AP42 Section: 11.1

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Title: Test Report For Air Pollution Source Testing At Macasphalt, Melbourne, Florida,

Ramcon Environmental Corporation, Memphis, TN,

December 2-4, 1992.

AP-42 Section 11.1
Reference
Report Sect. 4
Reference 49

Test Report for Air Pollution Source Testing

at

MACASPHALT
MELBOURNE, FLORIDA

and

NATIONAL ASPHALT PAVEMENT ASSOCIATION
5100 FORBES BLVD., NAPA BUILDING
LANHAM, MARYLAND

submitted by:

RAMCON ENVIRONMENTAL CORPORATION
6707 FLETCHER CREEK COVE
MEMPHIS, TENNESSEE 38133

December 2-4, 1992

Mr. Tom Brumagin
National Asphalt Pavement
Association

William Joseph Sewell, II
Vice President

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I. INTRODUCTION

On January 2, 3 and 4, 1993, personnel from RAMCON Environmental Corporation conducted source emissions determinations at Macasphalt located in Melbourne, Florida. The testing was conducted according to the National Asphalt Pavement Association (NAPA) guidelines entitled, "Protocol for Air Pollution Source Testing".

The scope of work involved testing this facility for filterable and condensible particulate matter, formaldehyde, and polynuclear aromatic hydrocarbons. These compounds were sampled according to specified isokinetic testing procedures. Reference Method 202 was employed for the particulate matter including condensibles. Method 0011/8315 issued in SW-846 was utilized for the formaldehyde extraction, collection, and analysis. The polynuclear aromatic hydrocarbons were sampled using Modified Method 5.

In addition, "real-time" continuous emission monitor (CEM) instrumentation was utilized to conduct on-site analysis for oxygen, carbon dioxide, total volatile organics, sulfur dioxide, carbon monoxide, and NOx. Reference Methods 3A, 6C, 7E, 10, and 25A were employed for the analysis of oxygen and carbon dioxide, sulfur dioxide, nitrogen oxides, carbon monoxide, and total hydrocarbons respectively. These testing procedures utilize a sampling system to continuously extract sample gas from the source. This sample stream is routed to individual CEM's for analysis of the various targeted pollutants and diluent gases. The test results are based on the average value of one minute averages generated by the CEM instrument data acquisition during the test periods.

Methane, benzene, toluene, ethyl benzene, and xylene compounds were analyzed on a semi-continuous basis by employing a gas chromatograph to the sampling location. Reference Method 18 was used for these determinations. The gas stream is continuously sampled during the testing period(s). Periodically, a sample of the extracted gas stream is injected into the gas chromatograph for analysis. The test results are based on the average value of the injections performed during each test period.

Additionally stack gas moisture, velocity, and volumetric flow rate were determined to provide data enabling conversion of flue gas concentrations to emission data. These determinations were conducted in conjunction with each of the isokinetic testing procedures.

Where possible, the testing was conducted simultaneously. This provides correlations of the various stack effluents relationships with one another. Three (3) test runs were conducted for each isokinetic testing procedure. Eleven test runs were conducted utilizing the CEM instrumental procedures for SO_2, CO, THC, NOx, CO_2, and O_2. Nine (9) test periods were conducted for the semi-continuous GC procedure.

The purpose of the testing project was to provide air emissions information for developing a database of information using various types of hot mix asphalt plants.

Mr. Thomas E. Brumagin representing the National Asphalt Pavement Association was present during the testing procedure(s) conducted by RAMCON Environmental Corporation.

II. TEST RESULTS

The test results are summarized in Tables I through III. Each summary table represents the test results for particulate, formaldehyde, and PAH's respectively. The gaseous pollutants of interest, THC, SO_2, CO_2, CO, NOx, O_2, CH_4, and BTEX, test results are listed in each summary table. The test results for these gaseous compounds listed on each summary table were correlated to the isokinetic tests according to date and times. This provides a direct comparison of the test data for a specific targeted pollutant to other operational and emission data.

The summary tables provide the test results in concentration values of milligrams per dry standard cubic meter (mg/dscm) and parts per million (ppm), volume basis. The emission values of all targeted compounds are listed in pounds per hour (lb/hr).

TABLE I — Summary of Results

Test Performed: Run No.: Date: Time: Production Rate: Amount of RAP:	Part. 1 12-02-02 1418-1521 154	Part. 2 12-03-92 1459-1618 153	Part. 3 12-04-92 0826-1058 146	Part. Average tph %	Part. 1 12-02-02 1418-1521 154	Part. 2 12-03-92 1459-1618 153	Part. 3 12-04-92 0826-1058 146	Part. Average tph %	Part. 1 12-02-02 1418-1521 154	Part. 2 12-03-92 1459-1618 153	Part. 3 12-04-92 0826-1058 146	Part. Average tph %
Volumetric Flow Rate (acfm)	44975	43624	42933	43844	44975	43624	42933	43844	44975	43624	42933	43844
Volumetric Flow Rate (dscfm)	25452	26549	25721	25907	25452	26549	25721	25907	25452	26549	25721	25907
Stack Temperature (°F)	272	264	264	267	272	264	264	267	272	264	264	267
Percent Moisture	21.78	16.83	18.07	18.89	21.78	16.83	18.07	18.89	21.78	16.83	18.07	18.89
% CO_2	5.5	4.2	4.8	4.8	5.5	4.2	4.8	4.8	5.5	4.2	4.8	4.8
% O_2	14.4	15.1	15.1	14.9	14.4	15.1	15.1	14.9	14.4	15.1	15.1	14.9
% CO	0.007	0.005	0.007	0.006	0.007	0.005	0.007	0.006	0.007	0.005	0.007	0.006
% Excess Air	213.3	243.3	249.6	235.4	213.3	243.3	249.6	235.4	213.3	243.3	249.6	235.4
	mg/m^3				ppm$_v$				lbs/hr			
CO	80.3	61.2	80.9	74.1	68.9	52.5	69.4	63.6	7.63	6.07	7.77	7.16
SO_2	398.4	353.9	317.1	356.5	149.5	132.8	119.0	133.87	37.88	35.10	30.47	34.48
NO_x	254.3	243.6	267.6	255.2	132.9	127.3	139.8	133.3	24.18	24.16	25.71	24.68
Total Hydrocarbon (as CH_4)	66.4	50.4	64.4	60.4	99.5	75.5	96.7	90.6	6.32	5.00	6.20	5.84
Methane	6.60	0.37	6.02	4.33	9.88	0.57	9.02	6.49	0.63	0.04	0.58	0.42
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Particulate Matter	130.9	122.2	162.8	138.6	N/A	N/A	N/A	N/A	12.46	12.13	15.65	13.41
Condensible Particulate	89.2	40.8	79.6	69.9	N/A	N/A	N/A	N/A	8.49	4.05	7.65	6.73

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TABLE II — Summary of Results

Test Performed: Run No.: Date: Time: Production Rate: Amount of RAP:	Form. 1 12-04-92 1149-1304 134	Form. 2 12-04-92 1303-1404 151	Form. 3 12-04-92 1448-1602 150	Form. Average tph %	Form. 1 12-04-92 1149-1304 134	Form. 2 12-04-92 1303-1404 151	Form. 3 12-04-92 1448-1602 150	Form. Average tph %	Form. 1 12-04-92 1149-1304 134	Form. 2 12-04-92 1303-1404 151	Form. 3 12-04-92 1448-1602 150	Form. Average tph %
Volumetric Flow Rate (acfm)	41638	47542	44796	44658	41638	47542	44796	44658	41638	47542	44796	44658
Volumetric Flow Rate (dscfm)	24469	27036	25632	25712	24469	27036	25632	25712	24469	27036	25632	25712
Stack Temperature (°F)	268	284	264	272	268	284	264	272	268	284	264	272
Percent Moisture	19.19	20.08	21.75	20.34	19.19	20.08	21.75	20.34	19.19	20.08	21.75	20.34
% CO_2	4.8	4.8	4.7	4.8	4.8	4.8	4.7	4.8	4.8	4.8	4.7	4.8
% O_2	15.0	15.0	15.3	15.1	15.0	15.0	15.3	15.1	15.0	15.0	15.3	15.1
% CO	.014	.014	.017	.015	.014	.014	.017	.015	.014	.014	.017	.015
% Excess Air	242.8	242.8	262.6	249.4	242.8	242.8	262.6	249.4	242.8	242.8	262.6	249.4
	mg/m^3				ppm_v				lbs/hr			
CO	161.2	161.2	201.4	174.6	138.4	138.4	172.9	149.9	14.74	16.29	19.29	16.77
SO_2	389.4	389.4	346.2	375.0	146.1	146.1	129.9	140.7	35.59	39.33	33.15	36.02
NO_x	245.2	245.2	212.8	234.4	128.1	128.1	111.2	122.5	22.41	24.76	20.38	22.52
Total Hydrocarbon (as CH_4)	79.7	80.5	95.6	85.3	119.4	120.7	143.3	127.8	7.28	8.13	9.16	8.19
Methane	4.18	14.02	15.01	11.1	6.27	21.02	22.50	16.60	0.38	1.42	1.44	1.08
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Formaldehyde	0.046	3.210	0.459	1.238	0.04	2.6	0.3	1.0	0.004	0.32	0.04	0.121

TABLE III-A — Summary of Results

Test Performed: Run No.: Date: Time: Production Rate: Amount of RAP:	PAH 1 12-03-92 1025-1222 142	PAH 2 12-03-92 1255-1639 153	PAH 3 12-04-92 0811-1126 149	PAH Average tph %	PAH 1 12-03-92 1025-1222 142	PAH 2 12-03-92 1255-1639 153	PAH 3 12-04-92 0811-1126 149	PAH Average tph %	PAH 1 12-03-92 1025-1222 142	PAH 2 12-03-92 1255-1639 153	PAH 3 12-04-92 0811-1126 149	PAH Average tph %
Volumetric Flow Rate (acfm)	48903	47642	46984	47843	48903	47642	46984	47843	48903	47642	46984	47843
Volumetric Flow Rate (dscfm)	28197	28131	27299	27875	28197	28131	27299	27875	28197	28131	27299	27875
Stack Temperature (°F)	280	266	266	270	280	266	266	270	280	266	266	270
Percent Moisture	19.46	19.08	20.32	19.62	19.46	19.08	20.32	19.62	19.46	19.08	20.32	19.62
% CO_2	4.6	4.5	4.8	4.6	4.6	4.5	4.8	4.6	4.6	4.5	4.8	4.6
% O_2	14.4	14.9	15.1	14.8	14.4	14.9	15.1	14.8	14.4	14.9	15.1	14.8
% CO	0.004	0.005	0.007	0.005	0.004	0.005	0.007	0.005	0.004	0.005	0.007	0.005
% Excess Air	206.1	233.5	249.6	229.7	206.1	233.5	249.6	229.7	206.1	233.5	249.6	229.7
	mg/m^3				ppm$_v$				lbs/hr			
CO	51.6	58.4	80.9	63.6	44.3	50.1	69.4	54.6	5.44	6.13	8.25	6.60
SO_2	399.8	363.0	317.1	359.9	150.0	136.2	119.0	135.0	42.11	38.15	32.34	37.53
NO_x	274.8	249.9	267.6	264.1	143.6	130.6	139.8	138.0	29.0	26.27	27.29	27.52
Total Hydrocarbon (as CH_4)	67.0	52.2	66.3	61.8	100.6	78.2	99.4	92.7	7.06	5.49	6.76	6.43
Methane	BDL	0.38	6.19	2.19	BDL	0.58	9.27	3.28	BDL	0.04	0.63	0.22
Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethyl Benzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

TABLE III-B — Summary of Results

Test Performed:	PAH	PAH	PAH	PAH	PAH	PAH	PAH	PAH	PAH	PAH	PAH	PAH
Run No.:	1	2	3		1	2	3		1	2	3	
Date:	12-02-92	12-03-92	12-04-92	Average	12-02-92	12-03-92	12-04-92	Average	12-02-92	12-03-92	12-04-92	Average
Time:	1025-1222	1255-1639	0811-1126		1025-1222	1255-1639	0811-1126		1025-1222	1255-1639	0811-1126	
Production Rate:	142	153	149	tph	142	153	149	tph	142	153	149	tph
Amount of RAP:				%				%				%
PAH's	mg/m^3				ppm$_v$				lbs/hr			
Naphthalene	0.0564	0.0489	0.0843	0.0632	0.0106	0.0092	0.0158	0.0119	0.0060	0.0052	0.0086	0.0066
2-Methylnaphthalene	0.0815	0.0711	0.1002	0.0843	0.0138	0.0120	0.0170	0.0143	0.0086	0.0075	0.0103	0.0088
2-Chloronaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Acenaphthylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluorene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Phenanthrene	BDL	0.0691	0.0380	0.0357	BDL	0.0093	0.0051	0.0048	BDL	0.0073	0.0039	0.0037
Anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Fluoranthene	0.0144	0.0698	0.0203	0.0348	0.0017	0.0083	0.0024	0.0041	0.0015	0.0074	0.0021	0.0037
Pyrene	0.0187	0.1937	0.0233	0.0786	0.0022	0.0231	0.0028	0.0094	0.0020	0.0204	0.0024	0.0083
Benzo(a)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chrysene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(b)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(k)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(e)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(a)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Indeno(1,2,3-cd)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibenz(a,h)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo(g,h,i)perylene	0.0054	BDL	BDL	0.0018	0.0005	BDL	BDL	0.0002	0.0006	BDL	BDL	0.0002
Total PAH's	0.1764	0.4526	0.2661	0.2966	0.0288	0.0619	0.0431	0.0445	0.0187	0.0478	0.0273	0.0311

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III. SAMPLING & ANALYTICAL PROCEDURES

The following is a description of each of the test methods that were conducted during the performance test(s). In this description, a discussion of the pertinent segments including preparation, sampling, and analysis is addressed. This section will provide information supporting the validity of the samples.

A. Determination of Carbon Dioxide and Oxygen Emissions From Stationary Sources (Instrumental Analyzer Procedure) - US EPA Method 3A:

The collection and analysis of carbon dioxide and oxygen content at the test location was performed by US EPA Reference Method 3A. This procedure utilizes continuous emissions monitors that provide the data results from the source on a "real-time" or instantaneous basis.

All of the CEM instrumental procedures that were conducted at the outlet testing location were extracted and analyzed with similar testing strategies. Because of this similarity, a detailed description of the calibration and operation procedures of the CEM procedures is provided in the discussion of Method 3A and is referred to in the other sections concerning the additional procedures.

1. Calibration.

The calibration of the instruments is performed using certified gas standards composed of a known concentration of carbon dioxide and oxygen in zero grade nitrogen. These gas standards are prepared using partial pressure/volumetric and gravimetric methods.

The prepared gas mixture is analyzed and the certification tolerance is not greater than 2% of the pollutant component. A copy of the analysis certificate for each of the certified gas mixtures used during the testing is included in the test report.

The oxygen instrument utilizes an paramagnetic detector and the carbon dioxide instrument utilizes a nondispersive infrared detector. The minimum detection limit for both gas analyzers is 0.1 %. The fullscale limitations of the oxygen and carbon dioxide analyzers is 25 and 20 % respectively.

Immediately prior to each compliance test series, a complete calibration of the instrument is performed. Each instrument has zero grade nitrogen injected into it and the zero potentiometer is adjusted, if necessary, until the proper voltage output from the analyzer is achieved.

Then a high range pollutant gas mixture, that has been prepared in the specified range percentage of the span or fullscale, is injected. After the system stabilizes, the span or fullscale potentiometer is adjusted until the voltage output from analyzer corresponds to the certification of analysis for the respective calibration gas.

When this procedure is complete and the system has responded properly to a zero and fullscale reading, a mid and/or low range certified calibration gas is injected into the system. No adjustments are made to the system except to achieve proper flow rate through the analyzer. The analyzer, after reaching a stable value, must correspond to the certified value of the calibration gas within a specified percentage of the fullscale.

This mid range calibration gas serves two purposes of quality control and quality assurance. The first is to show that the instrument analyzes and outputs data on a linear scale. The second purpose is to validate that the zero and fullscale values of the instrument are properly set.

Prior to sampling, a single calibration gas was injected into the probe inlet. This calibration gas is usually a mixture of oxygen and carbon dioxide in a balance of zero nitrogen. The system is not adjusted except to achieve proper flow through the analyzers. The calibration standard is allowed to traverse the sampling system. The response of the analyzer during this bias check must agree with the initial analyzer response of this standard within the specified tolerances set forth in the test method. This system bias check serves to demonstrate that the sample train is leak free and causes no interference to the integrity of the sample.

2. Sampling.

After calibration, the system is purged with zero grade nitrogen to remove any pollutants that were injected as calibration gas. Once the system indicates that the pollutant gases have been removed, the calibration valve assembly is positioned to allow stack gas to flow through the instrument.

The sample gas is filtered at the stack position to remove any particulate matter. This prevents instruments from being contaminated and ensures reliable data acquisition.

All samples injected to the instruments are removed from the stack and delivered to the instruments via a heated probe and sample line. This prevents any condensation of water vapor and/or pollutant in the gas stream. Once the sample gas exits the sample line, the stream is separated in a sample gas manifold. The split stream enables analysis of the CEM instrumentation on both wet and dry basis as necessary.

The portion of the sample gas dedicated to the dry basis analyzers is directed into a gas conditioning system where the moisture content of the stream is removed. The sample gas that exits the gas conditioning system is then routed to the instruments for analysis on a dry basis.

To demonstrate that the instrument did not exhibit any deviation from the calibrated values set at the beginning of a test period, a sample of certified calibration gas is injected into the sampling system at the conclusion of each test run. The sample system must respond within specified tolerance limits according to the initial system bias check.

This post-test calibration serves two purposes: (1) it demonstrates that excessive calibration drift of the instrument(s) did not occur during the test period and, (2) that the system was not contaminated with any foreign material from the source to alter any results during the test period.

3. Data Acquisition.

The CEM monitors utilized in the testing project output a voltage signal corresponding to the pollutant concentration determined by the detector. This signal is relayed to a computerized datalogger system. This system retrieves the output signal from each monitor every 10 seconds. This data is then averaged on a per minute basis and stored on the hard drive of the computer. Additionally, a strip chart recorder is employed to record the data. This device records the instrument output on a one minute, instantaneous basis.

The data listing for all of the analyzers, for each testing period, is provided in another section. This listing provides the data results as recorded by the computerized datalogger system.

B. Determination of Nitrogen Oxides Emissions From Stationary Sources (Instrumental Analyzer Procedure) - US EPA Method 7E:

The calibration, sampling, and data acquisition procedures are similar to that of Method 3A. Listed below are any deviations or differences that were incurred specifically in this testing procedure.

The calibration of the instruments is performed using certified gas standards composed of a known concentration of nitrogen oxide in zero grade nitrogen. These gas standards are prepared using partial pressure/volumetric and gravimetric methods.

The prepared gas mixture is analyzed and the certification tolerance is not greater than 2% of the pollutant component. A copy of the analysis certificate for each of the certified gas mixtures used during the testing is included in the test report.

