00	4.29	0.00	0.00
TOTAL VOC	**554.49**	**224.97**	**1528.26**	**2862.21**	**1583.98**	**156734.16**	**5155.18**	**21824.42**	**9983.20**
Sample Volume (mL) :	272.00	504.00	504.00	20.00	504.00	20.00	509.00	20.00	507.00

Table A-24

Description	burn	burn	burn	burn	burn	pre-ignition	pre-ignition	burn	burn	burn
VOC CONCENTRATION (µg/m3)	RS-1	RS-2	RS-2	RS-2	RS-2	downwind	downwind	Downwind	downwind	downwind
Compound Location	R/C boat 1	R/C boat 2	R/C boat 2	R/C boat 2	R/C boat 2	CCG 206	CCG 206	CCG 206	CCG 206	CCG 206
Propene	167.86	3.33	4.69	3.99	5.53	3.41	5.57	6.89	5.99	5.76
Propane	319.62	0.00	69.52	144.81	116.15	0.00	0.00	1.89	1.31	0.00
Freon22 (Chlorodifluoromethane)	0.71	5.15	1.32	1.59	1.34	0.00	0.00	0.58	0.34	0.31
Propyne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.24	0.00
Chloromethane	3.55	4.21	1.13	1.52	1.72	2.49	1.08	2.03	1.26	1.22
Isobutane (2-Methylpropane)	647.80	140.74	174.27	214.38	235.40	0.72	0.73	5.64	5.57	5.36
Freon114 (1,2-Dichlorotetrafluoroethane	1.39	2.04	0.35	0.51	1.26	1.89	1.32	0.92	0.59	0.68
1-Butene/2-Methylpropene	7.17	51.75	8.35	10.14	11.71	8.71	6.05	8.33	5.88	5.91
1,3-Butadiene	2.63	2.15	0.83	0.85	1.04	0.00	0.00	1.32	1.21	1.19
Butane	2325.97	170.47	573.66	704.88	824.29	1.20	1.43	11.49	11.72	11.62
t-2-Butene	1.06	34.08	3.57	4.21	4.48	0.72	0.40	1.30	1.57	1.56
2,2-Dimethylpropane	10.57	0.00	2.51	3.36	3.62	0.00	0.00	0.00	0.00	0.00
c-2-Butene	1.84	28.91	2.71	3.39	3.93	0.00	0.33	1.25	1.14	1.12
1-Pentene	1.94	8.27	1.77	2.19	2.74	0.95	1.20	1.11	1.31	1.25
Pentane		120.75		668.32	1285.34	1.15	1.24	16.47	17.39	17.72
Isoprene (2-Methyl-1,3-Butadiene)	1.01	1.79	0.49	0.53	0.00	0.00	0.00	0.70	0.65	0.68
t-2-Pentene	1.59	17.19	2.89	3.42	2.66	0.00	0.35	2.06	2.09	2.19
c-2-Pentene	1.06	13.91	1.58	1.85	2.40	0.00	0.00	1.10	1.23	1.24
Dichloromethane	36.17	39.92	210.67	192.59	267.56	4.39	1.34	0.59	2.25	1.94
2,2-Dimethylbutane	67.36	4.20	20.63	24.90	28.48	0.00	0.00	3.03	3.24	3.20
Cyclopentane	363.62	12.10	126.78	130.73	160.76	0.00	0.00	2.21	2.53	2.58
2,3-Dimethylbutane	245.33	10.97	81.32	85.95	104.80	0.00	0.23	3.50	3.87	3.88
t-4-Methyl-2-Pentene	0.00	0.73	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00
2-Methylpentane	1632.98	75.03	514.35	487.15	727.03	9.00	0.67	22.12	22.67	23.64
c-4-Methyl-2-Pentene	0.00	3.17	0.00	0.00	0.00	0.00	0.00	0.68	0.74	0.71
3-Methylpentane	1044.33	38.96	335.09	366.03	475.75	0.37	1.01	10.67	10.90	10.64
1-Hexene/2-Methyl-1-Pentene	1.75	4.25	1.56	1.83	2.38	0.94	0.99	1.17	1.28	1.28
Hexane	2596.62	60.18	679.12	666.43	1018.22	2.52	1.44	10.83	12.90	12.03
t-2-Hexene	0.84	2.88	0.71	0.90	0.78	0.00	0.00	0.85	0.91	0.93
t-3-Methyl-2-Pentene	0.43	3.03	0.52	0.65	0.70	0.00	0.00	0.67	0.71	0.71
c-2-Hexene	0.49	2.14	0.63	0.69	0.56	0.00	0.00	0.65	0.75	0.74
c-3-Methyl-2-Pentene	0.57	3.90	0.70	0.85	0.87	0.00	0.00	0.87	1.00	0.96
2,2-Dimethylpentane	55.43	1.28	17.47	20.00	22.97	0.00	0.00	0.49	0.52	0.55
1,2-Dichloroethane	8.97	0.00	2.90	3.32	3.42	0.00	0.00	0.00	0.00	0.00
Methylcyclopentane	1423.81	36.62	455.94	445.10	651.99	0.54	0.45	6.71	7.89	7.78
2,4-Dimethylpentane	121.96	3.84	41.54	43.36	52.75	0.00	0.00	1.51	1.67	1.65
1,1,1-Trichloroethane	1.22	4.64	1.06	1.15	1.24	0.67	0.65	0.66	0.81	0.81
2,2,3-Trimethylbutane	12.35	0.54	4.32	4.76	5.51	0.43	0.00	0.40	0.35	0.32
Benzene	44.37	15.90	14.50	15.97	19.44	0.79	0.71	7.12	8.81	8.86
Cyclohexane	1008.68	20.78	342.35	339.10	457.63	0.00	0.27	3.01	3.51	3.39
2-Methylhexane	268.82	8.64	104.87	110.64	141.60	0.00	0.00	2.82	2.37	7.49
2,3-Dimethylpentane	201.29	9.14	64.99	67.13	127.18	0.00	0.00	2.37	2.64	2.65
Cyclohexene	0.00	0.00	0.00	0.00	0.00		0.00	0.00		
3-Methylhexane	635.76	18.38	195.47	208.66	278.14	0.00	0.87	5.80	6.27	6.36
1-Heptene	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	3.26	3.11