The instrument utilizes an chemiluminescent detector. The detection limitation of the analyzer is 0.1 ppm. Multiple fullscale ranges are available for operation. A 250, 1000, 2500, and 10,000 ppm fullscale may be selected according to the concentrations of NOx present in the gas steam. The analyzers were calibrated using standards that were the appropriate percentage of fullscale according to Method 7E.

The pre-test calibration, system bias, and post-test calibration procedures are identical to those discussed in Reference Method 3A.

C. Determination of Carbon Monoxide Emissions From Stationary Sources (Instrumental Analyzer Procedure) - US EPA Method 10:

1. Calibration.

The calibration of the instruments is performed using certified gas standards composed of a known concentration of carbon monoxide in zero grade nitrogen. These gas standards are prepared using partial pressure/volumetric and gravimetric methods.

The prepared gas mixture is analyzed and the certification tolerance is not greater than 2% of the pollutant component. A copy of the analysis certificate for each of the certified gas mixtures used during the testing is included in the test report.

The instrument utilizes a Luft-type nondispersive infrared detector. Immediately prior to each compliance test series, a complete calibration of the instrument is performed. Each instrument has zero grade nitrogen injected into it and the zero potentiometer is adjusted, if necessary, until the proper voltage output from the analyzer is achieved.

Then a high range pollutant gas mixture, that has been prepared in the specified range percentage of the span or fullscale, is injected. After the system stabilizes, the span or fullscale potentiometer is adjusted until the voltage output from analyzer corresponds to the certification of analysis for the respective calibration gas.

When this procedure is complete and the system has responded properly to a zero and fullscale reading, a mid and low range certified calibration gas is injected into the system. No adjustments are made to the system except to achieve proper flow rate through the analyzer. The analyzer, after reaching a stable value, must correspond to the certified value of the calibration gas within a specified percentage of the fullscale. This mid and low range calibration gas serves two purposes of quality control and quality assurance. The first is to show that the instrument analyzes and outputs data on a linear scale. The second purpose is to validate that the zero and fullscale values of the instrument are properly set.

2. Sampling.

After calibration of the instrument(s) has been completed, a sample bias check is performed. This involves injecting calibration gas into the sample probe inlet and allowing the calibration gas to traverse through the sample train to the analyzer(s) where it is analyzed. This analysis will correspond to the pre-test calibration analysis value of the standard within the tolerances set forth in the reference method.

Once the system indicates that the calibration gases have been removed, the calibration valve assembly is positioned to allow stack gas to flow through the instrument. The sample gas is filtered at the stack position to remove any particulate matter. This prevents instruments from being contaminated and ensures reliable data acquisition.

All samples injected to the instruments are removed from the stack and delivered to the instruments via a heated probe and sample line. This prevents any condensation of water vapor and/or pollutant in the gas stream.

To demonstrate that the instrument did not exhibit any deviation from the calibrated values set at the beginning of a test period, a sample of certified calibration gas is injected into the sampling system at the conclusion of each test run. The sample system must respond within specified tolerance limits according to the initial system bias check.

This post-test calibration serves two purposes: (1) it demonstrates that excessive calibration drift of the instrument(s) did not occur during the test period and, (2) that the system was not contaminated with any foreign material from the source to alter any results during the test period.

D. Determination of Total Gaseous Organic Emissions From Stationary Sources (Instrumental Analyzer Procedure) - US EPA Method 25A:

1. Calibration.

The calibration of the instruments is performed using certified gas standards composed of a known concentration of methane in zero grade nitrogen. These gas standards are prepared using partial pressure/volumetric and gravimetric methods.

The prepared gas mixture is analyzed and the certification tolerance is not greater than 2% of the pollutant component. A copy of the analysis certificate for each of the certified gas mixtures used during the testing is included in the test report.

The instrument utilizes an flame ionization detector. Immediately prior to each compliance test series, a complete calibration of the instrument is performed. Each instrument has zero grade nitrogen injected into it and the zero potentiometer is adjusted, if necessary, until the proper voltage output from the analyzer is achieved.

Then a high range pollutant gas mixture, that has been prepared in the specified range percentage of the span or fullscale, is injected. After the system stabilizes, the span or fullscale potentiometer is adjusted until the voltage output from analyzer corresponds to the certification of analysis for the respective calibration gas.

When this procedure is complete and the system has responded properly to a zero and fullscale reading, a mid and low range certified calibration gas is injected into the system. No adjustments are made to the system except to achieve proper flow rate through the analyzer. The analyzer, after reaching a stable value, must correspond to the certified value of the calibration gas within a specified percentage of the fullscale. This mid and low range calibration gas serves two purposes of quality control and quality assurance. The first is to show that the instrument analyzes and outputs data on a linear scale. The second purpose is to validate that the zero and fullscale values of the instrument are properly set.

2. <u>Sampling</u>.

After calibration, the system is purged with zero grade nitrogen to remove any pollutants that were injected as calibration gas. Once the system indicates that the pollutant gases have been removed, the calibration valve assembly is positioned to allow stack gas to flow through the instrument.

The sample gas is filtered at the stack position to remove any particulate matter. This prevents instruments from being contaminated and ensures reliable data acquisition. All samples injected to the instruments are removed from the stack and delivered to the instruments via a heated probe and sample line. This prevents any condensation of water vapor and/or pollutant in the gas stream. The data obtained from the THC analyzer is therefore on a "wet basis". The data listing must be corrected to a "dry basis" for use in emission determinations, e.g. lb/hr. This correction is conducted utilizing the moisture percentage of the flue gas stream as determined during the test run.

To demonstrate that the instrument did not exhibit any deviation from the calibrated values set at the beginning of a test period, a sample of certified calibration gas is injected into the sampling system at the conclusion of each test run. The sample system must respond within specified tolerance limits according to the initial system bias check.

This post-test calibration serves two purposes: (1) it demonstrates that excessive calibration drift of the instrument(s) did not occur during the test period and, (2) that the system was not contaminated with any foreign material from the source to alter any results during the test period.

E. Total Particulate - US EPA Reference Methods 5:

1. Preparation.

All glassware utilized in each sampling train was thoroughly cleaned and dried prior to each test series. A glass fiber filter was used that had been labeled, desiccated for a minimum of 24 hours and pre-weighed.

The impinger system configuration was assembled using the procedure outlined in Method 5. One hundred ml of deionized water was placed in the first two impingers. The third impinger was initially empty and the fourth impinger contained a pre-weighed amount of silica gel for complete moisture removal.

A stainless steel probe liner and nozzle system was utilized for the total particulate determinations. The probe housed a set of calibrated S-type pitot tubes and a calibrated thermocouple for monitoring stack temperature.

2. Sampling.

The probe and sample box were heated to an approximate temperature of 250 F. These temperatures were monitored throughout the testing. An ice bath was prepared to submerse the impinger system. The temperature of the last impinger was monitored throughout the testing to ensure adequate condensation of the water vapor in the flue gases.

A leak check was performed prior to each test run. The sample train system was subjected to a vacuum that did not exceed 0.02 cfm leakage rate. The vacuum that was established during the pre-test leak check was not exceeded during the test period(s).

When a test run had been completed, a post-test leak check was conducted prior to dismantling of the sampling train. Once this had been successfully achieved, the sample train was dismantled for sample recovery.

The probe and connecting glassware were washed with acetone. The contents of the impingers were volumetrically measured for moisture gain and transferred to a labeled sample container. The glass fiber filter was carefully transferred to its sample container.

3. Analysis.

The glass fiber filter was desiccated for 24 hours prior to any weighing. The acetone probe wash was transferred to a tared beaker and evaporated to dryness. The resultant residue was also desiccated prior to gravimetric analysis.

The first weighing was performed after this initial period of drying. The weights were recorded to 0.0001 g. After a minimum of 6 additional hours of desiccating, a second weighing was conducted. The weights must agree within 0.0005 g or further desiccation must be conducted until the weights stabilize.

Sample field blanks of acetone were collected, contained, labeled and analyzed in conjunction with the samples. The blank weight was deducted from the acetone probe wash residue weight determinations.

F. EPA Draft Method 202, "Determination of Filterable and Condensible Particulate Matter"

The testing procedure was conducted according to Reference Method 5 for particulate matter determination. This testing procedure was covered in a previous section. The filterable portion of the particulate matter was determined via this procedure. The condensible fraction of the sample was determined by analyzing the back half impinger catch with a methylene chloride extraction.

This extraction procedure will yield fractions of inorganic and organic condensible matter. The concentrations and emission values of both filterable particulate and condensible particulate matter have been summarized in the test results section.

G. Polynuclear Aromatic Hydrocarbons - Method SW846 8270 "Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Column Technique

1. Preparation.

All glassware utilized in each sampling train was thoroughly cleaned with hot soapy water and dried prior to each test series. All residue silicon grease was removed from glassware upstream of the absorbent module. A glass fiber filter was used that has been properly labeled.

The absorbent traps was packed by the analytical laboratory that conducted the final analysis.

The impinger system was assembled using 100 ml of D.I. water in impingers 1 and 2. The third impinger was initially empty and the fourth impinger contained silica gel.

In assembling the sample train, teflon tape was placed on the ball joints to ensure adequate sealing upstream of the absorbent module. All connections downstream of the module were sealed with silicon grease.

A glass probe liner and nozzle system was utilized for the collection train. The probe housed a set of calibrated S-type pitot tubes and a calibrated thermocouple for monitoring stack temperature.

2. Sampling.

The probe and sample box was heated to an approximate temperature of 250 F. These temperatures were monitored throughout the testing.

The probe was connected to the heated filter system with connecting glassware. This filter system was connected to the condenser by a teflon line. The condenser and absorbent module are directly connected via ground glass ball and socket.

An ice bath was prepared to submerse the impinger system into. The temperature of the last impinger was monitored throughout the testing to ensure adequate condensation of the water vapor in the flue gases.

The condenser cooling fluid was recirculated through the system by a veristaltic pump. This pump is to be started prior to the start up of the sampling system to ensure that the temperature of the absorbent material in the module does not exceed its thermal decomposition temperature. The temperature of gas entering the module was monitored to ensure that the temperature did not exceed the recommended limitation for efficient capture.

A leak check was performed prior to each test run. The entire sample train system was subjected to a vacuum that did not exceed 0.02 cfm leakage rate. The vacuum that was established during the pre-test leak check was not exceeded during the test period.

Three sample runs were conducted to constitute a complete test. The sample time was be a minimum of one hour.

When a test run had been completed, a post-test leak check was conducted prior to any dismantling of the sampling train. Once this had been successfully achieved, the sample train was dismantled for sample recovery.

3. Sample Analysis.

Method 8270 is used to determine the concentration of semivolatile organic compounds in extracts prepared from all types of solid waste matrices. Each compound present in the sample is separated by gas chromatography and quantified by mass spectrometry.

The detection limitation of this type of sample has been determined to be 1.0 microgram. If the samples are separated for further analysis, the detection limit will be 2.0 micrograms.

H. EPA Draft Method 0011, "Determination of Formaldehyde"

This sampling procedure is similar to the operational procedures found in Reference Method 5. Described in this section are the differences set forth from Method 5 to ensure that the integrity of the formaldehyde sample is maintained.

Prior to any sampling, all glassware shall be rinsed with methylene chloride to remove any contamination that may be initially on the glassware such as stopcock grease. This includes the rinsing of the glass probe liner material required for the collection of the sample.

In collecting the sample, a minimum of 45 cubic feet must be pulled isokinetically such that the extracted sample is transferred through the DNPH absorption solution. All samples should be placed into glass amber sample containers to avoid the alteration of the sample by sunlight.

The analysis of the formaldehyde samples shall be conducted according to the procedures outlined in Method 8315. This analysis procedure provides guidance in the evaluation of formaldehyde samples by High Performance Liquid Chromatography (HPLC).

I. Determination of Gaseous Organic Emissions From Stationary Sources By Gas Chromatography - US EPA Method 18:

This procedure utilizes the technology of gas chromatography to separate, identify, and quantitate various volatile organic compounds that co-exist in a flue gas stream. In this testing project, methane and the BTEX compounds were targeted.

The gas chromatograph was first conditioned in the laboratory where ideal conditions exist for this initial calibration. This consists of conditioning the column, if necessary, and creating calibration curves based on actual data from the GC with known concentration standards. As required by EPA, three (3) standards of known concentration were used in creating the calibration curves. The concentrations of the standards bracketed the expected concentration of pollutant at the source level.

A field calibration check was performed prior to introducing any sample into the gas chromatograph. This is performed by injecting one of the known standards into the GC and comparing the result to the calibration curve. It must agree within 5 % of the previously determined response.

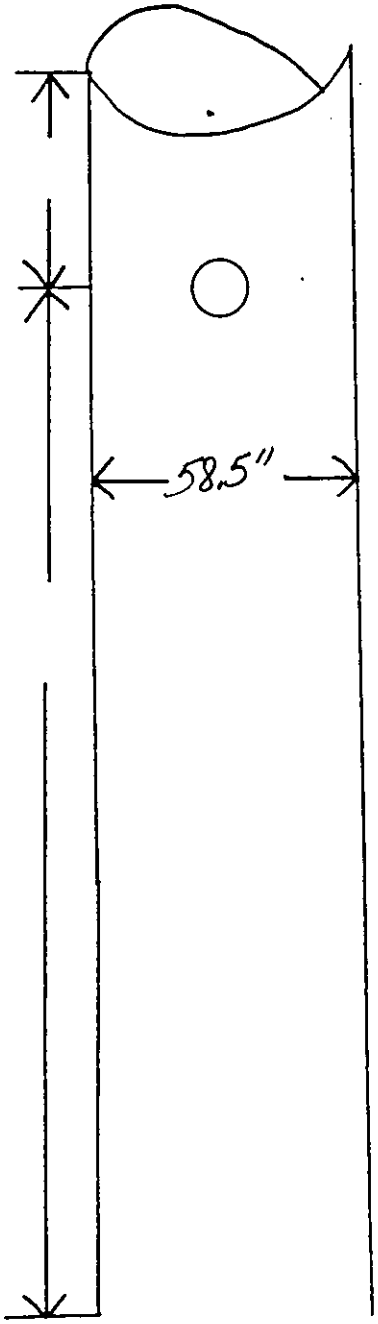
Analysis of the samples follow a successful field calibration. Collecting the sample consisted of extracting the sample from the stack via a heated sample line. The sample was introduced directly into the sample loop, where it was injected to the instrument for analysis. This type of sampling is termed "semi-continuous".

IV. SOURCE INFORMATION

The emissions test was conducted on a round stack with a diameter of 58.5". Two (2) sample ports are positioned at 90° apart in the same test plane. The sample port location is positioned such that the minimum requirements for sampling in a non-turbulent zone are met. Twenty-four (24) points were sampled, twelve (12) through each traverse for 2.5 minutes each for a total testing time of sixty (60) minutes.

Points on a Diameter	Probe Mark
1	*8.7"
2	11.4"
3	14.4"
4	17.8"
5	22.1"
6	28.2"
7	45.2"
8	51.3"
9	55.6"
10	59.0"
11	62.0"
12	65.0"

*Measurements include a 7.5" standoff.



EQUIPMENT USED

Equipment used to conduct the particulate emissions test was:

A. A Lear Siegler PM-100 stack sampler with appropriate auxiliary equipment and glassware (with train set up according to the schematic on the next page).

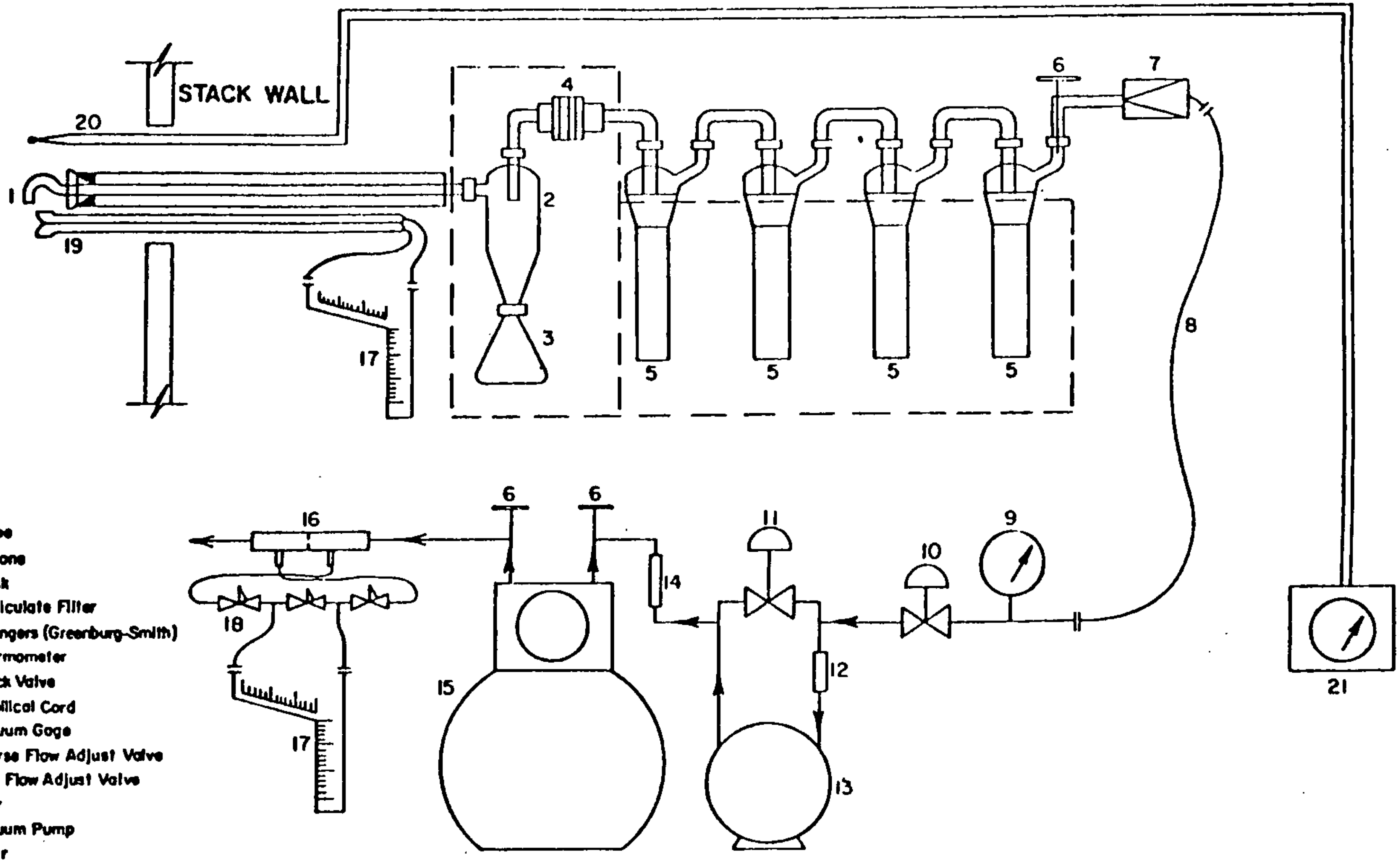
B. An Airguide Instruments Model 211-B (uncorrected) aneroid barometer for checking the barometric pressure.