2,2,4-Trimethylpentane	0.00	2.11	10.19	11.24	14.38	0.52	0.34	1.91	1.67	1.68
t-3-Heptene	0.19	0.40	0.00	0.39	0.18	0.21	0.00	0.26	0.47	0.49
Heptane	1346.33	31.77	421.60	445.11	573.21	0.77	0.65	5.67	5.99	5.98
t-2-Heptene	1.03	0.64	0.70	0.92	0.77	0.00	0.00	0.52	0.84	0.88
c-2-Heptene	0.57	0.00	0.72	0.71	1.31	0.00	0.00	0.36	0.68	0.69
2,2-Dimethylhexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.25	0.24
Methylcyclohexane	1992.43	42.22	596.17	610.66	854.76	0.00	0.00	3.31	3.57	3.56
2,5-Dimethylhexane	48.69	1.80	18.76	18.80	22.53	0.00	0.00	0.73	0.84	0.79
2,4-Dimethylhexane	78.57	2.51	25.07	26.37	32.99	0.00	0.00	0.93	1.00	1.00
2,3,4-Trimethylpentane	14.12	1.00	4.93	5.36	6.10	0.00	0.00	0.74	0.71	0.72
Toluene	107.52	35.80	42.89	44.80	58.20	1.81	1.68	21.92	26.63	26.59
2-Methylheptane	286.38	11.43	109.65	110.06	141.41	0.00	0.00	2.42	2.59	2.66
4-Methylheptane	110.08	0.00	37.26	36.19	0.00	0.00	0.00	0.00	1.17	1.10
1-Methylcyclohexene	0.00	0.00	0.00	0.00	0.00		0.00	39.37		
3-Methylheptane	247.75	10.80	94.77	91.55	115.09	0.00	0.00	3.45	3.85	3.82
c-1,3-Dimethylcyclohexane	326.07	9.36	93.45	99.75	140.10	0.00	0.00	0.63	0.63	0.63
t-1,4-Dimethylcyclohexane	145.51	4.90	56.35	47.71	76.08	0.00	0.00	0.35	0.30	0.34
2,2,5-Trimethylhexane	2.91	0.32	1.14	1.32	1.39	0.00	0.00	0.23	0.24	0.24
1-Octene	0.00	0.00	0.00	0.00	0.00	1.04	0.59	0.28	0.45	0.54
Octane	481.00	23.07	183.91	182.95	230.49	0.42	0.37	2.38	2.40	2.47
c-1,4/-1,3-Dimethylcyclohexane	85.66	2.80	25.40	26.10	33.83	0.00	0.00	0.36	0.40	0.38
c-2-Octene	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.19	0.00	0.00
Ethylbenzene	34.63	10.94	14.76	15.08	18.23	0.43	0.42	5.96	7.06	7.18
m/p-Xylene	116.32	37.73	48.71	50.43	61.70	1.42	1.37	18.47	22.04	22.03
Styrene	0.71	2.33	0.79	0.82	1.17	0.00	0.00	0.28	0.28	0.25
o-Xylene	34.80	12.83	14.66	14.96	18.19	0.52	0.48	6.46	8.18	8.25
Nonane	223.70	24.33	91.98	88.23	109.00	0.52	0.21	1.77	1.51	1.50
iso-Propylbenzene	7.05	1.41	2.62	2.87	3.24	0.00	0.00	0.44	0.47	0.48
3,6-Dimethyloctane	18.67	2.72	6.91	6.92	0.00	0.00	0.00	0.00	0.20	0.21
n-Propylbenzene	10.64	3.93	4.58	4.88	5.43	0.33	0.00	1.80	1.87	1.87
3-Ethyltoluene	27.69	12.28	11.52	12.17	13.91	0.40	0.23	5.16	5.75	5.81
4-Ethyltoluene	11.45	6.08	5.01	5.55	6.24	0.21	0.15	2.44	2.78	2.79
1,3,5-Trimethylbenzene	18.38	8.12	7.35	8.05	9.17	0.29	0.20	2.66	2.95	2.93
2-Ethyltoluene	10.37	5.48	4.50	4.89	5.29	0.20	0.14	1.82	2.03	2.03
1,2,4-Trimethylbenzene	43.51	31.30	19.65	20.02	26.46	0.94	0.49	8.28	9.49	9.58
Decane	98.23	37.37	41.67	41.25	47.26	0.61	0.24	1.31	1.10	1.12
iso-Butylbenzene	1.48	0.67	0.60	0.68	0.74	0.00	0.00	0.14	0.15	0.15
sec-Butylbenzene	2.90	1.10	1.10	1.21	1.28	0.00	0.00	0.14	0.15	0.15
1,2,3-Trimethylbenzene	13.64	10.77	6.16	6.75	7.22	0.27	0.20	1.75	1.86	1.89
p-Cymene	6.14	2.64	1.65	1.84	2.38	0.00	0.00	0.00	0.00	0.00
1,2-Dichlorobenzene	0.00	0.00	0.13	0.15	0.00	0.00	0.00	0.00	0.00	0.00
Indane	2.92	2.62	1.44	1.57	1.89	0.00	0.00	0.79	0.91	0.91
1,3-Diethylbenzene	1.79	2.15	1.02	1.15	1.25	0.00	0.00	0.42	0.45	0.44
1,4-Diethylbenzene	7.64	0.00	5.55	5.96	0.00	0.00	0.00	0.00	2.32	2.29
n-Butylbenzene	2.70	3.09	1.60	1.68	1.68	0.00	0.00	0.38	0.38	0.39
1,2-Diethylbenzene	0.83	0.77	0.35	0.38	0.44	0.00	0.00	0.11	0.13	0.12
Undecane	54.57	57.54	32.24	28.85	27.52	0.76	0.00	1.28	1.02	1.04
Naphthalene	0.00	8.44	5.86	5.92	0.00	1.01	0.00	1.78	1.46	1.53
Dodecane	23.24	54.09	33.97	24.21	14.67	0.90	0.31	1.45	1.10	0.97
Hexylbenzene	0.00	0.00	1.72	1.98	0.00	0.00	0.00	0.83	2.28	0.00
TOTAL VOC	**19317.72**	**1507.62**	**6158.13**	**7106.52**	**9740.35**	**55.30**	**36.39**	**304.35**	**298.94**	**294.73**
Sample Volume (mL)	123.00	95.00	504.00	494.00	125.00	488.00	504.00	504.00	488.00	488.00

Table A-24

Description	pre-ignition	burn	pre-ignition	burn	pre-ignition	pre-ignition	burn	burn	pre-ignition	burn
VOC CONCENTRATION (µg/m3) Compound / Location	CCG 203	CCG 203	CCG 204	CCG 204	CCG 212	CCG 212	CCG 212	CCG 212	CCG 214	CCG 214
Propene	44.96	6.99	4.93	0.40	129.49	71.03	23.98	49.66	25.69	6.11
Propane	8.52	0.00	1.11	0.43	0.00	0.00	0.00	0.00	55.16	9.23
Freon22 (Chlorodifluoromethane)	0.17	0.45	0.43	0.00	3.16	1.87	0.67	1.15	0.95	0.00
Propyne	3.06	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
Chloromethane	1.03	0.73	1.44	0.95	2.16	2.13	1.72	1.73	3.59	1.27
Isobutane (2-Methylpropane)	59.48	15.77	1.94	0.86	1.23	0.73	0.30	0.36	46.93	27.65
Freon114 (1,2-Dichlorotetrafluoroethane	0.39	0.66	0.85	0.45	2.01	0.76	0.57	0.62	1.75	0.35
1-Butene/2-Methylpropene	37.70	14.47	6.94	0.54	18.33	18.37	7.21	6.87	25.07	11.19
1,3-Butadiene	12.90	4.75	0.62	0.00	2.32	1.40	0.43	0.68	2.40	2.07
Butane	118.63	30.56	3.14	0.92	2.03	1.43	0.61	0.76	152.29	85.47
t-2-Butene	12.22	3.99	0.82	0.00	1.35	1.08	0.46	0.56	1.39	2.00
2,2-Dimethylpropane	0.72	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.78
c-2 Butene	12.98	3.61	0.60	0.00	1.15	1.11	0.62	0.59	1.46	2.49
1-Pentene	9.49	2.41	1.36	0.04	4.46	4.45	1.23	1.17	3.50	2.23
Pentane	170.60	40.20	1.79	0.56	1.80	1.22	0.45	0.48	168.00	97.37
Isoprene (2-Methyl-1,3-Butadiene)	7.81	2.39	0.00	0.00	0.00	0.00	0.00	0.00	1.08	0.99
t-2-Pentene	19.54	4.74	0.36	0.00	0.90	0.40	0.09	0.00	0.39	1.47
c-2 Pentene	17.68	3.90	0.00	0.00	0.00	0.00	0.00	0.00	0.56	1.92
Dichloromethane	2.32	3.92	3.70	1.75	6.40	5.76	1.52	1.81	4.41	0.39
2,2-Dimethylbutane	41.34	9.41	0.00	0.00	0.00	0.00	0.00	0.00	3.21	4.55
Cyclopentane	29.48	6.65	0.00	0.00	0.00	0.00	0.00	0.00	17.25	10.13
2,3-Dimethylbutane	48.90	10.22	0.30	0.12	0.00	0.00	0.00	0.00	10.26	8.87
1-4-Methyl-2-Pentene	1.32	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
2-Methylpentane	168.63	45.27	7.53	0.39	7.05	5.74	1.62	2.01	122.72	62.18
c-4-Methyl-2-Pentene	7.71	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78
3-Methylpentane	114.66	27.70	0.80	0.33	0.84	2.23	0.09	0.00	51.46	35.45
1-Hexene/2-Methyl-1-Pentene	11.93	2.60	1.05	0.00	3.58	4.05	1.25	1.18	3.49	2.08
Hexane	109.72	31.53	2.50	0.69	3.61	2.55	0.50	0.80	107.62	70.71
t-2-Hexene	9.07	2.00	0.00	0.00	0.00	0.31	0.00	0.00	0.33	0.61
t-3-Methyl-2-Pentene	8.85	1.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70
c-2-Hexene	6.36	1.32	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.52
c-3-Methyl-2-Pentene	11.83	2.37	0.00	0.00	0.00	0.00	0.00	0.00	0.19	1.03
2,2-Dimethylpentane	6.47	1.41	0.00	0.00	0.00	0.00	0.00	0.00	2.04	1.94
1,2-Dichloroethane	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35
Methylcyclopentane	81.58	17.60	0.68	0.22	0.68	0.53	0.00	0.00	61.30	44.81
2,4-Dimethylpentane	22.12	4.45	0.00	0.00	0.00	0.00	0.00	0.00	4.36	4.85
1,1,1-Trichloroethane	0.88	0.93	0.74	0.74	1.08	0.99	0.74	0.79	0.96	0.57
2,2,3-Trimethylbutane	1.66	0.38	0.32	0.00	2.19	1.79	0.38	0.42	1.50	0.80
Benzene	101.32	22.37	1.61	0.29	1.04	0.85	0.31	0.38	2.47	10.66
Cyclohexane	36.79	7.86	0.47	0.00	1.14	0.98	0.00	0.30	39.51	32.04
2-Methylhexane	39.84	6.68	0.00	0.00	0.00	0.00	0.00	0.00	11.30	11.48
2,3-Dimethylpentane	34.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.72	8.71
Cyclohexene	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylhexane	72.26	13.49	0.00	0.00	0.00	0.00	0.00	0.00	20.47	24.85
1-Heptene	0.00	0.00	1.03	0.00	3.14	4.59	1.46	0.00	0.00	0.00
2,2,4-Trimethylpentane	28.95	7.07	0.40	0.10	1.19	0.91	0.37	0.46	0.00	3.01
t-3-Heptene	1.11	0.27	0.70	0.00	2.45	0.83	0.21	0.58	0.66	0.17