C. Weston dial thermometers to check meter temperatures or an Analogic Model 2572 Digital Thermocouple to check stack temperatures.

D. A Hays 621 Analyzer to measure the oxygen, carbon dioxide and carbon monoxide content of the stack gases or, for non-combustion sources, a Bacharach Instrument Company Fyrite for gas analysis.

E. Schleicher and Schuell Type 1-HV filters with a porosity of .03 microns.

F. Reagent- or ACS-grade acetone with a residue of ≤ .001.



SAMPLING TRAIN
USED FOR ISOKINETIC SAMPLING

1) Probe
2) Cyclone
3) Flask
4) Particulate Filter
5) Impingers (Greenburg-Smith)
6) Thermometer
7) Check Valve
8) Umbilical Cord
9) Vacuum Gage
10) Course Flow Adjust Valve
11) Fine Flow Adjust Valve
12) Oiler
13) Vacuum Pump
14) Filter
15) Dry Gas Meter
16) Orifice Tube
17) Incline Manometer
18) Solenoid Valves
19) Pitot
20) Thermocouple
21) Pyrometer

**J.U.M.®
ENGINEERING**

HEATED TOTAL HYDROCARBON ANALYZER
MODEL VE7

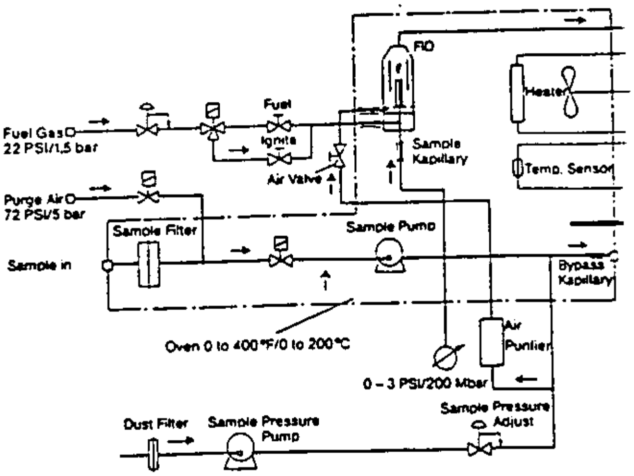
The J.U.M. Engineering Model VE7 is a high accuracy Total Hydrocarbon Analyzer for the measurement and analysis of organic vapors.

The VE7 utilizes a Hydrogen Flame Ionization Detector (FID) in a thermostatically controlled oven to prevent the loss of high molecular weight hydrocarbons.

Options

Digital display with BCD output/without BCD output Remote range control and range I.D.
Recorder output of oven temperature

- *All heated components*
- *Integrated heated sample pump*
- *Permanent heated stainless steel 2 micron sample filter*
- *Built in burner air supply - no extra bottles needed*
- *Automatic fuel enrichment for ignition*
- *19 inch relay rack mount*
- *1% precision full scale*
- *Response time - 90% full scale within 1 second*



STANDARD SPECIFICATIONS:

Analysis Method:	*Flame Ionization Detector (FID)*
Sensitivity:	*Max. 1 ppm CH*
Response Time:	*90% of full scale in less than one second*
Zero Drift:	*1% of full scale per 24 hours*
Span Drift:	*1% of full scale per 24 hours*
Linearity:	*Within 1%*
Oxygen Synergism:	*Less than 1% of selected range*
Ranges:	*Any three of the following:* *0 - 10, 100, 1000, 10,000, 100,000 ppm*
Outputs:	*0 - 10 Volts D.C.*
Display:	*Analog Meter in ppm Hydrocarbon or in % LEL*
Zero/Span Adjust:	*Manual on front panel*
Fuel Consumption:	*Hydrogen 20 cc/min at 22 psig (1.5 Bar)* *Hydrogen/Helium 40/60 mix: 80 cc/min.*
Air Consumption:	*None Integral Air generator*
Zero & Span Gas:	*3 psig (200 m Bar)*
Sample Pump:	*All Stainless Steel, heated, 3 liters per minute at operating temperature*
Sample Pressure:	*By Integral Pump 3 psig (200 m Bar)*
Sample Filter:	*Permanent all stainless steel 2 micron back-purged for cleaning*
Analysis Temperature:	*Adjustable 200 to 400°F (93 to 204°C)*
Power Requirements:	*110 Volts, 60 Hertz AC 800 Watts (others on request)*
Ambient Temperature:	*32°F to 110°F (0 to 43°C)*
Dimensions:	*Width 483 mm (19 inches), Depth 460 mm (18-1/8 inches), Height 221 mm (8-3/4 inches)*
Weight:	*38.6 lbs (17,5 kg)*
Shipping Weight:	*53 lbs (24 kg)*

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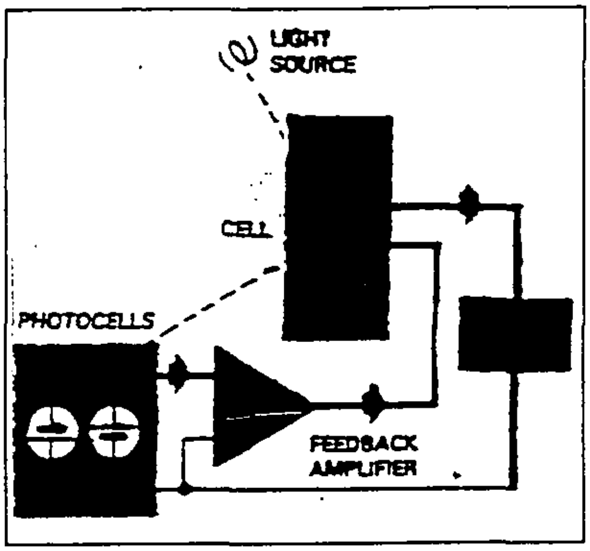
PRINCIPLES OF OPERATION

SERVOMEX 1400 SERIES GAS ANALYZERS

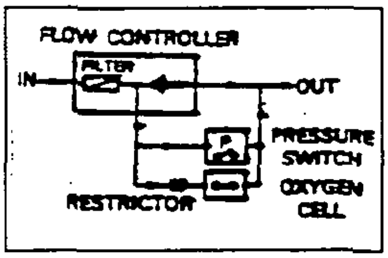
SPECIFICATION	*OXYGEN*
Principle	Magneto-dynamic
Linearity	±0.2% O_2
Repeatability	±0.2% $_2$
Zero Drift (Per Week)	<0.2% O_2
Signal Output	0-1V non-isolated for 0-100% O_2
Alarms	Flow alarm. 4 sets of changeover relay contacts rated at 3A/120V AC, 1A/240V AC or 1A/28V DC
Display	3½ digit LCD reading 0 to 100% O_2
Response Time	Less than 15 seconds to 90%
Operating Ambient Temperature	32 - 104°F (0-40°C)
Relative Humidity	0 - 85%, non-condensing
Sample Pressure	0.2 to 0.6 barg
Sample Contact Materials	Stainless steel, pyrex, glass, brass, platinum, epoxy resin, viton, polypropylene and glass fibre
AC Supply	110 to 120V AC, or 220 to 240V AC, ±10%, 48 to 62Hz, 15VA maximum
Dimensions	19" Rack - 4U case Bench top - 7.1" (180mm) high, 10.1" (256mm) wide, 15.4" (390mm) deep 22 lbs (10kg) approximately



PARAMAGNETIC OXYGEN

The oxygen analyzer measures the paramagnetic susceptibility of the sample gas by means of a magneto-dynamic type measuring cell.

Oxygen is virtually unique in being a paramagnetic gas, this means that it is attracted into a magnetic field. In the Servomex measuring cell, the oxygen concentration is detected by means of a dumb-bell mounted on a torque suspension in a strong, non-linear magnetic field. The higher the concentration of oxygen, the greater the dumb-bell is deflected from its rest position. this deflection is detected by an optical system and twin photocells connected to an amplifier. Around the dumb-bell is a coil of wire. A current is passed through this coil to return the dumb-bell to its original position. The current is measured and is proportional to the oxygen concentration.



Gas Flow Diagram

Advantages

- Not cross sensitive to most common gases
- Long lifetime
- Rugged Design
- No routine cell maintenance

8610 GAS CHROMATOGRAPH

Miniature Lab GC

At a fraction of the cost, the SRI 8610 Gas Chromatograph provides the capabilities and sophistication of vastly larger and more expensive instruments in a small, lightweight and attractive package. More of a miniature laboratory GC than a true portable, the 8610 is the perfect size and weight for easy field use without sacrificing big GC features. In the lab or in the field, the 8610 Gas Chromatograph gives you up to five detectors plus a built-in purge and trap in a simple to operate, easy to trouble-shoot, and unbelievably low cost package. And, the Peaksimple Data System, provided free with every 8610 GC turns your IBM PC into a powerful chromatography integrator which also controls the 8610's temperature program and purge and trap.

Multi-Level Temperature Programming

Temperature programming is a standard feature on every 8610 GC. Up to 15 ramp/plateau segments permit maximum flexibility. Because the temperature program is controlled by the data system, an unlimited number of different temperature programs may be permanently stored on disk and activated with a few keystrokes. The 8610's temperature program can be controlled either by the Peaksimple Data System (included free with every GC) or by any other data system or integrator which has the ability to close relay contacts at specified times during the run.

Ultra Low Mass Column Oven

The SRI 8610's large easily accessible column oven is designed to fit all standard packed and capillary columns with diameters up to eight inches. The ultra-low mass design allows rapid heat-up and cool-down from ambient to 250 degrees centigrade. Interchangeable screw-in heater elements allow power consumption to be reduced for low temperature battery powered applications, or easy heater replacement in the event of a failure. Squirrel-cage type oven fan insures uniform heat distribution and stability to within .1 degree.

Low Cost GC • Free Data System/Integrator

Field Portable • Built-In Purge and Trap

Temperature Programmable • Multiple Detectors

Digital Gas Flow Controllers

The carrier gas flow rate is regulated by a unique Digital Flow Controller. Precise and reproducible even at capillary flow rates below 1 cc/per minute, the carrier gas flow controller is standard equipment on every SRI 8610 GC (except low-cost student model). Digital dial allows flow rates to be adjusted without having to measure actual flows with a bubblemeter. A column head pressure gauge is provided to alert the operator to leaks or blockages in the column. The same flow controller is optionally available for hydrogen and air combustion gas flows (recommended for NPD operation). In addition, inlet pressure regulators are supplied for each gas to isolate the GC from fluctuations in gas supply pressure.

Direct Cool On Column Injection

The zero-dead volume on-column injector is designed for state of the art, cool on-column injections using both packed and wide-bore capillary (.53 mm). A special wide-bore adapter positions the .53 mm column so the syringe smoothly deposits the sample in the bore of the column itself. This provides a totally inert, metal and glass free sample path. Peaks are exceptionally sharp and well resolved.

Detectors

Thermal Conductivity (TCD)
Flame Ionization (FID)
Nitrogen-Phosphorus (NPD)
Thermionic Ionization (TID)
Photo-Ionization (PID)
Electron Capture (ECD)
Hall Detector (HALL or ELCD)
Flame Photometric (FPD)

Up to 3 detectors may be mounted simultaneously and plumbed in series so that one injection passes through each detector and into the next. Common series configurations include:

(PID-FID), (TCD-FID), (PID-ECD),
(PID-HALL) and (PID-ECD-FID).

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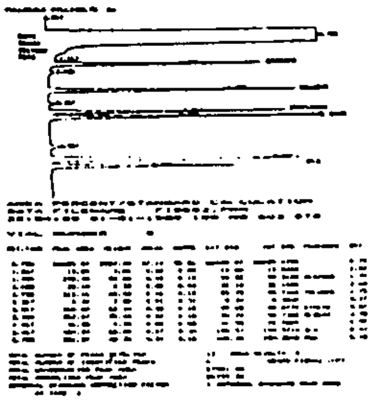


100 NG.
602 STD.
Data
plotted
using
Peaksimple
Data
System.

FUJI 730
NDIR SINGLE GAS ANALYZER

This unique Mass Flow Sensor used in the Fuji 730 Single Gas Analyzer provides significant advantages over other sensors used for this purpose. The design of the Mass Flow Detector minimizes the adverse effects of vibration which is often present in harsh environments. In addition the Mass Flow Sensor System virtually eliminates interference making the Fuji 730 a powerful analytical tool for monitoring burner and boiler efficiency heat treatment fermentation well logging and many other applications which require exceptional accuracy stability high sensitivity and reliabililty.

PRINCIPLE OF OPERATION

The Fuji 730 Series Analyzers use the infared adsorption characteristic of gases to measure the concentration of gas samples. An efficient single beam design which incorporates a unique mass flow sensor system insures accurate and interference free analysis for a wide variety of applications.

A single beam of infrared energy is chopped and passed through a sample cell containing the flowing as sample. Due to the adsorption characteristic, the amount of energy in the beam is reduced by the concentration of the measured gas in the sample. The attenuated infrared beam is passed serially through the twocavities of the mass flow sensor which contain a high concentration of the gas species the analyzer is intended to measure. The two cavity sensor performs two functions in the analyzing process, it first eliminates interference caused by other gases and water vapor by detecting and subtracting the interference component from the detector output, and secondly, produces an output signal which represents an accurate duplication of the relative infrared energy adsorption. This resultant signal is electronically processed and lineraized to provide an electrical signal which drives meters and other output devices.

STANDARD GASES:
Carbon Monoxide (CO)
Cardon Dioxide (CO_2)
Methane (CH_4)

STANDARD RANGES:
0-500/1000 ppm
0-1000/2000 ppm
0-2000/5000 ppm
0-2500/5000 ppm

0-0.5/1.0%
0-1/2%
0-2/5%
0-5/10%
1-10/20%

PURGE GAS FITTING
Standard Equipment

INTERNAL SPAN CHECK FEATURE
Calibration check without the use of span gases. Conserves gas and reduces operating costs.

SPECIFICATIONS

Repeatability:	±0.5% of full scale (low range) ±1.0% of full scale (high range)
Zero Drift*:	±1% of full scale per 24 hours
Span Drift*:	±1% of full scale per 24 hours
Linearity:	±2% of full scale (within linearizer)
Noise Level:	0.5% of full scale
Speed of Response:	90% indication
Electrical:	2, 3 or 5 seconds (field selectable)
Pneumatic:	Less than 15 seconds (depending on cell length)
Warm-Up:	Two hours (to ±2% full scale)
Internal Span Check:	Manually activated from front panel
Outputs:	0 to 1V DC, linear & 4-20mA DC, linear
Ambient Temperature Range:	23 to 113°F (-5 to 45°C)
Ambient Humidity:	To 90% R.H. (non-condensing)
Sample Gas Temperature:	32 to 122°F (0 to 50°C)
Sample Gas Flow Rate:	2 ± 1 scfh (1.0 ± .05 slpm)
Purge Gas Rate (where necessary):	2 scfh (1 slpm) when required
Power Requirements:	115V AC ± 10%, 60 Hz, 30VA
Gas Connections:	All ¼" compression-type tube fittings
Size and Weight:	7.9 (H) x 9.8 (W) x 21.3 (D) inches (200 x 250 x 541 mm) 24.2 pounds (11 kg)

*constant conditions

FUJI 760
NDIR GAS ANALYZER

- *Unique Mass Flow Sensor System Eliminates Interference*
- *Wide Dynamic Range Permits Ultra-Sensitive and High Concentration Gas Analysis*
- *Designed for Continuous Operation and Low Maintenance*
- *Measures:*
  - → *Carbon Monoxide (CO)*
  - → *Carbon Dioxide (CO_2)*
  - → *Sulfur Dioxide (SO_2)*
  - → *Nitric Oxide (NO)*
  - → *Methane (CH_4)*
- *Insensitive to Vibration*

This instrument is designed for stack monitoring and process control applications. It's remarkable accuracy and fast response makes it an ideal instrument for CEMS, boiler control equipment, research labs and many other monitoring applications. For usage requiring ultra sensitive measurement, the Fuji 760 delivers superior performance. Using the Non-Dispersive Infrared (NDIR) Mass Flow Detector, low concentration measurements are accurate and reliable. The Fuji 760 incorporates an Interference Compensating Detector which minimizes the effects of other gases, particularly when operating in ranges of high sensitivity.

FEATURES OF THE FUJI-760

The Fuji 760 Analyzre uses infrared adsorption techniques to measure gas concentrations, however, many innovative patented features make this instrument far superior to conventional Non Dispersive Infrared Analyzers. Among its unique features are an optical chopper design which virtually eliminates the effects of vibration and resultant optical noise; a mass flow sensor system which reduces the effects of interfering gases to insignificant levels, thus permitting gas analysis at low concentration ranges; and a dual beam optical system derived from a single infrared source which enhances long term stability.

PRINCIPAL OF OPERATION

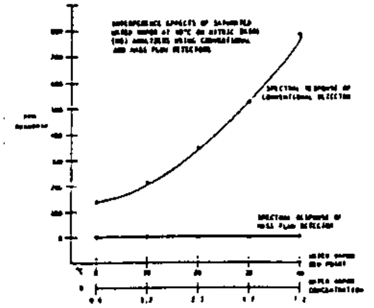
A single beam of infrared energy is modulated and split into two parallel beams by a distribution cell. One beam is passed through a reference cell containing a non-absorbing gas, and the other beam is passed through a cell containing the sample gas being measured. The beam passing through the sample cell is attenuated by the amount of gas concentration in the sample and compared against the unattenuated reference beam by the mass flow detector system. One set of detectors sense the amount of sample gas as compared against the reference, the second set of detectors measure and cancel interferents in the sample. The outputs of the detectors are electronically processed and conditioned into useable signals for indicators and other output devices.

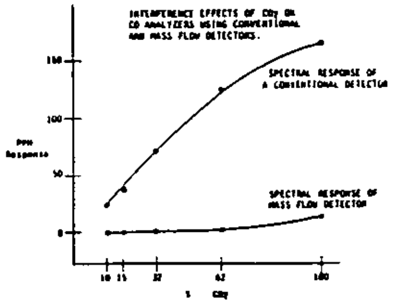
DETECTABLE GAS RANGES

Standard Configuration

Component	***Minimum Range***
Carbon Monoxide (CO)	*0 to 100 ppm*
Carbon Dioxide (CO_2)	*0 to 50 ppm*
Nitric Oxide (NO)	*0 to 100 ppm*
Sulfur Dioxide (SO_2)	*0 to 100 ppm*
Total Hydrocarbons	*0 to 500 ppm*

Other Gases can be measured.