Heptane	56.37	11.95	0.71	0.15	0.57	1.04	0.15	0.43	47.10	50.41
t-2-Heptene	4.16	0.81	1.46	0.00	5.02	3.73	0.88	1.12	2.88	0.67
c-2-Heptene	5.21	0.89	1.00	0.00	2.61	6.28	1.83	0.78	4.57	1.84
2,2-Dimethylhexane	2.68	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.95
Methylcyclohexane	34.19	6.07	0.38	0.00	0.00	0.00	0.00	0.00	61.13	68.08
2,5-Dimethylhexane	10.98	2.29	0.00	0.00	1.14	0.00	0.00	0.00	2.06	2.98
2,4-Dimethylhexane	13.64	2.25	0.00	0.00	0.00	0.00	0.00	0.00	2.25	3.93
2,3,4-Trimethylpentane	15.02	3.11	0.00	0.00	0.00	0.00	0.00	0.00	0.45	1.51
Toluene	298.82	67.78	2.91	0.79	3.10	2.30	0.50	0.74	6.46	38.07
2-Methylheptane	27.95	6.04	0.22	0.00	0.00	0.00	0.00	0.00	10.44	16.70
4-Methylheptane	12.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.64	0.00
1-Methylcyclohexene	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylheptane	42.88	8.47	0.00	0.00	0.00	0.00	0.00	0.00	6.91	16.32
c-1,3-Dimethylcyclohexane	5.57	0.77	0.00	0.00	0.00	0.00	0.00	0.00	7.40	12.94
t-1,4-Dimethylcyclohexane	3.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.90	6.79
2,2,5-Trimethylhexane	4.92	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.46
1-Octene	0.00	0.00	0.68	0.00	1.68	4.45	2.26	0.72	4.28	0.00
Octane	21.70	4.36	0.40	0.09	0.58	0.54	0.19	0.20	14.75	29.56
c-1,4/t-1,3-Dimethylcyclohexane	4.12	0.65	0.00	0.00	0.00	0.00	0.00	0.00	1.71	4.02
c-2-Octene	3.16	0.54	0.00	0.00	0.00	0.00	0.00	0.00	2.10	0.83
Ethylbenzene	77.85	17.25	0.56	0.16	0.64	0.53	0.11	0.18	1.57	11.77
m/p-Xylene	239.66	53.36	1.86	0.49	2.20	1.77	0.34	0.65	5.33	38.62
Styrene	4.72	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.30
o-Xylene	80.45	18.21	0.64	0.17	0.75	0.56	0.10	0.21	1.68	13.21
Nonane	10.90	1.90	0.37	0.00	0.84	0.62	0.24	0.28	6.83	23.77
iso-Propylbenzene	5.39	1.03	0.00	0.00	0.00	0.00	0.00	0.00	0.32	1.31
3,6-Dimethyloctane	2.18	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.25
n-Propylbenzene	20.70	4.40	0.23	0.03	0.49	0.39	0.26	0.28	1.14	3.91
3-Ethyltoluene	67.44	14.48	0.36	0.06	0.47	0.29	0.08	0.15	1.59	11.83
4-Ethyltoluene	33.83	6.69	0.20	0.00	0.15	0.21	0.05	0.09	0.74	5.78
1,3,5-Trimethylbenzene	35.35	6.91	0.25	0.07	0.39	0.30	0.06	0.09	1.09	6.74
2-Ethyltoluene	24.48	5.10	0.18	0.06	0.24	0.16	0.05	0.07	0.70	4.48
1,2,4-Trimethylbenzene	104.98	21.89	0.71	0.15	3.98	0.72	3.12	4.54	17.23	20.11
Decane	8.29	1.15	0.31	0.00	0.87	0.61	0.24	0.36	5.02	16.13
iso-Butylbenzene	1.72	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45
sec-Butylbenzene	1.74	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.62
1,2,3-Trimethylbenzene	23.15	4.64	0.23	0.00	0.00	0.00	0.00	0.00	1.11	5.19
p-Cymene	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.84
1,2-Dichloropenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Indane	12.50	1.99	0.00	0.00	0.00	0.00	0.00	0.00	0.29	1.88
1,3-Diethylbenzene	6.79	1.14	0.00	0.00	0.00	0.00	0.00	0.00	0.28	1.27
1,4-Diethylbenzene	33.84	0.00	0.28	0.00	0.00	0.00	0.00	0.00	1.06	0.00
n-Butylbenzene	5.55	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.40	1.47
1,2-Diethylbenzene	1.23	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
Undecane	12.04	1.27	0.51	0.00	0.94	0.58	0.27	0.40	8.67	14.65
Naphthalene	34.66	2.59	0.00	0.00	0.00	0.00	0.00	0.19	0.00	4.00
Dodecane	13.19	2.02	1.01	0.08	0.43	0.28	0.25	0.41	11.05	12.05
Hexylbenzene	1.46	0.84	8.37	0.00	0.00	0.00	0.00	0.00	10.08	3.09
TOTAL VOC	**2970.17**	**652.14**	**72.01**	**12.06**	**231.89**	**163.44**	**57.77**	**85.27**	**1221.79**	**1058.26**
Sample Volume (mL)	490.00	520.00	488.00	490.00	495.00	502.00	502.00	495.00	511.00	495.00