Specifications (Standard Configuration)

Repeatability: *±0.5% of full scale*
Zero Drift: *±2 % of full scale per week*
Span Drift: *±2% of full scale per week*
Linearity: *±2% of full scale*
Speed of Response: *90% indication within 5 seconds (Electronic Response)*
Range Selection: *Either of two ranges selected by front panel switch or external contact closure.*
Warm-Up: *Four hours minimum*
Outputs: *0 to 1V DC, linear and 4-20mA DC, linear*
Ambient Temperature Range: *23 to 113°F (-5 to 45°C)*
Ambient Humidity: *To 90% R.H. (non-condensing)*
Sample Gas Temperature: *32 to 122° F (0 to 50°C)*
Sample Gas Flow Rate: *1.0 ±0.5 scfh (0.50±0.25 slpm) for standard configuration*
Materials in Contact with Sample: *304 Stainless steel, neoprene rubber, silicone rubber, CaF2/ sapphire, Teflon®*
Power Requirements: *115V AC±10%, 50/60 Hz (switch selectable)*
110 VA max. (200VA max with converter)
220V AC available
Gas Connections: *All ¼" compression-type tube fittings*
Size and Weight:
8.66 (H) x 17.44 (W) x 16.78 (D) inches (220 x 443 x 350 mm)
37.4 pounds (17 kg)

MODEL 10
FOR CONTINUOUS SOURCE GAS MONITORING

CHEMILUMINESCENT NO/NO$_x$ ANALYZER

Thermo Electron's Model 10 NO/NO$_x$ Analyzer is based on the chemiluminescent reaction between nitric oxide (NO) and ozone (O_3) according to the reaction: $NO + O_3 \rightarrow NO_2 + O_2 + h\nu$

Light emission results when the electronically excited NO_2 molecules revert to their ground state.

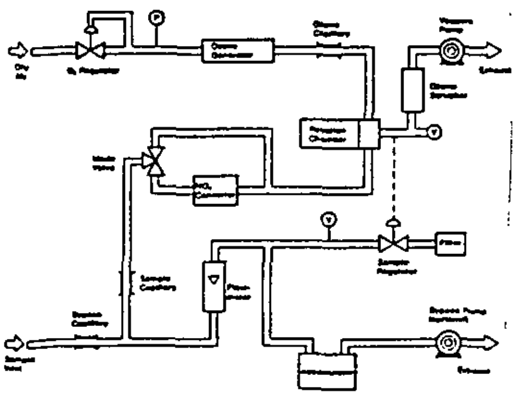
A front panel mode switch provides for either a direct readout of the NO concentration in the sample being analyzed ("NO" mode) or the total NO$_x$ concentration ("NO$_x$" mode). When the Model 10 is placed in the "NO$_x$" mode, the sample stream passes through a NO$_x$-to-NO converter prior to entering the reaction chamber for subsequent analysis.

Key Features

- *Selective detection of NO or NO$_x$*
- *Eight ranges, from 2.5 to 10,000 ppm FS*
- *Continuous monitoring with rapid response*
- *Linear on all ranges*
- *Field proven reliability*
- *Insensitive to changes in sample flow*

As illustrated in the diagram, sample gas enters the Model 10, flows through the bypass capillary, and divides. Most of the sample flows through the flowmeter, accumulator, bypass pump, and exhausts. Only a small amount of sample flows through the sample capillary for analysis. The bypass pump in conjunction with the sample regulator maintain a constant pressure differential across the sample capillary, thus maintaining constant sample flow for analysis. This plumbing network makes the analyzer insensitive to pressure fluctuation in the sample inlet.

From the sample capillary, the sample to be analyzed is either directed through the NO$_x$ to NO converter or around it, depending on the choice of the operator. In the reaction chamber the sample reacts with ozone to produce the light emission and is exhausted. The ozone is produced internally from dry air entering through the oxygen regulator and ozonator. The light emission is sensed by the photomultiplier tube and amplified.



Model 10 Specifications*

Ranges	*0-2.5 ppm 0-10 ppm 0-25 ppm 0-100 ppm 0-250 ppm 0-1000 ppm 0-2500 ppm 0-10,000 ppm*
Minimum Detectable Concentration	*.05 ppm*
Noise	*Less than 1% of FS*
Reproducibility	*1% of FS*
Operating Temperature Extremes	*0-40°C*
Response Time (0-90%)	*~1.5 second NO mode ~1.7 second NO$_x$ mode*
Zero Stability	*±1 ppm in 24 hours*
Span Stability	*±1% in 24 hours*
Linearity	*±1% from 0.05 to 10,000 ppm***
Power Requirements	*1000 watts, 115 ± 10 volts, 60 Hz standard. Also available in 115V 50 Hz, and 210 ± 15 volts, 50 Hz versions*
Physical Dimensions	*19" wide x 17" high x 20" deep*
Instrument Weight	*75 lbs. (including pump)*
Outputs	*Two standard outputs supplied: 1) 0-10V; 2) Field selectable from 0-10V, 5V, 1V, 100mV or 10mV. (ma options available.)*

**Specifications are typical and subject to change without notice.*
***With O_2 Feed; With dry air, linearity to 2000 ppm.*

VI. CALCULATIONS

A. Particulate — Condensibles

MACASPHALT
MELBOURNE, FLORIDA

SUMMARY OF TEST DATA

		12-02-92	12-03-92	12-04-92
		RUN #1	**RUN #2**	**RUN #3**
SAMPLING TRAIN DATA				
	start	14:18	14:59	08:26
	finish	15:21	16:18	10:58
1. Sampling time, minutes	Θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.3000	.3000	.3000
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000490	.000490	.000490
4. Isokinetic variation	I	100.1	90.9	100.3
5. Sample gas volume - meter cond., cf.	V_m	42.036	39.562	41.821
6. Average meter temperature, ^{o}R	T_m	548	545	537
7. Avg. oriface pressure drop, in. H_2O	dH	1.38	1.26	1.39
8. Total particulate collected, mg.	M_n	149.10	131.80	188.30
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2.	A	18.60	18.60	18.60
10. Absolute stack gas pressure, in. Hg.	P_s	30.01	30.02	30.00
11. Barometric pressure, in. Hg.	P_{bar}	30.01	30.02	30.00
12. Avg. absolute stack temperature, R^{o}	T_s	732	724	724
13. Average $\sqrt{\text{vel. head}}$, (C_p= .84)	$\sqrt{dP}$	0.59	0.58	0.57
14. Average stack gas velocity, ft./sec.	V_s	40.30	39.09	38.47
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	239.10	164.90	189.70
16. Moisture in stack gas, %	B_{ws}	21.78	16.83	18.07
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	1527	1592	1543
18. Stack gas flow rate, cfm	acfm	44975	43624	42933
19. Particulate concentration, gr/dscf	C_s	0.0571	0.0533	0.0710
20. Particulate concentration, lb/hr	E	12.46	12.13	15.65
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	5.50	4.20	4.80
23. Percent O_2 by volume	O_2	14.40	15.10	15.10
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	80.10	80.70	80.10

Format: summryR3

Dry Gas Volume

$$V_{m(std)} = V_m \left[\frac{T_{(std)}}{T_m}\right]\left[\frac{P_{bar} + \frac{dH}{13.6}}{P_{(std)}}\right] = 17.64\ \frac{{}^{o}R}{\text{in.Hg}}\ Y\ V_m \left[\frac{P_{bar} + \frac{dH}{13.6}}{T_m}\right]$$

Where:

$V_{m(std)}$ = Dry Gas Volume through meter at standard conditions, cu. ft.

V_m = Dry Gas Volume measured by meter, cu. ft.

P_{bar} = Barometric pressure at oriface meter, in. Hg.

P_{std} = Standard absolute pressure,(29.92 in. Hg.).

T_m = Absolute temperature at meter ^{o}R.

T_{std} = Standard absolute temperature ($528^{o}R$).

dH = Average pressure drop across oriface meter, in. H_2O.

Y = Dry gas meter calibration factor.

13.6 = Inches water per inches Hg.

RUN 1:

$$V_{m(std)} = (17.64)(\ .987)(\ 42.036)\left[\frac{(30.01) + \frac{1.38}{13.6}}{548}\right] = 40.215\ \text{dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(\ .987)(\ 39.562)\left[\frac{(30.02) + \frac{1.26}{13.6}}{545}\right] = 38.058\ \text{dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(\ .987)(\ 41.821)\left[\frac{(30.00) + \frac{1.39}{13.6}}{537}\right] = 40.816\ \text{dscf}$$

Format: dgmR3

Total Contaminants by Weight: GRAIN LOADING

Particulate concentration C_s' gr./dscf.

$$C_s' = \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{M_n}{V_{m(std)}}\right]$$

Where:

C_s' = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, gr./dscf.

M_n = Total amount of particulate matter collected, mg.

$V_{m(std)}$ = Dry gas volume through meter at standard conditions, cu. ft.

Run 1:

$$C_s' = \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{149.10}{40.215}\right] = 0.0571\ \text{gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{131.80}{38.058}\right] = 0.0533\ \text{gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{188.30}{40.816}\right] = 0.0710\ \text{gr./dscf.}$$

NAME: MACASPHALT
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

Particulate
CONVERSION TO mg/m³

$$C,mg/m^3 = (C,gr/dscf)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right)$$

Where:

$C,mg/m^3$ = Concentration as milligrams per cubic meter
$C,gr/dscf$ = Concentration as grains per cubic foot
35.31 = Conversion of ft^3 to m^3
0.0154 = Conversion from grains to milligrams

Run #1:

$$C,mg/m^3 = (0.0571)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 130.9$$

Run #2:

$$C,mg/m^3 = (0.0533)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 122.2$$

Run #3:

$$C,mg/m^3 = (0.0710)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 162.8$$

NAME: MACASPHALT
LOCATION: MELBOURNE, FLORIDA

DATE: December 2-4, 1992

TOTAL CONTAMINANTS BY WEIGHT: GRAIN LOADING

Condensible Particulate Concentration: C_S' gr/dscf

$$C_s' - \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{M_n}{V_{m(std)}}\right]$$

Where:

C_s' = Concentration of condensibles in stack gas, dry basis, corrected to standard conditions, gr/dscf.

M_n = Total amount of condensible matter collected, mg.

$V_{m(std)}$ = Dry gas volume through meter at standard conditions, cu. ft.

Run #1:

$$Cs = \left[0.0154\ \frac{gr}{mg}\right] \cdot \left[\frac{101.7}{40.215}\right] = 0.0389 \text{ gr/dscf}$$

Run #2:

$$Cs = \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{44.0}{38.058}\right] = 0.0178 \text{ gr/dscf}$$

Run #3:

$$Cs = \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{92.1}{40.816}\right] = 0.0347 \text{ gr/dscf}$$

NAME: MACASPHALT
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

Condensible Particulate
CONVERSION TO mg/m³

$$C,mg/m^3 = (C,gr/dscf)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right)$$

Where:

$C,mg/m^3$ = Concentration as milligrams per cubic meter
$C,gr/dscf$ = Concentration as grains per cubic foot
35.31 = Conversion of ft³ to m³
0.0154 = Conversion from grains to milligrams

Run #1:

$$C,mg/m^3 = (0.0389)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 89.2$$

Run #2:

$$C,mg/m^3 = (0.0178)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 40.8$$

Run #3:

$$C,mg/m^3 = (0.0347)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 79.6$$

Dry Molecular Weight

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%CO + \%N_2)$$

Where:

M_d = Dry molecular weight, lb./lb.-mole.

$\%CO_2$ = Percent carbon dioxide by volume (dry basis).

$\%O_2$ = Percent oxygen by volume (dry basis).

$\%N_2$ = Percent nitrogen by volume (dry basis).

$\%CO$ = Percent carbon monoxide by volume (dry basis).

0.264 = Ratio of O_2 to N_2 in air, v/v.

0.28 = Molecular weight of N_2 or CO, divided by 100.

0.32 = Molecular weight of O_2 divided by 100.

0.44 = Molecular weight of CO_2 divided by 100.

Run 1:

$$M_d = 0.44(5.50\%) + 0.32(14.40\%) + 0.28(.00\% + 80.10\%) = 29.46 \frac{lb}{lb\text{-}mole}$$

Run 2:

$$M_d = 0.44(4.20\%) + 0.32(15.10\%) + 0.28(.00\% + 80.70\%) = 29.28 \frac{lb}{lb\text{-}mole}$$

Run 3:

$$M_d = 0.44(4.80\%) + 0.32(15.10\%) + 0.28(.00\% + 80.10\%) = 29.37 \frac{lb}{lb\text{-}mole}$$

Water Vapor Condensed

$$V_{wc_{std}} = \left[V_f - V_i \right] \left[\frac{p_w \; R \; T_{(std)}}{M_w \quad P_{(std)}} \right] = 0.04707 \left[V_f - V_i \right]$$

$$V_{wsg_{std}} = \left[W_f - W_i \right] \left[\frac{R \quad T_{(std)}}{M_w \quad P_{(std)}} \right] = 0.04715 \left[W_f - W_i \right]$$

Where:

0.04707 = Conversion factor, $ft.^3/ml.$

0.04715 = Conversion factor, $ft.^3/g.$

$V_{wc_{std}}$ = Volume of water vapor condensed (standard conditions), scf.

$V_{wsg_{std}}$ = Volume of water vapor collected in silica gel (standard conditions), ml.

$V_f - V_i$ = Final volume of impinger contents less initial volume, ml.

$W_f - W_i$ = Final weight of silica gel less initial weight, g.

p_w = Density of water, 0.002201 lb/ml.

R = Ideal gas constant, 21.85 in.Hg. (cu.ft./lb.-mole)(^{O}R).

M_w = Molecular weight of water vapor, 18.0 lb/lb-mole.

T_{std} = Absolute temperature at standard conditions, 528^{O}R.

P_{std} = Absolute pressure at standard conditions, 29.92 inches Hg.

Run 1:

$V_{wc(std)}$ = (0.04707) (232.0) = 10.9 cu.ft
$V_{wsg(std)}$ = (0.04715) (7.1) = 0.3 cu.ft

Run 2:

$V_{wc(std)}$ = (0.04707) (160.0) = 7.5 cu.ft
$V_{wsg(std)}$ = (0.04715) (4.9) = 0.2 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (182.0) = 8.6 cu.ft
$V_{wsg(std)}$ = (0.04715) (7.7) = 0.4 cu.ft

Moisture Content of Stack Gases

$$B_{ws} = \frac{V_{wc_{std}} + V_{wsg_{std}}}{V_{wc_{std}} + V_{wsg_{std}} + V_{m_{std}}} \times 100$$

Where:

B_{ws} = Proportion of water vapor, by volume, in the gas stream.

V_m = Dry gas volume measured by dry gas meter,(dcf).

$V_{wc_{std}}$ = Volume of water vapor condensed corrected to standard conditions (scf).

$V_{wsg_{std}}$ = Volume of water vapor collected in silica gel corrected to standard conditions (scf).

Run 1:

$$B_{ws} = \frac{10.9 + 0.3}{10.9 + 0.3 + 40.215} \times 100 = 21.78\ \%$$

Run 2:

$$B_{ws} = \frac{7.5 + 0.2}{7.5 + 0.2 + 38.058} \times 100 = 16.83\ \%$$

Run 3:

$$B_{ws} = \frac{8.6 + 0.4}{8.6 + 0.4 + 40.816} \times 100 = 18.07\ \%$$

Molecular Weight of Stack Gases

$$M_s = M_d (1 - B_{ws}) + 18 (B_{ws})$$

Where:

M_s = Molecular weight of stack gas, wet basis, (lb./lb.-mole).

M_d = Molecular weight of stack gas, dry basis, (lb./lb.-mole).

Run 1:

M_s = 29.46 (1 - 21.78) + 18 (21.78) = 26.96 (lb./lb.-mole)

Run 2:

M_s = 29.28 (1 - 16.83) + 18 (16.83) = 27.38 (lb./lb.-mole)

Run 3:

M_s = 29.37 (1 - 18.07) + 18 (18.07) = 27.32 (lb./lb.-mole)

Stack Gas Velocity

$$V_s = K_p\, C_p \left[\sqrt{dP}\right] \text{avg.} \sqrt{\frac{T_{s(avg.)}}{P_s \quad M_s}}$$

Where:

V_s = Average velocity of gas stream in stack, ft./sec.

K_p = 85.49 ft/sec $\left[(g/g\text{-mole})\text{-}(mm\ Hg) \,/\, (^{o}K)(\ mm\ H_2O)\right]^{1/2}$

C_p = Pitot tube coefficient, (dimensionless).

dP = Velocity head of stack gas, in. H_2O.

P_{bar} = Barometric pressure at measurement site, (in. Hg).

P_g = Stack static pressure, (in. Hg).

P_s = Absolute stack gas pressure, (in. Hg) = $P_{bar} + P_g$

P_{std} = Standard absolute pressure, (29.92 in. Hg).

t_s = Stack temperature, (^{o}f).

T_s = Absolute stack temperature, (^{o}R). = 460 + t_s.

M_s = Molecular weight of stack gas, wet basis, (lb/lb-mole).

Run 1:

$$V = (85.49)(\ .84)(\ 0.59) \sqrt{\frac{732}{(30.01)(26.96)}} = 40.30 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)(\ .84)(\ 0.58) \sqrt{\frac{724}{(30.02)(27.38)}} = 39.09 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)(\ .84)(\ 0.57) \sqrt{\frac{724}{(30.00)(27.32)}} = 38.47 \text{ ft/sec.}$$

Format: vsR3

$$Q_{sd} = 3600 \left[1 - B_{wc} \right] V_s \; A \left[\frac{T_{std}}{T_{stk}} \right] \left[\frac{P_s}{P_{std}} \right]$$

Where:

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, (dscf/hr).

A = Cross sectional area of stack, (ft.^{2}).

3600 = Conversion factor, (sec./hr.).

t_s = Stack temperature, (^{o}f).

T_s = Absolute stack temperature, (^{o}R).

T_{std} = Standard absolute temperature, (528^{o}R).

P_{bar} = Barometric pressure at measurement site, (in.Hg.).

P_g = Stack static pressure, (in.Hg.).

P_s = Absolute stack gas pressure, (in.Hg.); = $P_{bar} + P_g$

P_{std} = Standard absolute pressure, (29.92 in.Hg.).

Run 1:

$$Q_{sd}=3600(1- .2178)(40.30)(18.60)\left[\frac{528}{732}\right]\left[\frac{30.01}{29.92}\right] = 1527093.2 \ \frac{dscf}{hr}$$

Run 2:

$$Q_{sd}=3600(1- .1683)(39.09)(18.60)\left[\frac{528}{724}\right]\left[\frac{30.02}{29.92}\right] = 1592913.8 \ \frac{dscf}{hr}$$

Run 3:

$$Q_{sd}=3600(1- .1807)(38.47)(18.60)\left[\frac{528}{724}\right]\left[\frac{30.00}{29.92}\right] = 1543247.6 \ \frac{dscf}{hr}$$

Emissions Rate from Stack

$$E = \frac{(C_s)(Q_{sd})}{7000 \text{ gr./lb.}} = \text{lb. / hr.}$$

Where:

E = Emissions rate, lb/hr.

C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, gr/dscf.

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/hr.

Run 1:

$$E = \frac{(0.0571)(1527093.2)}{7000} = 12.46 \text{ lb. / hr.}$$

Run 2:

$$E = \frac{(0.0533)(1592913.8)}{7000} = 12.13 \text{ lb. / hr.}$$

Run 3:

$$E = \frac{(0.0710)(1543247.6)}{7000} = 15.65 \text{ lb. / hr.}$$

NAME: MACASPHALT
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

Condensible Particulate
EMISSIONS RATE FROM STACK

$$E - \left[\frac{(C_s)\ \ (Q_{sd})}{7{,}000\ \mathrm{gr/lb}}\right] - 0.0000\ \mathrm{lb/hr}$$

Where:

E = Emissions rate, lbs/hr.

C_s = Concentration of condensibles in stack gas, dry basis, corrected to standard conditions, gr/dscf.

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/hr.

Run #1:

$$E = \frac{(0.0389)\ \ (1527093.2)}{7{,}000} = 8.49$$

Run #2:

$$E = \frac{(0.0178)\ \ (1592913.8)}{7{,}000} = 4.05$$

Run #3:

$$E = \frac{(0.0347)\ \ (1543247.6)}{7{,}000} = 7.65$$

$$I = 100 \quad T_s \left[\frac{0.002669 \quad V_{ic} + \quad (V_m \;/\; T_m) \quad (P_{bar} + \quad dH \;/\; 13.6)}{60 \quad \Theta \quad V_s \quad P_s \quad A_n} \right]$$

Where:

I = Percent isokinetic sampling.

100 = Conversion to percent.

T_s = Absolute average stack gas temperature, ^{o}R.

0.002669 = Conversion factor, Hg - ft^3/ml - ^{o}R.

V_{ic} = Ttl vol of liquid collected in impingers and silica gel, ml.

T_m = Absolute average dry gas meter temperature, ^{o}R.

P_{bar} = Barometric pressure at sampling site, (in. Hg).

dH = Av pressure differential across the oriface meter, (in.H_2O).

13.6 = Specific gravity of mercury.

60 = Conversion seconds to minutes.

Θ = Total sampling time, minutes.

V_s = Stack gas velocity, ft./sec.

P_s = Absolute stack gas pressure, in. Hg.

A_n = Cross sectional area of nozzle, ft^2.

Run 1:

$$I = (100)(\ 732\ ) \left[\frac{(0.002669)(239.10) + \frac{42.036}{548} \boxed{30.01 + \frac{1.38}{13.6}}}{60\ (\ 60.0\ )\ (\ 40.30\ )\ (\ 30.01\ )\ (\ .000490\ )} \right] = 100.1\%$$

Run 2:

$$I = (100)(\ 724\ ) \left[\frac{(0.002669)(164.90) + \frac{39.562}{545} \boxed{30.02 + \frac{1.26}{13.6}}}{60\ (\ 60.0\ )\ (\ 39.09\ )\ (\ 30.02\ )\ (\ .000490\ )} \right] = 90.9\%$$

Run 3:

$$I = (100)(\ 724\ ) \left[\frac{(0.002669)(189.70) + \frac{41.821}{537} \boxed{30.00 + \frac{1.39}{13.6}}}{60\ (\ 60.0\ )\ (\ 38.47\ )\ (\ 30.00\ )\ (\ .000490\ )} \right] = 100.3\%$$

VI. CALCULATIONS

B. Formaldehyde

NAME: MACASPHALT (Formaldehyde)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

SUMMARY OF TEST DATA

		Run #1 12-04-92	Run #2 12-04-92	Run #3 12-04-92
SAMPLING TRAIN DATA	Start	11:49	13:03	14:48
	Finish	13:04	14:04	16:02
1. Sampling time, minutes	θ	72.0	60.0	72.0
2. Sampling nozzle diameter, in.	D_n	.3000	.3200	.3000
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000490	.000576	.000490
4. Isokinetic variation	I	100.8	91.9	99.9
5. Sample gas volume - meter cond., cf.	V_m	49.675	50.155	52.085
6. Average meter temperature, °R	T_m	557	567	562
7. Avg. orifice pressure drop, in. H_2O	ΔH	1.29	2.68	1.46
8. Total formaldehyde collected, mg.	M_n	.063	4.30	.600
VELOCITY TRAVERSE DATA				
9. Stack area, $ft.^2$	A	18.60	18.60	18.60
10. Absolute stack gas pressure, in. Hg.	P_s	30.00	30.00	30.00
11. Barometric pressure, in. Hg.	P_{bar}	30.00	30.00	30.00
12. Avg. absolute stack temperature, R°	T_s	728	744	724
13. Average $\sqrt{}$vel. head, (C_p = .84)	$\sqrt{dp}$	0.55	0.62	0.59
14. Average stack gas velocity, ft./sec.	V_s	37.31	42.60	40.14
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{lc}	236.90	246.30	285.40
16. Moisture in stack gas, %	B_{ws}	19.19	20.08	21.75
EMISSION DATA				
17. Stack gas flow rate, dscf/hr.	Q_{sd}	1468	1622	1537
18. Stack gas flow rate, cfm	acfm	41638	47542	44796
19. Formaldehyde concentration, gr/dscf	C_s	0.00002	0.00140	0.00020
20. Formaldehyde concentration, lb/hr	E	0.004	0.320	0.040
ORSAT DATA				
21. Percent CO_2 by volume	CO_2	4.80	4.80	4.70
22. Percent O_2 by volume	O_2	15.00	15.00	15.30
23. Percent CO by volume	CO	.00	.00	.00
24. Percent N_2 by volume	N_2	80.20	80.20	80.00

NAME: MACASPHALT (Formaldehyde)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

MOISTURE DETERMINATION
DRY GAS VOLUME

$$V_{m(std)} =$$

$$V_m \left[\frac{T_{(std)}}{T_m}\right] \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}}\right] - 17.64 \frac{^\circ R}{\epsilon.\ Hg} \, Y \, V_m \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right]$$

Where:

$V_{m(std)}$ = Dry gas volume through meter at standard conditions, ft^3.
V_m = Dry gas volume measured by meter, ft^3.
P_{bar} = Barometric pressure at orifice meter, in. Hg.
P_{std} = Standard absolute pressure, (29.92 in. Hg.).
T_m = Absolute temperature at meter, °R.
T_{std} = Standard absolute temperature, (528°R).
ΔH = Avg. pressure drop across orifice meter, in. H_2O.
Y = Dry gas meter calibration factor.
13.6 = Inches of water per Hg.

Run #1:

$$V_{m(std)} - (17.64)(.987)(49.675) \left[\frac{30.00 + \frac{1.29}{13.6}}{557}\right] - 46.729 \text{ dscf}$$

Run #2:

$$V_{m(std)} - (17.64)(.980)(50.155) \left[\frac{30.00 + \frac{2.68}{13.6}}{567}\right] - 46.176 \text{ dscf}$$

Run #3:

$$V_{m(std)} - (17.64)(.987)(52.085) \left[\frac{30.00 + \frac{1.46}{13.6}}{562}\right] - 48.581 \text{ dscf}$$

NAME: MACASPHALT (Formaldehyde)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

TOTAL CONTAMINANTS BY WEIGHT: GRAIN LOADING

Formaldehyde Concentration: C_S' gr/dscf

$$C_s' - \left[0.0154 \frac{gr}{mg}\right] \left[\frac{M_n}{V_{m(std)}}\right]$$

Where:

C_s' = Concentration of formaldehyde in stack gas, dry basis, corrected to standard conditions, gr/dscf.

M_n = Total amount of formaldehyde collected, mg.

$V_{m(std)}$ = Dry gas volume through meter at standard conditions, cu. ft.

Run #1:

$$Cs = \left[\ 0.0154 \ \frac{gr}{mg}\right] \left[\frac{0.063}{46.729}\right] = 0.00002 \text{ gr/dscf}$$

Run #2:

$$Cs = \left[\ 0.0154 \ \frac{gr}{mg}\right] \left[\frac{4.200}{46.176}\right] = 0.00140 \text{ gr/dscf}$$

Run #3:

$$Cs = \left[\ 0.0154 \ \frac{gr}{mg}\right] \left[\frac{0.600}{48.581}\right] = 0.00020 \text{ gr/dscf}$$

NAME: MACASPHALT (Formaldehyde)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

Formaldehyde
CONVERSION TO mg/m³

$$C,mg/m^3 = (C,gr/dscf)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right)$$

Where:

$C,mg/m^3$ = Concentration as milligrams per cubic meter
$C,gr/dscf$ = Concentration as grains per cubic foot
35.31 = Conversion of ft^3 to m^3
0.0154 = Conversion from grains to milligrams

Run #1:

$$C,mg/m^3 = (0.00002)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 0.046$$

Run #2:

$$C,mg/m^3 = (0.00140)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 3.210$$

Run #3:

$$C,mg/m^3 = (0.00020)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 0.459$$

NAME: MACASPHALT (Formaldehyde)
LOCATION: MELBOURNE, FLORIDA

DATE: December 2-4, 1992

Emissions of Formaldehyde: PPM (PARTS PER MILLION)

$$E = \frac{C_S}{} \cdot \frac{g}{1{,}000\text{ mg}} \cdot \frac{\text{MOL}}{30.03\text{g}} \cdot \frac{22.4\ \ell}{\text{MOL}} \cdot \frac{293^\circ\text{K}}{273^\circ\text{K}} \cdot \frac{\text{ft}^3}{28.317} \cdot 1{,}000{,}000$$

Where:

C_S = Concentration of formaldehyde in mg/dscf.
1000 mg/g = Conversion to grams.
30.03 g/MOL = Molar conversion for formaldehyde.
22.4 ℓ/MOL = Volumetric molar conversion @ 273°K.
293°K/273°K = Temperature correction to standard conditions.
28.317/ft^3 = Conversion to liters.
1,000,000 = Conversion to parts per million.

Run #1:

$$\frac{0.063\text{ mg}}{46.729\text{ dscf}} \cdot \frac{g}{1{,}000\text{ mg}} \cdot \frac{\text{MOL}}{30.03\text{ g}} \cdot \frac{22.4\ \ell}{\text{MOL}} \cdot \frac{293^\circ\text{K}}{273^\circ\text{K}} \cdot \frac{\text{ft}^3}{28.317} \cdot 1{,}000{,}000 = 0.04\text{ ppm}$$

Run #2:

$$\frac{4.20\text{ mg}}{46.176\text{ dscf}} \cdot \frac{g}{1{,}000\text{ mg}} \cdot \frac{\text{MOL}}{30.03\text{ g}} \cdot \frac{22.4\ \ell}{\text{MOL}} \cdot \frac{293^\circ\text{K}}{273^\circ\text{K}} \cdot \frac{\text{ft}^3}{28.317} \cdot 1{,}000{,}000 = 2.60\text{ ppm}$$

Run #3:

$$\frac{0.60\text{ mg}}{48.581\text{ dscf}} \cdot \frac{g}{1{,}000\text{ mg}} \cdot \frac{\text{MOL}}{30.03\text{ g}} \cdot \frac{22.4\ \ell}{\text{MOL}} \cdot \frac{293^\circ\text{K}}{273^\circ\text{K}} \cdot \frac{\text{ft}^3}{28.317} \cdot 1{,}000{,}000 = 0.30\text{ ppm}$$

NAME: MACASPHALT (Formaldehyde)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

DRY MOLECULAR WEIGHT

$$M_d - 0.44\ (\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%CO + \%N_2)$$

Where:

M_d = Dry molecular weight, lb/lb-mole.
$\%CO_2$ = Percent carbon dioxide by volume, dry basis.
$\%O_2$ = Percent oxygen by volume, dry basis.
$\%N_2$ = Percent nitrogen by volume, dry basis.
%CO = Percent carbon monoxide by volume, dry basis.
0.264 = Ratio of O_2 to N_2 in air, v/v.
0.28 = Molecular weight of N_2 or CO, divided by 100.
0.32 = Molecular weight of O_2 divided by 100.
0.44 = Molecular weight of CO_2 divided by 100.

Run #1:

$$M_d - 0.44\ (4.80\%) + 0.32\ (15.00\%) + 0.28\ (0.00\% + 80.20\%) - 29.37\ \frac{lb}{lb\text{-}mole}$$

Run #2:

$$M_d - 0.44\ (4.80\%) + 0.32\ (15.00\%) + 0.28\ (0.00\% + 80.20\%) - 29.37\ \frac{lb}{lb\text{-}mole}$$

Run #3:

$$M_d - 0.44\ (4.70\%) + 0.32\ (15.30\%) + 0.28\ (0.00\% + 29.36\%) - 29.36\ \frac{lb}{lb\text{-}mole}$$

WATER VAPOR CONDENSED

$$V_{wc_{std}} - [V_f - V_i] \left[\frac{P_w \; R \; T_{(std)}}{M_w \; P_{(std)}}\right] - 0.04707 \; [V_f - V_i]$$

$$V_{wsg_{std}} - [W_f - W_i] \left[\frac{R \; T_{(std)}}{M_w \; P_{(std)}}\right] - 0.04715 \; [W_f - W_i]$$

Where:

0.04707 = Conversion factor, ft^3/ml.
0.04715 = Conversion factor, ft^3/g.
Vwc_{std} = Volume of water vapor condensed (std. cond.), ml.
$Vwsg_{std}$ = Volume of water vapor collected in silica gel (standard conditions), ml.
$V_f - V_i$ = Final volume of impinger contents less initial volume, ml.
$W_f - W_i$ = Final weight of silica gel less initial weight, g.
P_w = Density of water, 0.002201 lb/ml.
R = Ideal gas constant, 21.85 in.Hg. (cu.ft./lb-mole)(°R).
M_w = Molecular weight of water vapor, 18.0 lb/lb-mole.
T_{std} = Absolute temperature at standard conditions, 528°R.
P_{std} = Absolute pressure at standard conditions, 29.92 inches Hg.

Run 1:

$V_{wc_{std}}$ - (0.04707) (230.0) - 10.8 cu.ft
$V_{wsg_{std}}$ - (0.04715) (6.9) - 0.3 cu.ft

Run 2:

$V_{wc_{std}}$ - (0.04707) (240.0) - 11.3 cu.ft
$V_{wsg_{std}}$ - (0.04715) (6.3) - 0.3 cu.ft

Run 3:

$V_{wc_{std}}$ - (0.04707) (280.0) - 13.2 cu.ft
$V_{wsg_{std}}$ - (0.04715) (5.4) - 0.3 cu.ft

NAME: MACASPHALT (Formaldehyde)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

MOISTURE CONTENT OF STACK GASES

$$B_{ws} = \left[\frac{V_{wc_{std}} + V_{wsg_{std}}}{V_{wc_{std}} + V_{wsg_{std}} + V_{mstd}}\right] \times 100$$

Where:

B_{ws} = Proportion of water vapor, by volume, in the gas stream.

V_m = Dry gas volume measured by dry gas meter, dcf.

Vwc_{std} = Volume of water vapor condensed, corrected to standard conditions, scf.

$Vwsg_{std}$ = Volume of water vapor collected in silica gel corrected to std. cond., scf.

Run 1:

$$B_{ws} = \left[\frac{10.8 + 0.3}{10.8 + 0.3 + 46.729}\right] \times 100 = 19.19\%$$

Run 2:

$$B_{ws} = \left[\frac{11.3 + 0.3}{11.3 + 0.3 + 46.176}\right] \times 100 = 20.08\%$$

Run 3:

$$B_{ws} = \left[\frac{13.2 + 0.3}{13.2 + 0.3 + 48.581}\right] \times 100 = 21.75\%$$

NAME: MACASPHALT (Formaldehyde)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

MOLECULAR WEIGHT OF STACK GASES

$$M_s \; - \; M_d \,(1 - B_{ws}) + 18\,(B_{ws})$$

Where:

M_s = Molecular weight of stack gas, wet basis (lb./lb.-mole).

M_d = Molecular weight of stack gas, dry basis (lb./lb.-mole).

Run #1:

$$M_s \; - \; 29.37\,(1 - 19.19) + 18\,(19.19) \; - \; 27.19 \text{ (lb./lb.-mole)}$$

Run #2:

$$M_s \; - \; 29.37\,(1 - 20.08) + 18\,(20.08) \; - \; 27.09 \text{ (lb./lb.-mole)}$$

Run #1:

$$M_s \; - \; 29.36\,(1 - 21.75) + 18\,(21.75) \; - \; 26.89 \text{ (lb./lb.-mole)}$$

NAME: MACASPHALT (Formaldehyde)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

STACK GAS VELOCITY

$$V_s - K_p \; C_p \; \left[\sqrt{\Delta P}\right] \text{avg} \; \sqrt{\frac{T_s(\text{avg})}{P_s \; M_s}}$$

Where:

V_s = Average velocity of gas stream in stack, ft/sec.
K_p = 85.49 ft/sec [(g/g-mole) - (mm Hg)/(°K)(mm H_2O]$^{1/2}$
C_p = Pitot tube coefficient, dimensionless.
ΔP = Velocity head of stack gas, in. H_2O.
P_{bar} = Barometric pressure at measurement site, in. Hg.
P_g = Stack static pressure, in. Hg.
P_s = Absolute stack gas pressure, in. Hg. = $P_{bar} + P_g$
P_{std} = Standard absolute pressure, 29.92 in. Hg.
t_s = Stack temperature, °F.
T_s = Absolute stack temperature, °R. = 460 + t_s.
M_s = Molecular weight of stack gas, wet basis, lb/lb-mole.

Run #1:

$$V - (85.49)\,(.84)\,(0.55)\,\sqrt{\frac{728}{(30.00)(27.19)}} - 37.31 \text{ ft/sec}$$

Run #2:

$$V - (85.49)\,(.84)\,(0.62)\,\sqrt{\frac{744}{(30.00)(27.09)}} - 42.60 \text{ ft/sec}$$

Run #3:

$$V - (85.49)\,(.84)\,(0.59)\,\sqrt{\frac{724}{(30.00)(26.89)}} - 40.14 \text{ ft/sec}$$

NAME: MACASPHALT (Formaldehyde)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

STACK GAS FLOW RATE

$$Q_{sd} - 3600 \left[1 - B_{wc} \right] V_s \; A \left[\frac{T_{std}}{T_{stk}} \right] \left[\frac{P_s}{P_{std}} \right]$$

Where:

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions (dscf/hr).
A = Cross sectional area of stack (ft²).
3600 = Conversion factor (sec/hr).
T_{stk} = Absolute stack temperature (°R).
T_{std} = Standard absolute temperature (528°R).
P_{bar} = Barometric pressure at measurement site (in. Hg.).
P_g = Stack static pressure (in. Hg.).
P_s = Absolute stack gas pressure (in. Hg.) = $P_{bar} + P_g$
P_{std} = Standard absolute pressure (29.92 in. Hg.).

Run #1:

$$Q_{sd} - 3600 \; (1 - .1919) \; (37.31) \; (18.60) \left[\frac{528}{728} \right] \left[\frac{30.00}{29.92} \right] - 1468141.8 \; \frac{\text{dscf}}{\text{hr}}$$

Run #2:

$$Q_{sd} - 3600 \; (1 - .2008) \; (42.60) \; (18.60) \left[\frac{528}{744} \right] \left[\frac{30.00}{29.92} \right] - 1622188.0 \; \frac{\text{dscf}}{\text{hr}}$$

Run #3:

$$Q_{sd} - 3600 \; (1 - .2175) \; (40.14) \; (18.60) \left[\frac{528}{724} \right] \left[\frac{30.00}{29.92} \right] - 1537914.5 \; \frac{\text{dscf}}{\text{hr}}$$

Formaldehyde
EMISSIONS RATE FROM STACK

$$E - \left[\frac{(C_s)\ \ (Q_{sd})}{7{,}000\ \text{gr/lb}}\right] - 0.0000\ \text{lb/hr}$$

Where:

E = Emissions rate, lbs/hr.