Table A-24

Description	pre-ignition	burn	pre-ignition	burn	burn	pre-ignition	pre-ignition	burn	burn	burn
VOC CONCENTRATION (µg/m3)										R/C H1-CA
Compound Location	Ann Harvey	Ann Harvey	SWG	SWG	SWG	Casaco	Casaco	Casaco	Casaco	
Propene	0.00	0.00	68.85	16.37	11.80	1.82	10.69	4.53	3.59	34.77
Propane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.56
Freon22 (Chlorodifluoromethane)	2.21	0.68	2.02	0.58	1.18	0.86	1.65	0.58	1.19	6.00
Propyne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloromethane	0.86	0.88	3.42	1.35	1.29	1.45	4.94	1.56	1.16	0.23
Isobutane (2-Methylpropane)	1.53	1.01	0.62	0.38	0.23	1.84	0.87	0.32	0.00	2.17
Freon114 (1,2-Dichlorotetrafluoroethane	1.94	0.71	2.12	1.31	0.71	1.33	2.08	0.72	0.71	0.45
1-Butene/2-Methylpropene	4.78	0.76	18.42	8.19	8.68	4.96	16.13	6.28	7.33	3.12
1,3-Butadiene	0.00	0.00	1.67	0.37	0.52	0.00	0.91	0.39	0.00	0.00
Butane	2.52	0.48	1.27	0.35	0.35	3.96	1.87	0.64	0.80	2.23
t-2-Butene	0.54	0.00	0.82	0.43	0.33	0.85	1.13	0.38	0.40	0.17
2,2-Dimethylpropane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Butene	0.00	0.00	1.06	0.51	0.46	0.73	1.51	0.42	0.48	0.19
1-Pentene	0.59	0.09	4.31	2.08	2.15	1.23	4.40	2.37	1.35	0.49
Pentane	3.25	0.52	0.72	0.34	0.37	3.38	1.06	0.43	0.48	1.93
Isoprene (2-Methyl-1,3-Butadiene)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-2-Pentene	0.00	0.00	0.00	0.12	0.00	0.69	0.00	0.13	0.11	0.08
c-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.00	0.00	0.00
Dichloromethane	4.76	3.64	1.91	1.02	0.83	11.97	3.81	1.91	0.88	7.83
2,2-Dimethylbutane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cyclopentane	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.24
2,3-Dimethylbutane	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.21
I-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylpentane	1.01	0.34	2.73	2.42	2.80	1.30	30.16	12.33	1.13	1.40
c-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylpentane	1.16	0.60	0.00	0.00	0.00	1.36	0.00	0.00	0.00	1.10
1-Hexene/2-Methyl-1-Pentene	0.00	0.00	4.08	2.07	2.19	1.37	3.18	1.92	1.44	0.87
Hexane	5.83	1.59	1.13	0.63	0.51	18.74	2.38	1.22	1.01	13.43
t-2-Hexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-3-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Hexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-3-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00
2,2-Dimethylpentane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,2-Dichloroethene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Methylcyclopentane	1.15	0.40	0.00	0.00	0.00	0.93	0.42	0.19	0.25	1.93
2,4-Dimethylpentane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
1,1,1-Trichloroethane	4.05	0.99	1.53	0.89	0.89	1.22	1.34	0.98	0.94	0.73
2,2,3-Trimethylbutane	0.00	0.00	0.66	0.71	0.73	0.00	0.90	0.65	0.41	0.34
Benzene	0.92	0.28	0.55	0.24	0.25	1.62	0.83	0.29	0.38	0.38
Cyclohexane	0.78	0.30	0.00	0.00	0.00	0.77	0.85	0.32	0.44	0.35
2-Methylhexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
2,3-Dimethylpentane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27
Cyclohexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylhexane	1.26	0.00	0.00	0.00	0.00	1.13	1.42	0.00	0.00	0.65
1-Heptene	0.00	0.00	6.31	2.38	2.82	1.38	3.51	2.80	0.00	0.00
2,2,4-Trimethylpentane	0.33	0.13	0.90	0.44	0.52	0.38	1.07	0.00	0.53	0.48
t-3-Heptene	0.00	0.00	0.51	0.27	0.24	0.00	0.91	0.20	0.23	0.06
Heptane	1.09	0.28	0.39	0.35	0.40	1.00	1.46	0.79	0.73	0.64
t-2-Heptene	0.00	0.00	2.91	1.50	1.22	0.00	3.85	0.71	0.95	0.18
c-2-Heptene	0.00	0.00	7.06	3.08	2.77	0.00	6.81	1.12	1.50	0.00
2,2-Dimethylhexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Methylcyclohexane	0.57	0.00	0.00	0.00	0.00	0.90	1.09	0.58	0.70	0.56
2,5-Dimethylhexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00
2,4-Dimethylhexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,3,4-Trimethylpentane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Toluene	3.92	0.63	1.05	0.45	0.43	5.15	2.31	0.74	1.19	3.47
2-Methylheptane	0.00	0.00	0.00	0.00	0.00	0.40	0.38	0.48	0.21	0.18
4-Methylheptane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Methylcyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylheptane	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.15	0.15	0.15
c-1,3-Dimethylcyclohexane	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.18	0.25	0.00
t-1,4-Dimethylcyclohexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,2,5-Trimethylhexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1-Octene	0.00	0.00	13.17	3.97	5.85	1.06	5.69	4.40	2.57	1.28
Octane	0.63	0.21	0.39	0.21	0.16	0.71	0.93	0.39	0.52	0.39
c-1,4/t-1,3-Dimethylcyclohexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Octene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ethylbenzene	0.70	0.26	0.38	0.08	0.08	0.99	0.51	0.22	0.28	0.42
m/p-Xylene	1.92	0.78	1.28	0.36	0.33	2.88	1.73	0.71	0.94	1.42
Styrene	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00
o-Xylene	0.77	0.28	0.37	0.11	0.10	0.92	0.65	0.26	0.33	0.46
Nonane	0.60	0.22	0.55	0.23	0.25	1.19	1.37	0.68	0.81	0.76
iso-Propylbenzene	0.00	0.00	0.00	0.00	0.00	0.16	0.26	0.10	0.13	0.00
3,6-Dimethyloctane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
n-Propylbenzene	0.21	0.11	0.59	0.16	0.19	0.36	0.60	0.37	0.44	0.25
3-Ethyltoluene	0.44	0.21	0.23	0.12	0.12	0.61	0.76	0.27	0.42	0.41
4-Ethyltoluene	0.33	0.11	0.14	0.08	0.07	0.28	0.42	0.14	0.22	0.22
1,3,5-Trimethylbenzene	0.27	0.10	0.24	0.12	0.11	0.39	0.49	0.19	0.31	0.37
2-Ethyltoluene	0.33	0.16	0.11	0.06	0.06	0.32	0.38	0.15	0.22	0.21
1,2,4-Trimethylbenzene	0.97	0.44	8.45	0.27	0.34	1.85	1.99	0.98	1.01	1.16
Decane	0.55	0.22	0.77	0.19	0.16	1.68	1.71	0.68	0.83	1.53
iso-Butylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sec-Butylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,2,3-Trimethylbenzene	0.30	0.16	0.00	0.00	0.00	0.46	0.64	0.21	0.38	0.42
p-Cymene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00
1,2-Dichlorobenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Indane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,3-Diethylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,4-Diethylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.39	0.00
n-Butylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,2-Diethylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Undecane	0.37	0.00	0.89	0.27	0.21	1.51	2.87	0.55	1.15	1.67
Naphthalene	0.00	0.00	0.00	0.00	0.00	0.00	2.32	0.00	0.91	0.00
Dodecane	0.44	0.39	0.71	0.43	0.20	0.96	2.78	0.51	1.11	1.32
Hexylbenzene	6.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00
TOTAL VOC	**80.48**	**17.92**	**165.29**	**55.52**	**52.91**	**91.51**	**140.76**	**57.32**	**45.71**	**102.73**
Sample Volume (mL) :	495.00	504.00	502.00	502.00	502.00	502.00	507.00	502.00	507.00	248.00