C_s = Concentration of formaldehyde in stack gas, dry basis, corrected to standard conditions, gr/dscf.

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/hr.

Run #1:

$$E = \frac{\underline{(0.00002)}\ \underline{(1468141.8)}}{7{,}000} = 0.004$$

Run #2:

$$E = \frac{\underline{(0.00140)}\ \underline{(1622188.0)}}{7{,}000} = 0.320$$

Run #3:

$$E = \frac{\underline{(0.00020)}\ \underline{(1537914.5)}}{7{,}000} = 0.040$$

NAME: MACASPHALT (Formaldehyde)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

ISOKINETIC VARIATION

$$I - 100\, T_s \left[\frac{(0.002669)\ (V_{lc} + (V_m/T_m)\ (P_{bar} + \Delta H/13.6)}{60 \quad \theta \quad V_s \quad P_s \quad A_n} \right]$$

Where:

I = Percent isokinetic sampling.
100 = Conversion to percent.
T_s = Absolute average stack gas temperature, °R.
0.002669 = Conversion factor, Hg - ft^3/ml - °R.
V_{ic} = Total volume of liquid collected in impingers and silica gel, ml.
T_m = Absolute average dry gas meter temperature, °R.
P_{bar} = Barometric pressure at sampling site, in. Hg.
ΔH = Average pressure differential across the orifice meter, in. H_2O.
13.6 = Specific gravity of mercury.
60 = Conversion seconds to minutes.
θ = Total sampling time, minutes.
V_s = Stack gas velocity, ft/sec.
P_s = Absolute stack gas pressure, in. Hg.
A_n = Cross sectional area of nozzle, ft^2.

Run #1:

$$I - (100)\ (728) \left[\frac{(0.002669)\ (236.90) + \frac{49.675}{557}\left[30.00 + \frac{1.29}{13.6}\right]}{60\ \ (72.0)\ \ (37.31)\ \ (30.00)\ \ (.000490)} \right] - 100.8\%$$

Run #2:

$$I - (100)\ (744) \left[\frac{(0.002669)\ (246.30) + \frac{50.155}{567}\left[30.00 + \frac{2.68}{13.6}\right]}{60\ \ (60.0)\ \ (42.60)\ \ (30.00)\ \ (.000576)} \right] - 91.9\%$$

Run #3:

$$I - (100)\ (724) \left[\frac{(0.002669)\ (285.40) + \frac{52.085}{562}\left[30.00 + \frac{1.46}{13.6}\right]}{60\ \ (72.0)\ \ (40.14)\ \ (30.00)\ \ (.000490)} \right] - 99.9\%$$

VI. CALCULATIONS

C. PAH

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

SUMMARY OF TEST DATA

		Run #1 12-03-92	Run #2 12-03-92	Run #3 12-04-92
SAMPLING TRAIN DATA	Start	10:25	12:55	08:11
	Finish	12:22	16:39	11:26
1. Sampling time, minutes	θ	90.0	90.0	90.0
2. Sampling nozzle diameter, in.	D_n	.3250	.3100	.3250
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000576	.000525	.000576
4. Isokinetic variation	I	93.8	92.8	87.1
5. Sample gas volume - meter cond., cf.	V_m	79.821	71.546	70.457
6. Average meter temperature, °R	T_m	566	564	555
7. Avg. *orifice pressure drop, in.* H_2O	ΔH	2.70	2.12	2.64
8. Total PAH collected, mg.	M_n	.00	.00	.00
VELOCITY TRAVERSE DATA				
9. Stack area, $ft.^2$	A	18.60	18.60	18.60
10. Absolute stack gas pressure, in. Hg.	P_s	30.02	30.02	30.00
11. Barometric pressure, in. Hg.	P_{bar}	30.02	30.02	30.00
12. Avg. absolute stack temperature, R°	T_s	740	726	726
13. Average √vel. head, (C_p = .84)	√dp	0.64	0.63	0.62
14. Average stack gas velocity, ft./sec.	V_s	43.82	42.69	42.10
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{lc}	378.30	331.40	358.80
16. Moisture in stack gas, %	B_{ws}	19.46	19.08	20.32
EMISSION DATA				
17. Stack gas flow rate, dscf/hr.	Q_{sd}	1691	1687	1637
18. Stack gas flow rate, cfm	acfm	48903	47642	46984
19. PAH concentration, gr/dscf	C_s	0.00010	0.00020	0.00009
20. PAH concentration, lb/hr	E	0.024	0.048	0.021
ORSAT DATA				
21. Percent CO_2 by volume	CO_2	4.60	4.50	4.80
22. Percent O_2 by volume	O_2	14.40	14.90	15.10
23. Percent CO by volume	CO	.00	.00	.00
24. Percent N_2 by volume	N_2	81.00	80.60	80.10

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

MOISTURE DETERMINATION
DRY GAS VOLUME

$V_{m(std)} =$

$$V_m \left[\frac{T_{(std)}}{T_m}\right] \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{std}}\right] - 17.64 \frac{°R}{\epsilon.\ Hg}\ Y\ V_m \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right]$$

Where:

$V_{m(std)}$ = Dry gas volume through meter at standard conditions, ft^3.
V_m = Dry gas volume measured by meter, ft^3.
P_{bar} = Barometric pressure at orifice meter, in. Hg.
P_{std} = Standard absolute pressure, (29.92 in. Hg.).
T_m = Absolute temperature at meter, °R.
T_{std} = Standard absolute temperature, (528°R).
ΔH = *Avg. pressure drop across orifice meter, in.* H_2O.
Y = Dry gas meter calibration factor.
13.6 = Inches of water per Hg.

Run #1:

$$V_{m(std)} - (17.64)(.980)(79.821) \left[\frac{30.02 + \frac{2.70}{13.6}}{566}\right] - 73.671 \text{ dscf}$$

Run #2:

$$V_{m(std)} - (17.64)(.980)(71.546) \left[\frac{30.02 + \frac{2.12}{13.6}}{564}\right] - 66.175 \text{ dscf}$$

Run #3:

$$V_{m(std)} - (17.64)(.980)(70.457) \left[\frac{30.00 + \frac{2.64}{13.6}}{555}\right] - 66.264 \text{ dscf}$$

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

TOTAL CONTAMINANTS BY WEIGHT: GRAIN LOADING

PAH Concentration: C_S' gr/dscf

$$C_s' - \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{M_n}{V_{m(std)}}\right]$$

Where:

C_s' = Concentration of PAH in stack gas, dry basis, corrected to standard conditions, gr/dscf.

M_n = Total amount of PAH's collected, mg.

$V_{m(std)}$ = Dry gas volume through meter at standard conditions, cu. ft.

Run #1:

$$C_s' - \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{0.499}{73.671}\right] - 0.00010\ \text{gr/dscf}$$

Run #2:

$$C_s' - \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{0.848}{66.175}\right] - 0.00020\ \text{gr/dscf}$$

Run #3:

$$C_s' - \left[0.0154\ \frac{gr}{mg}\right]\left[\frac{0.368}{66.264}\right] - 0.00009\ \text{gr/dscf}$$

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

PAH
CONVERSION TO mg/m³

$$C,mg/m^3 = (C,gr/dscf)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right)$$

Where:

C,mg/m³ = Concentration as milligrams per cubic meter
C,gr/dscf = Concentration as grains per cubic foot
35.31 = Conversion of ft³ to m³
0.0154 = Conversion from grains to milligrams

Run #1:

$$C,mg/m^3 = (0.00010)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 0.229$$

Run #2:

$$C,mg/m^3 = (0.00020)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 0.459$$

Run #3:

$$C,mg/m^3 = (0.00009)\left(\frac{35.31\ ft^3}{m^3}\right)\left(\frac{mg}{0.0154\ gr}\right) = 0.206$$

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

DRY MOLECULAR WEIGHT

$$M_d - 0.44\,(\%CO_2) + 0.32\,(\%O_2) + 0.28\,(\%CO + \%N_2)$$

Where:

M_d = Dry molecular weight, lb/lb-mole.
$\%CO_2$ = Percent carbon dioxide by volume, dry basis.
$\%O_2$ = Percent oxygen by volume, dry basis.
$\%N_2$ = Percent nitrogen by volume, dry basis.
$\%CO$ = Percent carbon monoxide by volume, dry basis.
0.264 = Ratio of O_2 to N_2 in air, v/v.
0.28 = Molecular weight of N_2 or CO, divided by 100.
0.32 = Molecular weight of O_2 divided by 100.
0.44 = Molecular weight of CO_2 divided by 100.

Run #1:

$$M_d - 0.44\,(4.60\%) + 0.32\,(14.40\%) + 0.28\,(0.00\% + 81.00\%) - 29.31\,\frac{lb}{lb\text{-}mole}$$

Run #2:

$$M_d - 0.44\,(4.50\%) + 0.32\,(14.90\%) + 0.28\,(0.00\% + 80.60\%) - 29.32\,\frac{lb}{lb\text{-}mole}$$

Run #3:

$$M_d - 0.44\,(4.80\%) + 0.32\,(15.10\%) + 0.28\,(0.00\% + 80.10\%) - 29.37\,\frac{lb}{lb\text{-}mole}$$

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

WATER VAPOR CONDENSED

$$V_{wc_{std}} - [V_f - V_i] \left[\frac{P_w \; R \; T_{(std)}}{M_w \; P_{(std)}} \right] - 0.04707 \; [V_f - V_i]$$

$$V_{wsg_{std}} - [W_f - W_i] \left[\frac{R \; T_{(std)}}{M_w \; P_{(std)}} \right] - 0.04715 \; [W_f - W_i]$$

Where:

0.04707 = Conversion factor, ft^3/ml.
0.04715 = Conversion factor, ft^3/g.
Vwc_{std} = Volume of water vapor condensed (std. cond.), ml.
$Vwsg_{std}$ = Volume of water vapor collected in silica gel (standard conditions), ml.
$V_f - V_i$ = Final volume of impinger contents less initial volume, ml.
$W_f - W_i$ = Final weight of silica gel less initial weight, g.
P_w = Density of water, 0.002201 lb/ml.
R = Ideal gas constant, 21.85 in.Hg. (cu.ft./lb-mole)(°R).
M_w = Molecular weight of water vapor, 18.0 lb/lb-mole.
T_{std} = Absolute temperature at standard conditions, 528°R.
P_{std} = Absolute pressure at standard conditions, 29.92 inches Hg.

Run 1:

$$V_{wc_{std}} - (0.04707) \; (370.0) \; - \; 17.4 \text{ cu.ft}$$
$$V_{wsg_{std}} - (0.04715) \; (8.3) \; - \; 0.4 \text{ cu.ft}$$

Run 2:

$$V_{wc_{std}} - (0.04707) \; (325.0) \; - \; 15.3 \text{ cu.ft}$$
$$V_{wsg_{std}} - (0.04715) \; (6.4) \; - \; 0.3 \text{ cu.ft}$$

Run 3:

$$V_{wc_{std}} - (0.04707) \; (353.0) \; - \; 16.6 \text{ cu.ft}$$
$$V_{wsg_{std}} - (0.04715) \; (5.8) \; - \; 0.3 \text{ cu.ft}$$

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

MOISTURE CONTENT OF STACK GASES

$$B_{ws} - \left[\frac{V_{wc_{std}} + V_{wsg_{std}}}{V_{wc_{std}} + V_{wsg_{std}} + V_{mstd}} \right] \times 100$$

Where:

B_{ws} = Proportion of water vapor, by volume, in the gas stream.

V_m = Dry gas volume measured by dry gas meter, dcf.

Vwc_{std} = Volume of water vapor condensed, corrected to standard conditions, scf.

$Vwsg_{std}$ = Volume of water vapor collected in silica gel corrected to std. cond., scf.

Run 1:

$$B_{ws} - \left[\frac{17.4 + 0.4}{17.4 + 0.4 + 73.671} \right] \times 100 - 19.46\%$$

Run 2:

$$B_{ws} - \left[\frac{15.3 + 0.3}{15.3 + 0.3 + 66.175} \right] \times 100 - 19.08\%$$

Run 3:

$$B_{ws} - \left[\frac{16.6 + 0.3}{16.6 + 0.3 + 66.264} \right] \times 100 - 20.32\%$$

Format: bwsR3/19-001

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

MOLECULAR WEIGHT OF STACK GASES

$$M_s \quad - \quad M_d\ (1 - B_{ws}) + 18\ (B_{ws})$$

Where:

M_s = Molecular weight of stack gas, wet basis (lb./lb.-mole).

M_d = Molecular weight of stack gas, dry basis (lb./lb.-mole).

Run #1:

$$M_s \quad - \quad 29.31\ (1 - 19.46) + 18\ (19.46) \quad - \quad 27.11\ \text{(lb./lb.-mole)}$$

Run #2:

$$M_s \quad - \quad 29.32\ (1 - 19.08) + 18\ (19.08) \quad - \quad 27.16\ \text{(lb./lb.-mole)}$$

Run #1:

$$M_s \quad - \quad 29.37\ (1 - 20.32) + 18\ (20.32) \quad - \quad 27.06\ \text{(lb./lb.-mole)}$$

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

STACK GAS VELOCITY

$$V_s = K_p \; C_p \; \left[\sqrt{\Delta P}\right] \text{avg} \; \sqrt{\frac{T_s(\text{avg})}{P_s \; M_s}}$$

Where:

V_s = Average velocity of gas stream in stack, ft/sec.
K_p = 85.49 ft/sec [(g/g-mole) - (mm Hg)/(°K)(mm H_2O)]$^{1/2}$
C_p = Pitot tube coefficient, dimensionless.
ΔP = Velocity head of stack gas, in. H_2O.
P_{bar} = Barometric pressure at measurement site, in. Hg.
P_g = Stack static pressure, in. Hg.
P_s = Absolute stack gas pressure, in. Hg. = $P_{bar} + P_g$
P_{std} = Standard absolute pressure, 29.92 in. Hg.
t_s = Stack temperature, °F.
T_s = Absolute stack temperature, °R. = 460 + t_s.
M_s = Molecular weight of stack gas, wet basis, lb/lb-mole.

Run #1:

$$V = (85.49)\,(.84)\,(0.64)\,\sqrt{\frac{740}{(30.02)(27.11)}} = 43.82 \text{ ft/sec}$$

Run #2:

$$V = (85.49)\,(.84)\,(0.63)\,\sqrt{\frac{726}{(30.02)(27.16)}} = 42.69 \text{ ft/sec}$$

Run #3:

$$V = (85.49)\,(.84)\,(0.62)\,\sqrt{\frac{726}{(30.00)(27.06)}} = 42.10 \text{ ft/sec}$$

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

STACK GAS FLOW RATE

$$Q_{sd} - 3600 \left[1 - B_{wc} \right] V_s \; A \left[\frac{T_{std}}{T_{stk}} \right] \left[\frac{P_s}{P_{std}} \right]$$

Where:

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions (dscf/hr).
A = Cross sectional area of stack (ft^2).
3600 = Conversion factor (sec/hr).
T_{stk} = Absolute stack temperature (°R).
T_{std} = Standard absolute temperature (528°R).
P_{bar} = Barometric pressure at measurement site (in. Hg.).
P_g = Stack static pressure (in. Hg.).
P_s = Absolute stack gas pressure (in. Hg.) = $P_{bar} + P_g$
P_{std} = Standard absolute pressure (29.92 in. Hg.).

Run #1:

$$Q_{sd} - 3600\ (1 - .1946)\ (43.82)\ (18.60) \left[\frac{528}{740} \right] \left[\frac{30.02}{29.92} \right] - 1691806.7 \ \frac{dscf}{hr}$$

Run #2:

$$Q_{sd} - 3600\ (1 - .1908)\ (42.69)\ (18.60) \left[\frac{528}{726} \right] \left[\frac{30.02}{29.92} \right] - 1687889.0 \ \frac{dscf}{hr}$$

Run #3:

$$Q_{sd} - 3600\ (1 - .2032)\ (42.10)\ (18.60) \left[\frac{528}{726} \right] \left[\frac{30.00}{29.92} \right] - 1638962.0 \ \frac{dscf}{hr}$$

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA

DATE: December 2-4, 1992

EMISSIONS RATE FROM STACK

$$E - \left[\frac{(C_s^{\prime})\ (Q_{sd})}{7{,}000\ gr/lb}\right] - 0.0000\ lb/hr$$

Where:

E = Emissions rate, lbs/hr.

C_s = Concentration of PAH's in stack gas, dry basis, corrected to standard conditions, gr/dscf.

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/hr.

Run #1:

$$E - \left[\frac{(0.00010)\ (1691806.7)}{7{,}000}\right] - 0.024\ lbs/hr$$

Run #2:

$$E - \left[\frac{(0.00020)\ (1687889.0)}{7{,}000}\right] - 0.048\ lbs/hr$$

Run #3:

$$E - \left[\frac{(0.00009)\ (1637962.0)}{7{,}000}\right] - 0.021\ lbs/hr$$

NAME: MACASPHALT (PAH)
LOCATION: MELBOURNE, FLORIDA
DATE: December 2-4, 1992

ISOKINETIC VARIATION

$$I - 100\, T_s \left[\frac{(0.002669)\ (V_{ic} + (V_m/T_m)\ (P_{bar} + \Delta H/13.6)}{60\ \ \theta\ \ V_s\ \ P_s\ \ A_n} \right]$$

Where:

I = Percent isokinetic sampling.
100 = Conversion to percent.
T_s = Absolute average stack gas temperature, °R.
0.002669 = Conversion factor, Hg - ft^3/ml - °R.
V_{ic} = Total volume of liquid collected in impingers and silica gel, ml.
T_m = Absolute average dry gas meter temperature, °R.
P_{bar} = Barometric pressure at sampling site, in. Hg.
ΔH = Average pressure differential across the orifice meter, in. H_2O.
13.6 = Specific gravity of mercury.
60 = Conversion seconds to minutes.
θ = Total sampling time, minutes.
V_s = Stack gas velocity, ft/sec.
P_s = Absolute stack gas pressure, in. Hg.
A_n = Cross sectional area of nozzle, ft^2.