Table A-24

Description / VOC CONCENTRATION (µg/m3) / Compound / Location	burn R/C H1-CA	post-burn R/C H1	burn R/C H2-CA	burn R/C H2-CA	pre-ignition (14:09) Convair no ship exhaust	burn (14:13) Convair/plume 2ml DNH1000'	burn (14:32) Convair/plume 2ml DNH1000'	burn (14:24) Convair/plume 2ml DNH1980'	burn (14:24) Convair/plume 2ml DNH1800'
Propene	20.39	1.03	54.01	10.21	0.00	0.28	0.49	28.62	3.55
Propane	0.31	0.28	0.09	0.69	0.00	0.15	0.15	0.00	1.43
Freon22 (Chlorodifluoromethane)	0.26	0.73	0.48	1.08	0.81	1.00	0.00	1.48	1.26
Propyne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloromethane	0.57	0.43	0.65	0.24	0.95	0.86	0.98	0.91	0.75
Isobutane (2-Methylpropane)	0.49	0.56	0.65	0.31	0.00	0.32	0.48	3.43	3.35
Freon114 (1,2-Dichlorotetrafluoroethane	0.30	0.34	0.37	0.40	0.24	0.22	0.24	0.24	0.22
1-Butene/2-Methylpropene	1.10	2.05	3.21	3.37	0.35	1.01	0.54	1.13	1.06
1,3-Butadiene	0.20	0.00	0.10	0.10	0.00	0.16	0.22	0.44	0.43
Butane	1.21	0.89	1.11	0.48	0.23	1.70	1.76	14.21	13.00
t-2-Butene	0.00	0.13	0.15	0.17	0.00	0.00	0.00	0.16	0.11
2,2-Dimethylpropane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
c-2-Butene	0.15	0.11	0.31	0.29	0.00	0.00	0.00	0.00	0.09
1-Pentene	0.11	0.17	0.44	0.82	0.00	0.00	0.10	0.12	0.11
Pentane	1.02	0.85	1.22	0.48	0.06	2.21	2.34	22.27	16.22
Isoprene (2-Methyl-1,3-Butadiene)	0.00	0.00	0.19	0.18	0.00	0.12	0.14	0.22	0.19
t-2-Pentene	0.07	0.09	0.23	0.05	0.00	0.00	0.00	0.13	0.05
c-2-Pentene	0.07	0.08	0.16	0.06	0.00	0.00	0.00	0.00	0.00
Dichloromethane	0.29	8.31	124.07	7.54	128.21	451.30	114.51	247.86	159.64
2,2-Dimethylbutane	0.10	0.14	0.16	0.00	0.00	0.00	0.00	0.44	0.29
Cyclopentane	0.11	0.11	0.19	0.00	0.00	0.33	0.29	2.36	1.68
2,3-Dimethylbutane	0.12	0.16	0.29	0.00	0.08	0.71	0.51	2.05	1.52
t-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylpentane	0.53	0.72	2.52	4.97	0.06	1.86	1.58	10.03	8.96
c-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylpentane	0.10	0.72	39.38	1.42	0.00	1.26	1.06	7.19	5.21
1-Hexene/2-Methyl-1-Pentene	0.19	0.20	0.59	0.83	0.00	0.00	0.00	0.00	0.00
Hexane	2.83	3.79	602.03	26.51	0.12	2.93	2.24	15.29	11.05
t-2-Hexene	0.00	0.05	0.17	0.00	0.00	0.00	0.00	0.00	0.00
t-3-Methyl-2-Pentene	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Hexene	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00
c-3-Methyl-2-Pentene	0.04	0.05	0.13	0.05	0.00	0.00	0.00	0.00	0.00
2,2-Dimethylpentane	0.00	0.00	0.00	0.00	0.00	0.07	0.05	0.29	0.22
1,2-Dichloroethane	0.00	0.00	0.61	0.00	0.00	0.00	0.00	0.00	0.00
Methylcyclopentane	0.58	0.57	97.97	4.20	0.00	1.86	1.43	9.21	6.59
2,4-Dimethylpentane	0.05	0.09	0.16	0.00	0.10	0.73	0.49	1.37	1.04
1,1,1-Trichloroethane	0.45	1.77	1.01	0.00	0.73	0.90	0.76	0.82	0.71
2,2,3-Trimethylbutane	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.11	0.09
Benzene	0.34	30.88	1.62	0.16	0.10	1.39	3.16	2.70	2.03
Cyclohexane	0.17	0.17	0.81	0.07	0.23	1.45	1.00	5.80	4.07
2-Methylhexane	0.00	0.13	0.41	0.00	0.00	0.45	0.32	1.80	1.24
2,3-Dimethylpentane	0.11	0.00	0.36	0.00	0.08	0.68	0.44	1.42	1.05
Cyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylhexane	0.19	0.36	0.88	0.00	0.00	0.86	0.62	3.05	2.47
1-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,2,4-Trimethylpentane	0.08	0.19	0.00	0.00	1.39	8.48	5.35	9.86	7.59
t-3-Heptene	0.00	0.00	0.06	0.07	0.00	0.00	0.00	0.00	0.02
Heptane	0.27	0.29	1.23	0.39	0.00	2.11	1.44	6.77	5.34
t-2-Heptene	0.07	0.00	0.29	0.17	0.00	0.00	0.00	0.00	0.00
c-2-Heptene	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00
2,2-Dimethylhexane	0.00	0.00	0.00	0.00	0.00	0.08	0.05	0.00	0.00
Methylcyclohexane	0.25	0.15	0.50	0.00	0.00	3.25	2.17	9.77	7.25
2,5-Dimethylhexane	0.00	0.00	0.14	0.00	0.21	1.15	0.68	1.41	1.09
2,4-Dimethylhexane	0.00	0.00	0.20	0.00	0.28	1.51	0.97	2.04	1.48
2,3,4-Trimethylpentane	0.00	0.11	0.18	0.00	0.58	2.95	1.71	3.22	2.49
Toluene	0.80	4.04	18.26	0.54	1.62	5.02	3.09	5.66	4.43
2-Methylheptane	0.07	0.12	0.52	0.47	0.00	0.49	0.34	1.30	1.02
4-Methylheptane	0.00	0.00	0.28	0.00	0.00	0.16	0.11	0.41	0.32
1-Methylcyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylheptane	0.12	0.13	0.79	0.05	0.00	0.41	0.25	1.03	0.76
c-1,3-Dimethylcyclohexane	0.06	0.36	0.16	0.00	0.00	0.44	0.31	1.14	0.84
t-1,4-Dimethylcyclohexane	0.00	0.00	0.00	0.00	0.00	0.19	0.14	0.64	0.47
2,2,5-Trimethylhexane	0.00	0.20	0.32	0.00	0.24	1.31	0.77	1.50	1.17
1-Octene	0.00	0.00	0.32	1.56	0.00	0.00	0.00	0.00	0.00
Octane	0.10	0.18	0.73	0.10	0.01	0.72	0.51	1.78	1.50
c-1,4/t-1,3-Dimethylcyclohexane	0.00	0.00	0.11	0.00	0.00	0.11	0.09	0.26	0.21
c-2-Octene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ethylbenzene	0.21	1.02	2.70	0.11	0.05	0.17	0.10	0.27	0.17
m/p-Xylene	0.71	1.31	8.65	0.36	0.13	0.32	0.28	0.57	0.50
Styrene	0.00	0.17	0.35	0.10	6.52	4.01	4.71	5.36	5.85
o-Xylene	0.23	0.37	2.80	0.12	0.05	0.11	0.09	0.18	0.17
Nonane	0.07	0.26	0.86	0.24	0.00	0.00	0.25	0.53	0.48
iso-Propylbenzene	0.00	0.04	0.23	0.06	0.00	0.00	0.00	0.00	0.00
3,5-Dimethyloctane	0.00	0.00	0.19	0.03	0.00	0.00	0.00	0.00	0.00
n-Propylbenzene	0.06	0.10	0.78	0.18	0.02	0.00	0.04	0.00	0.08
3-Ethyltoluene	0.13	0.18	1.93	0.15	0.05	0.00	0.07	0.10	0.12
4-Ethyltoluene	0.07	0.10	0.93	0.12	0.03	0.00	0.05	0.59	0.08
1,3,5-Trimethylbenzene	0.10	0.14	1.18	0.13	0.04	0.00	0.06	0.08	0.09
2-Ethyltoluene	0.06	0.10	0.73	0.08	0.02	0.00	0.04	0.05	0.06
1,2,4-Trimethylbenzene	0.31	0.42	3.64	0.90	0.14	0.00	0.19	0.25	0.42
Decane	0.14	0.48	1.67	0.29	0.18	0.00	0.24	0.30	0.30
iso-Butylbenzene	0.00	0.00	0.06	0.04	0.00	0.00	0.00	0.00	0.00
sec-Butylbenzene	0.00	0.00	0.11	0.04	0.00	0.00	0.00	0.00	0.00
1,2,3-Trimethylbenzene	0.11	0.16	0.96	0.15	0.07	0.00	0.09	0.09	0.12
p-Cymene	0.32	0.00	0.71	0.00	0.18	0.00	0.19	0.00	0.00
1,2-Dichlorobenzene	0.00	0.00	0.00	0.14	0.00	0.00	0.07	0.00	0.00
Indane	0.04	0.00	0.33	0.07	0.00	0.00	0.04	0.00	0.00
1,3-Diethylbenzene	0.00	0.00	0.16	0.10	0.00	0.00	0.05	0.00	0.00
1,4-Diethylbenzene	0.00	0.00	0.47	0.28	0.00	0.00	0.16	0.11	0.13
n-Butylbenzene	0.00	0.00	0.18	0.14	0.00	0.00	0.00	0.00	0.00
1,2-Diethylbenzene	0.00	0.00	0.00	0.09	0.00	0.00	0.07	0.00	0.00
Undecane	0.18	0.54	1.33	0.52	0.39	0.00	0.39	0.45	0.49
Naphthalene	0.00	0.38	0.00	1.92	0.00	0.00	1.24	0.41	1.21
Dodecane	0.40	0.37	0.45	1.32	0.86		0.98	0.80	0.99
Hexylbenzene	0.00	0.00	0.00	4.06	0.00	0.00	0.27	0.00	0.00
TOTAL VOC	**37.48**	**67.94**	**992.45**	**80.16**	**145.41**	**507.79**	**183.51**	**441.94**	**296.95**
Sample Volume (mL) :	246.00	489.00	246.00	270.00	498.00	489.00	489.00	545.00	495.00

Table A-24

Description	burn (14:58)	burn (14:58)	burn (15:18)	burn (15:18)	post-burn (15:28)	post-burn (15:32)	post-burn (15:36)	post-burn (15:10)
VOC CONCENTRATION (µg/m3)	Convairplume	Convairplume	Convairfahr pl	Convairfahr pl	Convairplume	Convairplume	Convairplume	Convairplume
Compound Location	9mi DW	9mi DW	18mi DW/200'	18mi DW/200'	6mi DW/1100'	9mi DW/1400'	6mi DW/1700'	12mi DW/1500'
Propene	18.28	6.51	8.79	10.12	0.26	0.24	0.26	0.57
Propane	0.30	0.14	0.00	0.00	0.15	0.00	0.18	0.19
Freon22 (Chlorodifluoromethane)	0.84	0.62	0.40	0.65	0.00	0.81	0.74	
Propyne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloromethane	0.43	0.22	0.89	0.33	0.84	0.97	1.02	1.07
Isobutane (2-Methylpropane)	0.28	0.21	0.00	0.00	0.70	0.65	0.84	0.31
Freon114 (1,2-Dichlorotetrafluoroethane	0.22	0.22	0.23	0.24	0.24	0.23	0.43	0.22
1-Butene/2-Methylpropene	0.74	0.69	0.71	0.46	0.64	0.53	0.88	1.66
1,3-Butadiene	0.00	0.06	0.00	0.00	0.15	0.00	0.00	0.00
Butane	0.83	0.92	0.16	0.16	2.63	2.87	3.69	3.06
t-2-Butene	0.00	0.04	0.00	0.00	0.00	0.00	0.08	0.25
2,2-Dimethylpropane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Butene	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.35
1-Pentene	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.17
Pentane	0.90	1.09	0.00	0.00	2.48	2.93	3.35	0.54
Isoprene (2-Methyl-1,3-Butadiene)	0.00	0.00	0.00	0.00	0.17	0.13	0.12	0.24
t-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloromethane	20.33	18.00	19.15	15.37		166.76	90.87	
2,2-Dimethylbutane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cyclopentane	0.11	0.12	0.00	0.00	0.24	0.30	0.34	0.08
2,3-Dimethylbutane	0.20	0.22	0.11	0.10	0.89	0.77	1.22	2.23
t-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylpentane	0.56	0.61	0.08	0.06	1.38	1.58	1.99	1.46
c-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylpentane	0.41	0.46	0.00	0.04	0.90	0.99	1.26	0.52
1-Hexene/2-Methyl-1-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
Hexane	0.85	0.80	0.16	0.15	1.75	2.02	2.24	0.63
t-2-Hexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-3-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Hexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-3-Methyl-2-Pentene	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,2-Dimethylpentane	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
1,2-Dichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Methylcyclopentane	0.43	0.46	0.00	0.00	0.85	1.06	1.16	0.21
2,4-Dimethylpentane	0.21	0.22	0.14	0.13	0.84	0.73	1.18	2.41
1,1,1-Trichloroethane	0.72	0.75	0.74	0.73	0.74	0.72	0.70	0.75
2,2,3-Trimethylbutane	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.16
Benzene	0.51	0.52	0.11	0.08	1.08	0.91	1.08	0.50
Cyclohexane	0.31	0.31	0.00	0.00	0.54	0.70	0.89	0.14
2-Methylhexane	0.11	0.10	0.00	0.00	0.18	0.21	0.25	0.16
2,3-Dimethylpentane	0.17	0.18	0.10	0.09	0.50	0.46	0.60	1.30
Cyclohexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylhexane	0.20	0.20	0.00	0.00	0.32	0.39	0.54	0.37
1-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00
2,2,4-Trimethylpentane	2.67	2.84	2.00	1.94	9.30	8.81	14.57	28.55
t-3-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heptane	0.40	0.44	0.02	0.02	0.65	0.75	0.86	0.27
t-2-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,2-Dimethylhexane	0.00	0.01	0.00	0.00	0.00	0.03	0.03	0.00
Methylcyclohexane	0.58	0.62	0.00	0.00	0.83	0.99	1.13	0.22
2,5-Dimethylhexane	0.40	0.40	0.27	0.26	1.06	0.98	1.73	3.63
2,4-Dimethylhexane	0.55	0.55	0.38	0.37	1.28	1.27	2.07	4.64
2,3,4-Trimethylpentane	1.06	1.12	0.77	0.76	2.54	2.48	4.27	9.12
Toluene	2.33	2.38	1.64	1.97	4.11	3.53	5.61	11.01
2-Methylheptane	0.11	0.12	0.00	0.00	0.15	0.16	0.21	0.15
4-Methylheptane	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00
1-Methylcyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylheptane	0.10	0.10	0.00	0.00	0.12	0.14	0.19	0.13
c-1,3-Dimethylcyclohexane	0.09	0.09	0.00	0.00	0.10	0.12	0.13	0.05
t-1,4-Dimethylcyclohexane	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00
2,2,5-Trimethylhexane	0.48	0.50	0.34	0.33	0.99	1.04	2.06	4.45
1-Octene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
Octane	0.16	0.18	0.02	0.01	0.17	0.20	0.22	0.11
c-1,4/t-1,3-Dimethylcyclohexane	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Octene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
Ethylbenzene	0.14	0.10	0.13	0.17	0.12	0.08	0.10	0.16
m/p-Xylene	0.20	0.18	0.15	0.38	0.22	0.18	0.21	0.30
Styrene	4.30	4.91	3.22	4.22	3.73	2.20	2.34	6.05
o-Xylene	0.07	0.07	0.06	0.13	0.09	0.06	0.07	0.11
Nonane	0.10	0.10	0.00	0.00	0.09	0.07	0.08	0.10
iso-Propylbenzene	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
3,6-Dimethyloctane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n-Propylbenzene	0.00	0.00	0.45	0.05	0.05	0.00	0.00	0.09
3-Ethyltoluene	0.05	0.05	0.04	0.17	0.05	0.03	0.04	0.07
4-Ethyltoluene	0.03	0.02	0.02	0.09	0.04	0.02	0.02	0.05
1,3,5-Trimethylbenzene	0.05	0.03	0.03	0.13	0.05	0.03	0.03	0.06
2-Ethyltoluene	0.03	0.03	0.02	0.08	0.03	0.02	0.02	0.04
1,2,4-Trimethylbenzene	0.18	0.14	0.14	0.83	0.14	0.09	0.10	0.21
Decane	0.18	0.15	0.12	0.16	0.17	0.10	0.12	0.28
iso-Butylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sec-Butylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,2,3-Trimethylbenzene	0.07	0.06	0.05	0.15	0.06	0.04	0.04	0.09
p-Cymene	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.19
1,2-Dichlorobenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
Indene	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
1,3-Diethylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1,4-Diethylbenzene	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.21
n-Butylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
1,2-Diethylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
Undecane	0.45	0.33	0.29	0.38	0.46	0.27	0.33	0.81
Naphthalene	0.27	0.00	0.21	0.00	1.15	0.00	0.47	1.58
Dodecane	0.57	0.73	0.58	0.57	1.77	0.72	0.88	1.97
Hexylbenzene	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.73
TOTAL VOC	**63.66**	**50.25**	**42.71**	**41.89**	**48.46**	**211.35**	**155.14**	**95.78**
Sample Volume (mL) :	497.00	492.00	497.00	495.00	489.00	498.00	498.00	489.00