Run #1:

$$I - (100)\ (740) \left[\frac{(0.002669)\ (378.30) + \dfrac{79.821}{566} \left[30.02 + \dfrac{2.70}{13.6} \right]}{60\ \ (90.0)\ \ (43.82)\ \ (30.02)\ \ (.000576)} \right] - 93.8\,\%$$

Run #2:

$$I - (100)\ (726) \left[\frac{(0.002669)\ (331.40) + \dfrac{71.546}{564} \left[30.02 + \dfrac{2.12}{13.6} \right]}{60\ \ (90.0)\ \ (42.69)\ \ (30.02)\ \ (.000524)} \right] - 92.8\,\%$$

Run #3:

$$I - (100)\ (726) \left[\frac{(0.002669)\ (358.80) + \dfrac{70.457}{555} \left[30.00 + \dfrac{2.64}{13.6} \right]}{60\ \ (90.0)\ \ (42.10)\ \ (30.00)\ \ (.000576)} \right] - 87.1\,\%$$

VI. CALCULATIONS

D. SO_2, THC, CO, NO_x and CH_4

NAME: MACASPHALT (Gaseous Compounds)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

CO
GASEOUS CONCENTRATION CONVERSION TO mg/m^3

Example Calculation

ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	28.01 g	1,000 mg	= mg/m^3
	$1x10^{-6}$	ft^3	m^3	293°K	22.4 ℓ	mole	g	

Where:

ppm = Parts per million, dry basis
$1x10^{-6}$ = Conversion form parts per million
28.317 = Conversion of liters to ft^3
35,3145 = Conversion of ft^3 to m^3
273/293°K = Temperature correction to standard conditions
22.4ℓ = Volumetric molar conversion @ 273°K
28.01 g/mole = Molecular weight of pollutant
1,000 mg/g = Conversion to milligrams

Run #1:

138.4 ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	28.01 g	1000 mg	=	161.2 mg/m^3
	$1x10^{-6}$	ft^3	m^3	293°K	22.4 ℓ	mole	g		

Run #2:

138.4 ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	28.01 g	1000 mg	=	161.2 mg/m^3
	$1x10^{-6}$	ft^3	m^3	293°K	22.4 ℓ	mole	g		

Run #3:

172.9 ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	28.01 g	1000 mg	=	201.4 mg/m^3
	$1x10^{-6}$	ft^3	m^3	293°K	22.4 ℓ	mole	g		

NAME: MACASPHALT (Gaseous Compounds)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

SO_2
GASEOUS CONCENTRATION CONVERSION TO mg/m^3

Example Calculation

ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	64.07 g	1,000 mg	= mg/m^3
	1x10^{-6}	ft^3	m^3	293°K	22.4 ℓ	mole	g	

Where:

ppm = Parts per million, dry basis
1x10^{-6} = Conversion form parts per million
28.317 = Conversion of liters to ft^3
35,3145 = Conversion of ft^3 to m^3
273/293°K = Temperature correction to standard conditions
22.4ℓ = Volumetric molar conversion @ 273°K
64.07 g/mole = Molecular weight of pollutant
1,000 mg/g = Conversion to milligrams

Run #1:

146.1 ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	64.07 g	1000 mg	= 389.4 mg/m^3
	1x10^{-6}	ft^3	m^3	293°K	22.4 ℓ	mole	g	

Run #2:

146.1 ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	64.07 g	1000 mg	= 389.4 mg/m^3
	1x10^{-6}	ft^3	m^3	293°K	22.4 ℓ	mole	g	

Run #3:

129.9 ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	64.07 g	1000 mg	= 346.2 mg/m^3
	1x10^{-6}	ft^3	m^3	293°K	22.4 ℓ	mole	g	

NAME: MACASPHALT (Gaseous Compounds)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

NO_x
GASEOUS CONCENTRATION CONVERSION TO mg/m^3

Example Calculation

ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	46.01 g	1,000 mg	= mg
	1x10^{-6}	ft^3	m^3	293°K	22.4 ℓ	mole	g	m^3

Where:

ppm = Parts per million, dry basis
1x10^{-6} = Conversion form parts per million
28.317 = Conversion of liters to ft^3
35,3145 = Conversion of ft^3 to m^3
273/293°K = Temperature correction to standard conditions
22.4ℓ = Volumetric molar conversion @ 273°K
46.01 g/mole = Molecular weight of pollutant
1,000 mg/g = Conversion to milligrams

Run #1:

128.1	1	28.317 ℓ	35.3145 ft^3	273°K	mole	46.01 g	1000 mg	= 245.2 mg
ppm	1x10^{-6}	ft^3	m^3	293°K	22.4 ℓ	mole	g	m^3

Run #2:

128.1	1	28.317 ℓ	35.3145 ft^3	273°K	mole	46.01 g	1000 mg	= 245.2 mg
ppm	1x10^{-6}	ft^3	m^3	293°K	22.4 ℓ	mole	g	m^3

Run #3:

111.2	1	28.317 ℓ	35.3145 ft^3	273°K	mole	46.01 g	1000 mg	= 212.8mg
ppm	1x10^{-6}	ft^3	m^3	293°K	22.4 ℓ	mole	g	m^3

NAME: MACASPHALT (Gaseous Compounds)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

TOTAL HYDROCARBON EMISSIONS - Convert ppm (wet) to ppm (dry)

$$ppm_d = ppm_w\left(\frac{100}{(100 - B_{ws})}\right)$$

Where:

ppm_d = Parts per million, dry basis, as carbon.

ppm_w = Parts per million, wet basis, as carbon.

B_{ws} = Proportion of water vapor, by volume, in the gas stream.

Run #1 =

$$(96.5)\left(\frac{100}{(100 - 19.19)}\right) = 119.4 \ ppm_d$$

Run #2 =

$$(96.5)\left(\frac{100}{(100 - 20.08)}\right) = 120.7 \ ppm_d$$

Run #3 =

$$(112.1)\left(\frac{100}{(100 - 21.75)}\right) = 143.3 \ ppm_d$$

NAME: MACASPHALT (Gaseous Compounds)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

THC
GASEOUS CONCENTRATION CONVERSION TO mg/m^3

Example Calculation

ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	16.04 g	1,000 mg	= $\frac{mg}{m^3}$
	$1x10^{-6}$	ft^3	m^3	293°K	22.4 ℓ	mole	g	

Where:

ppm = Parts per million, dry basis
$1x10^{-6}$ = Conversion form parts per million
28.317 = Conversion of liters to ft^3
35,3145 = Conversion of ft^3 to m^3
273/293°K = Temperature correction to standard conditions
22.4ℓ = Volumetric molar conversion @ 273°K
16.04 g/mole = Molecular weight of pollutant (CH_4)
1,000 mg/g = Conversion to milligrams

Run #1:

119.4 ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	16.04 g	1000 mg	= 79.7 $\frac{mg}{m^3}$
	$1x10^{-6}$	ft^3	m^3	293°K	22.4 ℓ	mole	g	

Run #2:

120.7 ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	16.04 g	1000 mg	= 80.5 $\frac{mg}{m^3}$
	$1x10^{-6}$	ft^3	m^3	293°K	22.4 ℓ	mole	g	

Run #3:

143.3 ppm	1	28.317 ℓ	35.3145 ft^3	273°K	mole	16.04 g	1000 mg	= 95.6 $\frac{mg}{m^3}$
	$1x10^{-6}$	ft^3	m^3	293°K	22.4 ℓ	mole	g	

NAME: MACASPHALT (Gaseous Compounds)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

TOTAL CARBON MONOXIDE EMISSIONS: POUNDS PER HOUR

$$E = (2.59 \times 10^{-9})(M_d)(ppm_d)(Q_{sd})(K)$$

Where:

E = CO emissions rate, lbs/hr.

2.59×10^{-9} = Conversion factor, lbs/dscf.

M_d = Dry molecular weight (CO = 28.01).

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/hr.

ppm_d = Parts per million, dry basis.

K = Constant (typically 1).

Run #1:

$E = (2.59 \times 10^{-9})\ (28.01)\ (138.4)\ (1{,}468{,}141.8) = 14.74$ lbs/hr

Run #2:

$E = (2.59 \times 10^{-9})\ (28.01)\ (138.4)\ (1{,}622{,}188.0) = 16.29$ lbs/hr

Run #3:

$E = (2.59 \times 10^{-9})\ (28.01)\ (172.9)\ (1{,}537{,}914.5) = 19.29$ lbs/hr

NAME: MACASPHALT (Gaseous Compounds)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

TOTAL SULFUR DIOXIDE EMISSIONS: POUNDS PER HOUR

$$E = (2.59 \times 10^{-9})(M_d)(ppm_d)(Q_{sd})(K)$$

Where:

E = SO_2 emissions rate, lbs/hr.

2.59×10^{-9} = Conversion factor, lbs/dscf.

M_d = Dry molecular weight (SO_2 = 64.07).

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/hr.

ppm_d = Parts per million, dry basis.

K = Constant (typically 1).

Run #1:

$E = (2.59 \times 10^{-9})\ (64.07)\ (146.1)\ 1{,}468{,}141.8 = 35.59$ lbs/hr

Run #2:

$E = (2.59 \times 10^{-9})\ (64.07)\ (146.1)\ 1{,}622{,}188.0 = 39.33$ lbs/hr

Run #3:

$E = (2.59 \times 10^{-9})\ (64.07)\ (129.9)\ 1{,}537{,}914.5 = 33.15$ lbs/hr

NAME: MACASPHALT (Gaseous Compounds)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

TOTAL NO_x EMISSIONS: POUNDS PER HOUR

$$E = (2.59 \times 10^{-9})(M_d)(ppm_d)(Q_{sd})(K)$$

Where:

E = NO_x as NO_2 emissions rate, lbs/hr.

2.59×10^{-9} = Conversion factor, lbs/dscf.

M_d = Dry molecular weight (NO_2 = 46.01).

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/hr.

ppm_d = Parts per million, dry basis.

K = Constant (typically 1).

Run #1:

$E = (2.59 \times 10^{-9})\ (46.01)\ (128.1)\ (1{,}468{,}141.8) = 22.41$ lbs/hr

Run #2:

$E = (2.59 \times 10^{-9})\ (46.01)\ (128.1)\ (1{,}622{,}180.0) = 24.76$ lbs/hr

Run #3:

$E = (2.59 \times 10^{-9})\ (46.01)\ (111.2)\ (1{,}537{,}914.5) = 20.38$ lbs/hr

NAME: MACASPHALT (Gaseous Compounds)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

TOTAL HYDROCARBON EMISSIONS: POUNDS PER HOUR

$$E = (2.59 \times 10^{-9})(M_d)(ppm_d)(Q_{sd})(K)$$

Where:

E = THC as CH_4 emissions rate, lbs/hr.

2.59×10^{-9} = Conversion factor, lbs/dscf.

M_d = Dry molecular weight (CH_4 = 16.04).

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/hr.

ppm_d = Parts per million, dry basis.

K = Constant (typically 1).

Run #1:

$E = (2.59 \times 10^{-9})\ (16.04)\ (119.4)\ (1{,}468{,}141.8) = 7.28$ lbs/hr

Run #2:

$E = (2.59 \times 10^{-9})\ (16.04)\ (120.7)\ (1{,}622{,}180.0) = 8.13$ lbs/hr

Run #3:

$E = (2.59 \times 10^{-9})\ (16.04)\ (143.3)\ (1{,}537{,}914.5) = 9.16$ lbs/hr

NAME: MACASPHALT (Gaseous Compounds)
LOCATION: MELBOURNE, FLORIDA **DATE:** December 2-4, 1992

TOTAL METHANE EMISSIONS: POUNDS PER HOUR

$$E = (2.59 \times 10^{-9})(M_d)(ppm_d)(Q_{sd})(K)$$

Where:

E = CH_4 emissions rate, lbs/hr.

2.59×10^{-9} = Conversion factor, lbs/dscf.

M_d = Dry molecular weight (CH_4 = 16.04).

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/hr.

ppm_d = Parts per million, dry basis.

K = Constant (typically 1).

Run #1:

$E = (2.59 \times 10^{-9})\ (16.04)\ (6.27)\ (1{,}468{,}141.8) = 0.38$ lbs/hr

Run #2:

$E = (2.59 \times 10^{-9})\ (16.04)\ (21.02)\ (1{,}622{,}180.0) = 1.42$ lbs/hr

Run #3:

$E = (2.59 \times 10^{-9})\ (16.04)\ (22.50)\ (1{,}537{,}914.5) = 1.44$ lbs/hr

VII. LABORATORY ANALYSIS RESULTS

A. Formaldehyde Analysis Results

AMERICAN INTERPLEX
CORPORATION
LABORATORIES

8600 Kanis Road
Little Rock, AR 72204-2322
(501) 224-5060

RECEIVED
DEC 31 1992

Ramcon Environmental Corporation (C-488)
6707 Fletcher Creek Cove
Memphis, TN 38134

December 28, 1992

ATTN: Mr. Joe Sewell

Control No. 11643

Sample Description: Six (6) impinger solutions received on 12/17/92
Plant: Mac Asphalt - NAPA; P.O. Nos. 080102, 080103

Results:

Sample Identification	Volume, ml	Formaldehyde, mg
Run 1, 12/9/92	530	8.8
Run 2, 12/9/92	700	8.8
Run 3, 12/9/92	685	5.8
Run 1, 12/4/92	495	0.063
Run 2, 12/4/92	495	4.2
Run 3, 12/4/92	575	0.60

Method: 40 CFR Part 266, Appendix IX Section 3.6 Method 0011A

AMERICAN INTERPLEX CORPORATION

By Steven Lovell
Steven Lovell
Technical Director

SL/td

VII. LABORATORY ANALYSIS RESULTS

B. PAH Analysis Results

Triangle Laboratories of RTP, Inc.
801 Capitola Dr.
Durham, NC 27713
(919) 544-5729

Sample File : GL505
Response File : GL500
Date Analyzed : 01/03/93
Date Reported : 01/05/93
Project Number: 22680

Sample ID: RUN#1
TLI ID: 62.51.1A-I
Dilution Factor: 4.00

Quantitation Results Method 8270

Analyte	Area	RF	SCAN	ISID	Amt. (ug)	Code	Quan Limit	FLAG
1,4-Dichlorobenzene-d4	3692		420	1		I		
Naphthalene-d8	16898		599	2		I		
2-Methylnaphthalene	12192	0.679	705	2	170.01	D	40.0	____
Naphthalene	12447	1.001	602	2	117.74	D	40.0	____
Acenaphthene-d10	7882		857	3		I		
Acenaphthene	0	0.957	0	3	0.42	ND	40.0	____
Fluorene	0	1.180	0	3	0.34	ND	40.0	____
2-Chloronaphthalene	0	0.971	0	3	0.42	ND	40.0	____
Acenaphthylene	0	1.680	0	3	0.24	ND	40.0	____
Phenanthrene-d10	12369		1076	4		I		
Phenanthrene	0	0.921	0	4	0.28	ND	40.0	____
Anthracene	0	0.944	0	4	0.27	ND	40.0	____
Fluoranthene	2581	1.115	1256	4	29.95	E	40.0	____
Chrysene-d12	15209		1471	5		I		
Chrysene	0	0.995	0	5	0.21	ND	40.0	____
Pyrene	4322	1.167	1288	5	38.97	E	40.0	____
Benzo(a)anthracene	0	0.978	0	5	0.22	ND	40.0	____
Perylene-d12	13417		1741	6		I		
Benzo(b)fluoranthene	0	1.380	0	6	0.17	ND	40.0	____
Benzo(k)fluoranthene	0	1.785	0	6	0.13	ND	40.0	____
Benzo(e)pyrene	0	1.423	0	6	0.17	ND	40.0	____
Benzo(a)pyrene	0	1.321	0	6	0.18	ND	40.0	____
Perylene	0	0.688	0	6	0.35	ND	40.0	____
Indeno(1,2,3-cd)pyrene	0	0.876	0	6	0.27	ND	40.0	____
Dibenz(a,h)anthracene	0	0.875	0	6	0.27	ND	40.0	____
Benzo(g,h,i)perylene	1004	1.068	2016	6	11.22	E	40.0	____

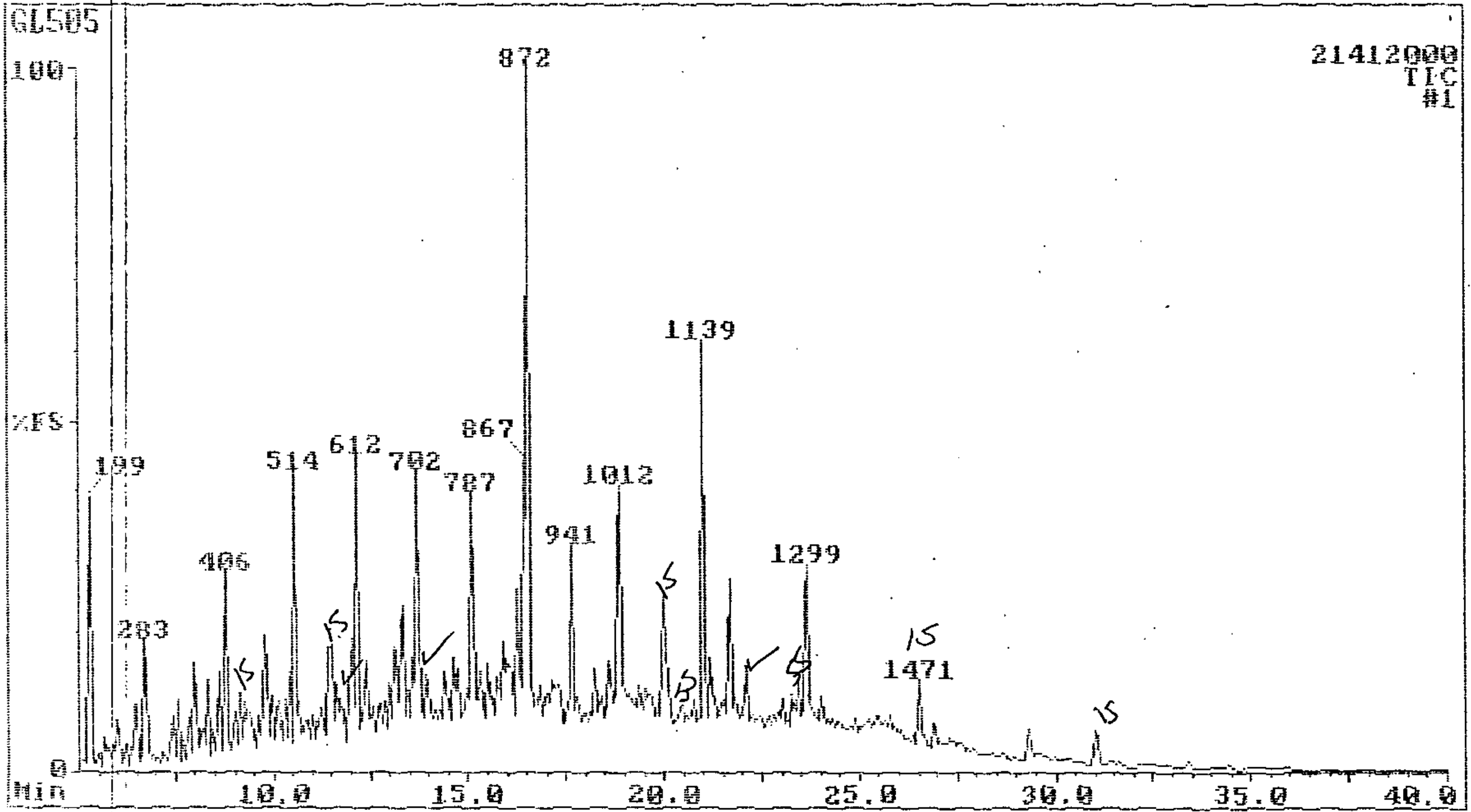
Surrogate Summary	Area	RF	SCAN	ISID	Amount (ug)	Code	%REC
Anthracene-d10	4253	0.508	1084	4	108.32	D	108.3
Pyrene-d10	6179	1.066	1286	5	60.98	D	61.0