Table A-24

Description	post-burn (16:23)	post-burn (16:23)	post residue (16:34)	post-burn	lot blank	blank	blank	blank	unused
VOC CONCENTRATION (µg/m3)	Convair	Convair	Convair	R/C H-1	CCG 206				
Compound Location	background	background		static blank					
Propene	0.00	0.00	0.66	1.14	0.00	0.71	0.81	0.00	0.00
Propane	0.00	0.00	0.00	0.77	0.00	0.13	0.13	0.18	0.00
Freon22 (Chlorodifluoromethane)	10.20	9.82	1.64	1.36	0.00	0.00	0.18	0.00	4.57
Propyne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloromethane	0.95	0.92	0.75	0.73	0.06	0.37	0.22	0.09	0.60
Isobutane (2-Methylpropane)	0.17	0.17	0.00	0.38	0.33	0.16	0.07	0.10	0.00
Freon114 (1,2-Dichlorotetrafluroethane	0.23	0.22	0.22	0.23	0.27	0.56	0.30	0.35	7.86
1-Butene/2-Methylpropene	0.31	0.28	1.82	4.61	0.09	1.32	1.54	0.27	8.23
1,3-Butadiene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Butane	0.81	0.73	0.37	0.70	0.07	0.14	0.15	0.21	3.79
t-2-Butene	0.00	0.00	0.21	0.14	0.00	0.12	0.08	0.00	0.00
2,2-Dimethylpropane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Butene	0.00	0.00	0.27	0.13	0.00	0.10	0.08	0.00	0.00
1-Pentene	0.00	0.00	0.18	0.36	0.00	0.26	0.47	0.03	0.00
Pentane	0.10	0.09	0.07	1.03	0.03	0.13	0.08	0.17	2.45
Isoprene (2-Methyl-1,3-Butadiene)	0.13	0.11	0.12	0.38	0.00	0.00	0.00	0.00	0.00
t-2-Pentene	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00
c 2 Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloromethane	585.47	571.80	387.71	1.87	0.20	0.63	0.34	0.25	6.88
2,2-Dimethylbutane	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00
Cyclopentane	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00
2,3-Dimethylbutane	0.49	0.50	0.22	0.13	0.00	0.00	0.00	0.00	0.00
t 4 Methyl 2 Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-Methylpentane	0.22	0.21	0.49	0.52	0.01	0.20	0.17	0.07	0.50
c-4-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylpentane	0.20	0.17	0.00	0.43	0.00	0.33	0.00	0.00	0.00
1-Hexene/2-Methyl-1-Pentene	0.00	0.00	0.14	0.37	0.00	0.24	0.41	0.00	0.00
Hexane	0.23	0.16	0.12	2.18	0.10	8.77	0.22	0.30	4.23
t-2-Hexene	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00
t-3-Methyl-2-Pentene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Hexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-3-Methyl-2-Pentene	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00
2,2-Dimethylpentane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,2-Dichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Methylcyclopentane	0.00	0.00	0.00	0.44	0.00	0.98	0.06	0.05	0.00
2,4-Dimethylpentane	0.55	0.55	0.23	0.07	0.00	0.00	0.00	0.00	0.00
1,1,1-Trichloroethane	0.89	0.73	0.66	1.72	0.00	0.08	0.00	0.00	0.00
2,2,3-Trimethylbutane	0.00	0.00	0.23	0.14	0.00	0.07	0.07	0.00	0.00
Benzene	0.13	0.14	0.11	23.43	0.03	0.10	0.08	0.06	1.05
Cyclohexane	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00
2-Methylhexane	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00
2,3-Dimethylpentane	0.33	0.28	0.13	0.10	0.00	0.00	0.00	0.00	0.00
Cyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylhexane	0.04	0.04	0.00	0.33	0.12	0.18	0.00	0.00	0.00
1-Heptene	0.00	0.00	0.00	0.33	0.00	0.30	0.57	0.00	0.00
2,2,4-Trimethylpentane	7.88	7.57	3.27	0.20	0.00	0.00	0.09	0.03	1.10
t-3-Heptene	0.00	0.00	0.04	0.03	0.00	0.02	0.07	0.00	0.00
Heptane	0.00	0.00	0.03	0.37	0.00	0.17	0.14	0.18	0.00
t-2-Heptene	0.00	0.00	0.09	0.11	0.00	0.00	0.26	0.00	0.00
c-2-Heptene	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00
2,2-Dimethylhexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Methylcyclohexane	0.00	0.00	0.00	0.17	0.00	0.10	0.10	0.10	0.00
2,5-Dimethylhexane	0.90	0.87	0.38	0.00	0.00	0.00	0.00	0.00	0.00
2,4-Dimethylhexane	1.22	1.12	0.47	0.00	0.00	0.00	0.00	0.00	0.00
2,3,4-Trimethylpentane	2.43	2.34	0.95	0.04	0.00	0.00	0.00	0.00	0.00
Toluene	3.78	3.49	1.88	3.28	0.05	0.20	0.19	0.13	2.36
2-Methylheptane	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00
4-Methylheptane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-Methylcyclohexene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-Methylheptane	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.05	0.00
c-1,3-Dimethylcyclohexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-1,4-Dimethylcyclohexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,2,5-Trimethylhexane	1.07	1.06	0.42	0.00	0.00	0.00	0.00	0.00	0.00
1-Octene	0.00	0.00	0.00	0.24	0.00	0.46	1.02	0.00	0.00
Octane	0.02	0.01	0.02	0.29	0.00	0.10	0.10	0.14	0.00
c-1,4/t-1,3-Dimethylcyclohexane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c-2-Octene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ethylbenzene	0.07	0.07	0.07	0.24	0.00	0.05	0.05	0.04	0.00
m/p-Xylene	0.18	0.13	0.19	0.75	0.04	0.15	0.13	0.12	2.00
Styrene	2.46	1.81	1.22	0.00	0.00	0.00	0.00	0.00	0.00
o-Xylene	0.07	0.05	0.06	0.25	0.00	0.05	0.05	0.04	0.00
Nonane	0.00	0.00	0.05	0.48	0.00	0.15	0.15	0.10	0.00
iso-Propylbenzene	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00
3,6-Dimethyloctane	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00
n-Propylbenzene	0.00	0.00	0.03	0.22	0.00	0.07	0.06	0.01	0.00
3-Ethyltoluene	0.04	0.02	0.04	0.32	0.00	0.06	0.04	0.04	0.00
4-Ethyltoluene	0.02	0.02	0.03	0.19	0.00	0.03	0.03	0.00	0.00
1,3,5-Trimethylbenzene	0.04	0.03	0.03	0.02	0.00	0.05	0.03	0.02	0.00
2-Ethyltoluene	0.02	0.02	0.00	0.18	0.00	0.03	0.02	0.02	0.00
1,2,4-Trimethylbenzene	0.13	0.08	0.13	1.04	0.00	1.22	0.41	0.06	0.00
Decane	0.10	0.08	0.13	1.62	0.00	0.20	0.13	0.08	0.00
iso-Butylbenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sec-Butylbenzene	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
1,2,3-Trimethylbenzene	0.05	0.03	0.04	0.48	0.00	0.06	0.04	0.00	0.00
p-Cymene	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00
1,2-Dichlorobenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Indane	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00
1,3-Diethylbenzene	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00
1,4-Diethylbenzene	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00
n-Butylbenzene	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00
1,2-Diethylbenzene	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00
Undecane	0.29	0.23	0.33	5.11	0.00	0.28	0.13	0.10	0.00
Naphthalene	0.52	0.48	0.72	0.97	0.00	0.00	0.00	0.00	0.00
Dodecane	0.79	0.56	1.11	3.76	0.00	0.34	0.16	0.08	0.00
Hexylbenzene	0.00	0.00	0.37	2.40	0.00	0.00	0.31	0.00	0.00
TOTAL VOC	**623.58**	**606.97**	**408.66**	**68.91**	**1.40**	**19.67**	**10.32**	**3.48**	**45.62**
Sample Volume (mL)	489.00	513.00	489.00	489.00	504.00	489.00	489.00	489.00	20.00

Table A25 - Water Sample Analysis

	water samples during burn					pre-burn water samples						first half burn water samples						second half burn samples						post-burn samples			
sample number	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Compound	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)	(µg/L H_2O)
naphthalene	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.15	0.15	0.10	0.10	0.10	0.10	0.15	0.00	0.11	0.12	0.00	0.15
2-mehtyl-naphthalene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-methyl-naphthalene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
biphenyl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,6-dimethyl-napthalene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
acenaphthylene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
acenaphthene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2,3,5-trimethyl-napthalene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
fluorene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
dibenzothiophene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
phenanthrene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1-methyl-phenanthrene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
fluoranthene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
pyrene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
benz(a)anthracene/chrysene *	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
benz(b)fluoranthene/b(k)fluor.*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
benzo(e)pyrene/benzo(a)pyrene*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perylene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
indeno(1,2,3-cd) pyrene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
dibenz (a,h) anthracene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
benzo (ghi) perylene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total PAH	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.15	0.15	0.10	0.10	0.10	0.10	0.15	0.00	0.11	0.12	0.00	0.15
Recovery Check	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Compound	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery	% recovery
d10-acenaphthalene	50	50	40	50	60	40.0	40.0	40.0	40.0	40.0	80.0	40.0	50.0	60.0	50.0	40.0	50.0	60	40	50	50	50	30	50.0	30.0	40.0	40.0
d10-phenanthrene	60	60	50	70	70	50.0	60.0	50.0	60.0	50.0	100.0	50.0	60.0	70.0	70.0	50.0	70.0	70	50	60	60	70	40	70.0	40.0	50.0	50.0
d12-benz(a)anthracene	70	70	50	80	70	60.0	80.0	60.0	70.0	70.0	140.0	70.0	70.0	90.0	80.0	60.0	80.0	80	50	70	70	80	40	80.0	50.0	60.0	60.0
d12-perylene	60	70	40	70	60	60.0	70.0	50.0	60.0	60.0	110.0	70.0	70.0	80.0	80.0	60.0	80.0	70	50	60	60	70	40	80.0	40.0	50.0	50.0

*: Compounds are reported in pairs due to a lack in resolution of the signal.

**Legend: BR1, Burn #1, B1,Boat #1, CS, Control seawater, M96, 96 hr Menidia test endpoint sample
BR2, Burn #2, B2,Boat #2, BG, Background, EB, Early burn, LB, Late burn
B4, Boat 4