Reveiwed by ____________ Date 1 / 5 / 93

ND -Not Detected; D- Detected; E- Estimated; I- Internal Standard

Orgrep v2.5

03-Jan-93 23:51 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #1 (1:4 DIL.) 22680 Instrument G



OJ 1-5-93

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QUAN DB : GL505                    LAB-BASE  QUAN                  04-Jan-93     08:14

 No. MAT  FOR REV Delta        Area P.Flags  Scan     QM Name
------------------------------------------------------------------------------------------
   1  93   52  97     0      369290 bb        420    152 1,4-Dichlorobenzene-d4
   2  90   54  90     0     1689900 vv        599    136 Naphthalene-d8
      75   33  87     0      788270 vv        857    164 Acenaphthene-d10
   4  88   46  94     0     1236900 vv       1076    188 Phenanthrene-d10
   5  92   61  97    -1     1520900 vv       1471    240 Chrysene-d12
   6 100   66  94     0     1341700 bv       1741    264 Perylene-d12
   7   0    0   0     0           0             0    112 2-Fluorophenol
   8   0    0   0     0           0             0    132 2-Chlorophenol-d4
   9   0    0   0     0           0             0     99 Phenol-d5
  10   0    0   0     0           0             0    152 1,2-Dichlorobenzene-d4
  11   0    0   0     0           0             0     82 Nitrobenzene-d5
  12   0    0   0     0           0             0    185 1,3,5-Trichlorobenzene-d3
  13   0    0   0     0           0             0    240 1,4-Dibromobenzene-d4
  14   0    0   0     0           0             0    172 2-Fluorobiphenyl
  15   0    0   0     0           0             0    330 2,4,6-Tribromophenol
  16  68   26  83    -1      425390 vv       1084    188 Anthracene-d10
  17  81   38  92     0      617930 vv       1286    212 Pyrene-d10
  18   0    0   0     0           0             0    244 Terphenyl-d14
  19  84   38  97     0     1244800 vv        602    128 Naphthalene
  20  88   54  87     0     1219200 vb        705    142 2-Methylnaphthalene
  21   0    0   0     0           0             0    162 2-Chloronaphthalene
  22   0    0   0     0           0             0    152 Acenaphthylene
  23   0    0   0     0           0             0    154 Acenaphthene
  24   0    0   0     0           0             0    166 Fluorene
  25   0    0   0     0           0             0    266 Pentachlorophenol
  26   0    0   0     0           0             0    178 Phenanthrene
  27   0    0   0     0           0             0    178 Anthracene
      66   24  89    -1      258180 vb       1256    202 Fluoranthene
      73   30  87    -1      432270 vv       1288    202 Pyrene
  30   0    0   0     0           0             0    228 Benzo(a)anthracene
  31   0    0   0     0           0             0    228 Chrysene
  32   0    0   0     0           0             0    252 Benzo(b)fluoranthene
  33   0    0   0     0           0             0    252 Benzo(k)fluoranthene
  34   0    0   0     0           0             0    252 Benzo(e)pyrene
  35   0    0   0     0           0             0    252 Benzo(a)pyrene
  36   0    0   0     0           0             0    252 Perylene
  37   0    0   0     0           0             0    276 Indeno(1,2,3-cd)pyrene
  38   0    0   0     0           0             0    278 Dibenz(a,h)anthracene
  39  42   21  83    -4      100470 bb       2016    276 Benzo(g,h,i)perylene
```

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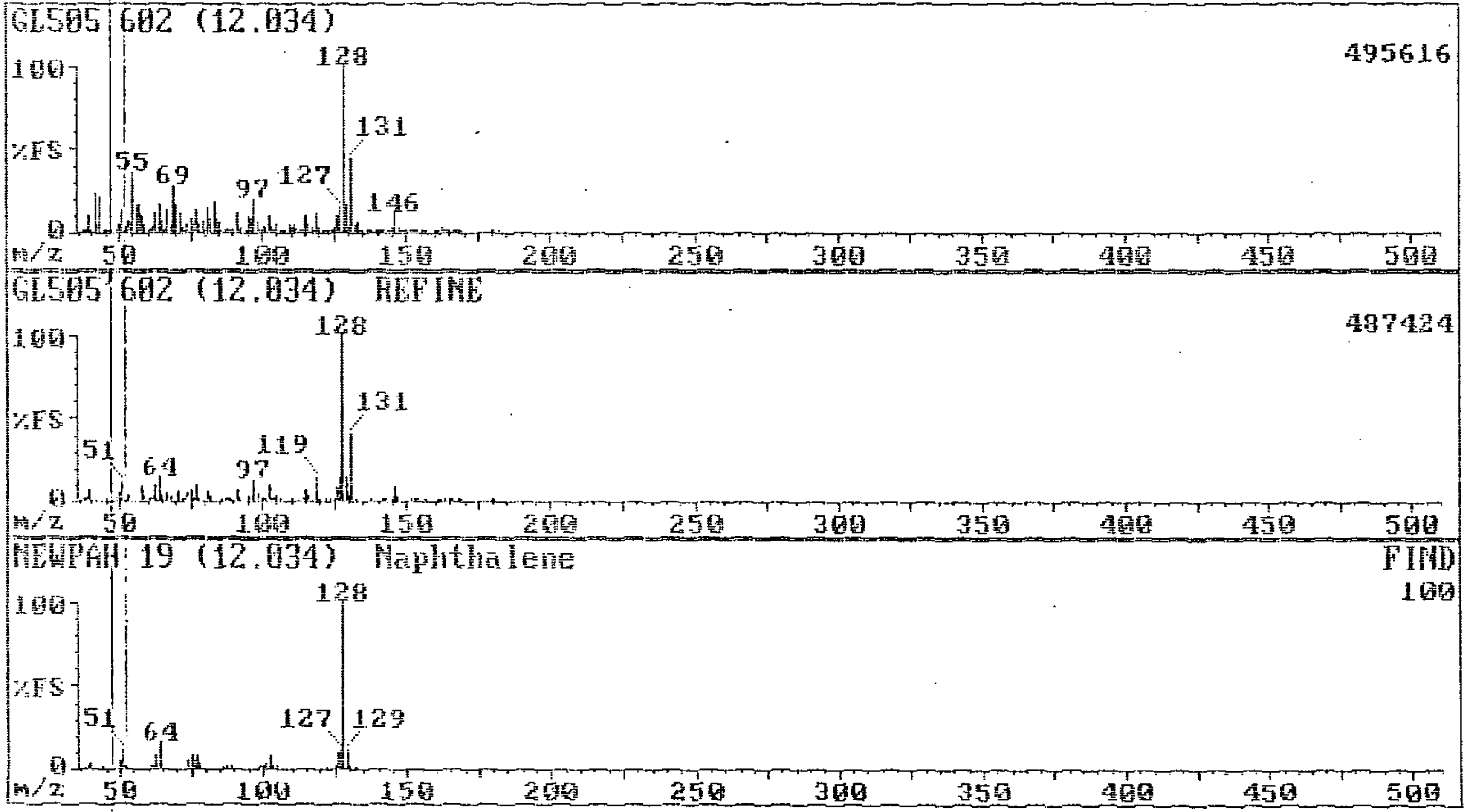
1-5-93

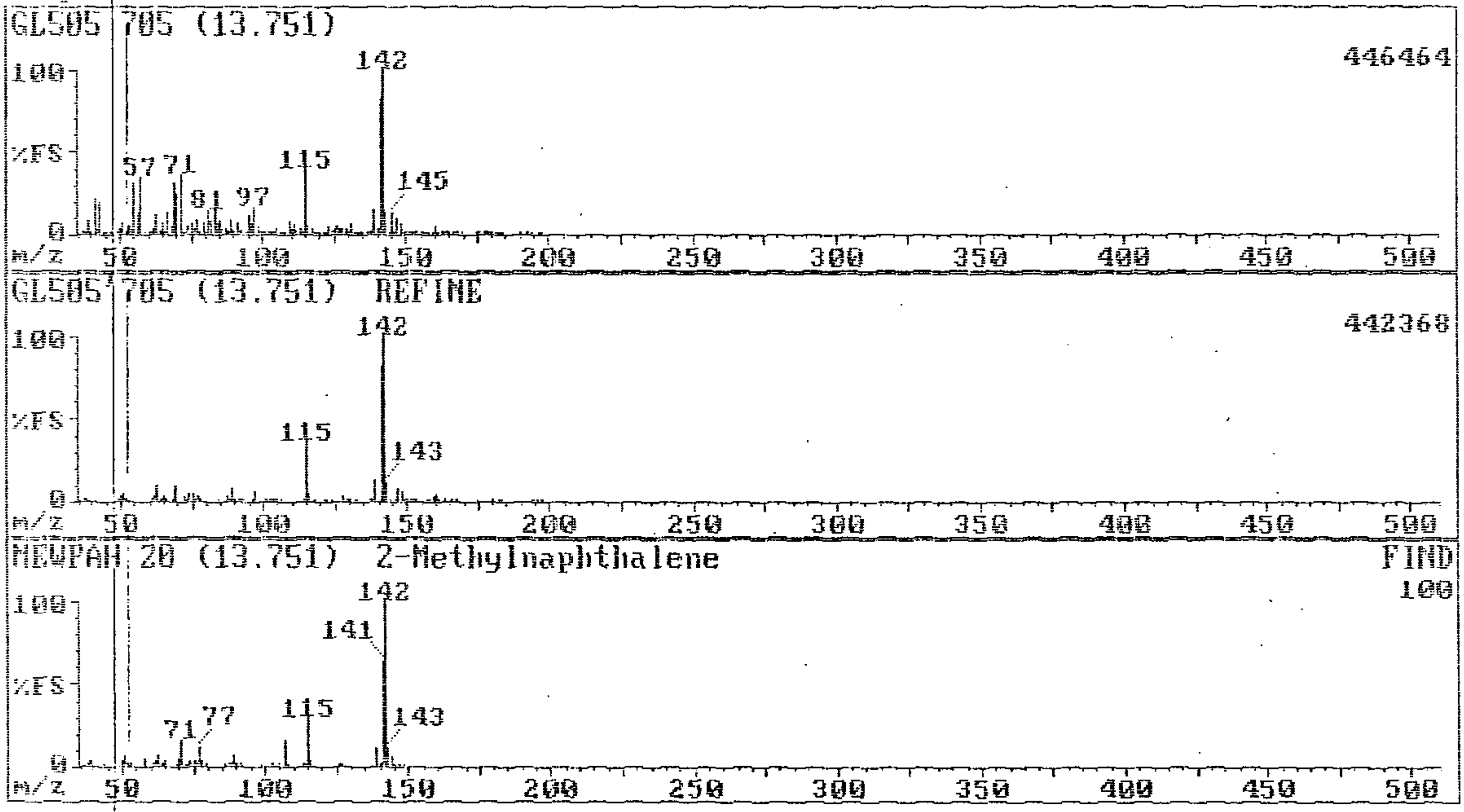
03-Jan-93 23:51 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #1 (1:4 DIL.) 22680 Instrument G


GL505 602 (12.034)

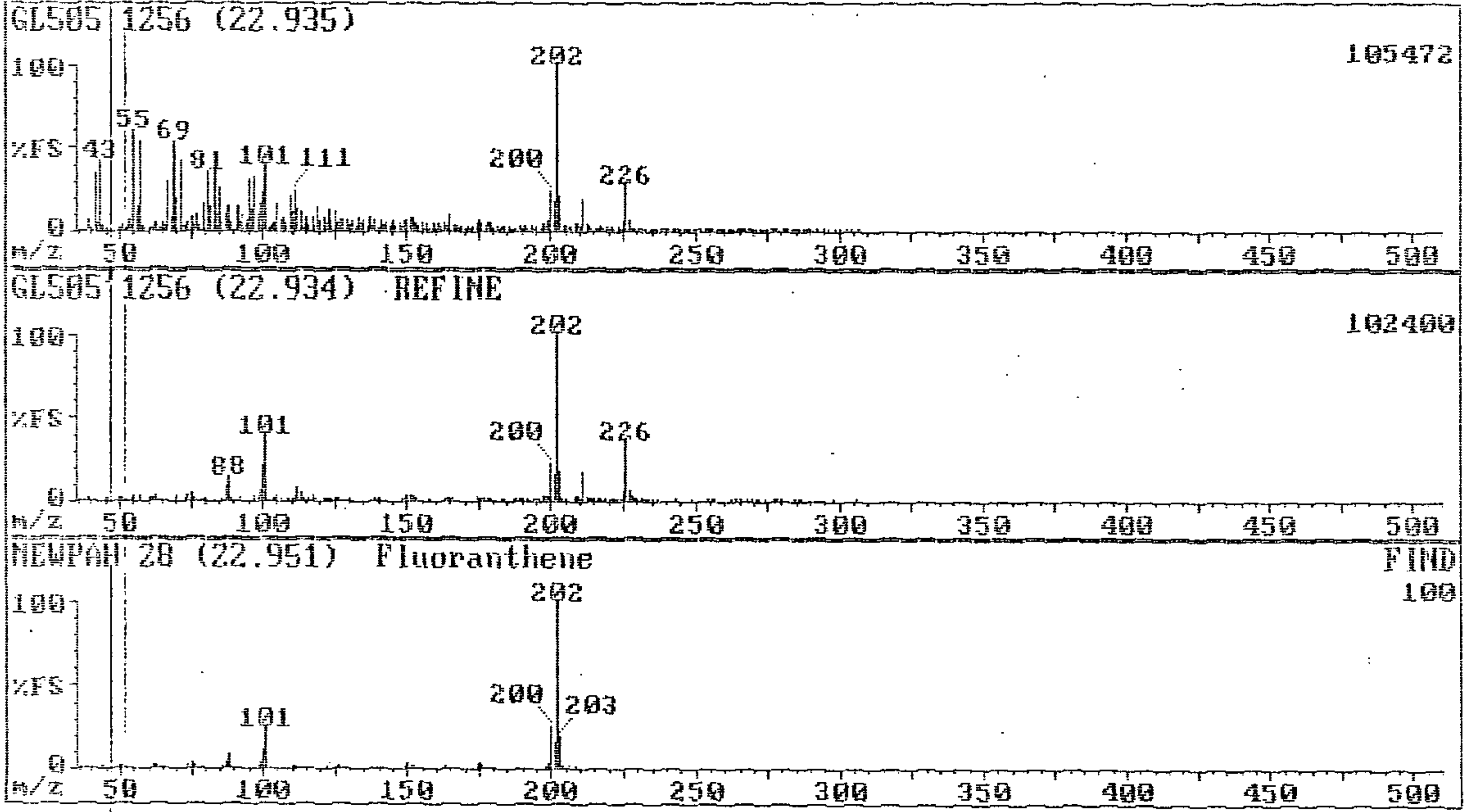
GL505 602 (12.034) REFINE

NEWPAH 19 (12.034) Naphthalene

03-Jan-93 23:51 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #1 (1:4 DIL.) 22680 Instrument G

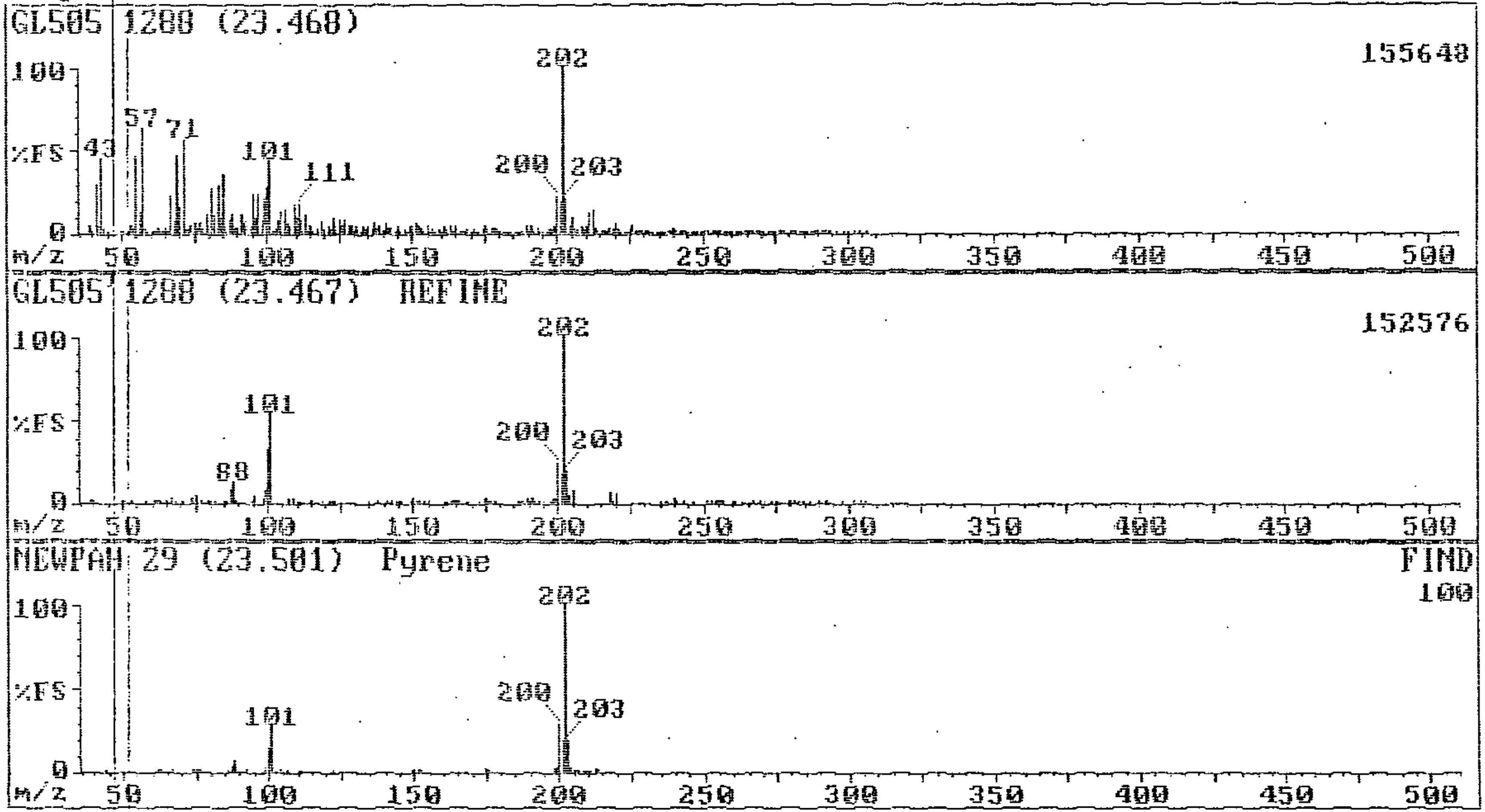


03-Jan-93 23:51 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #1 (1:4 DIL.) 22680 Instrument G

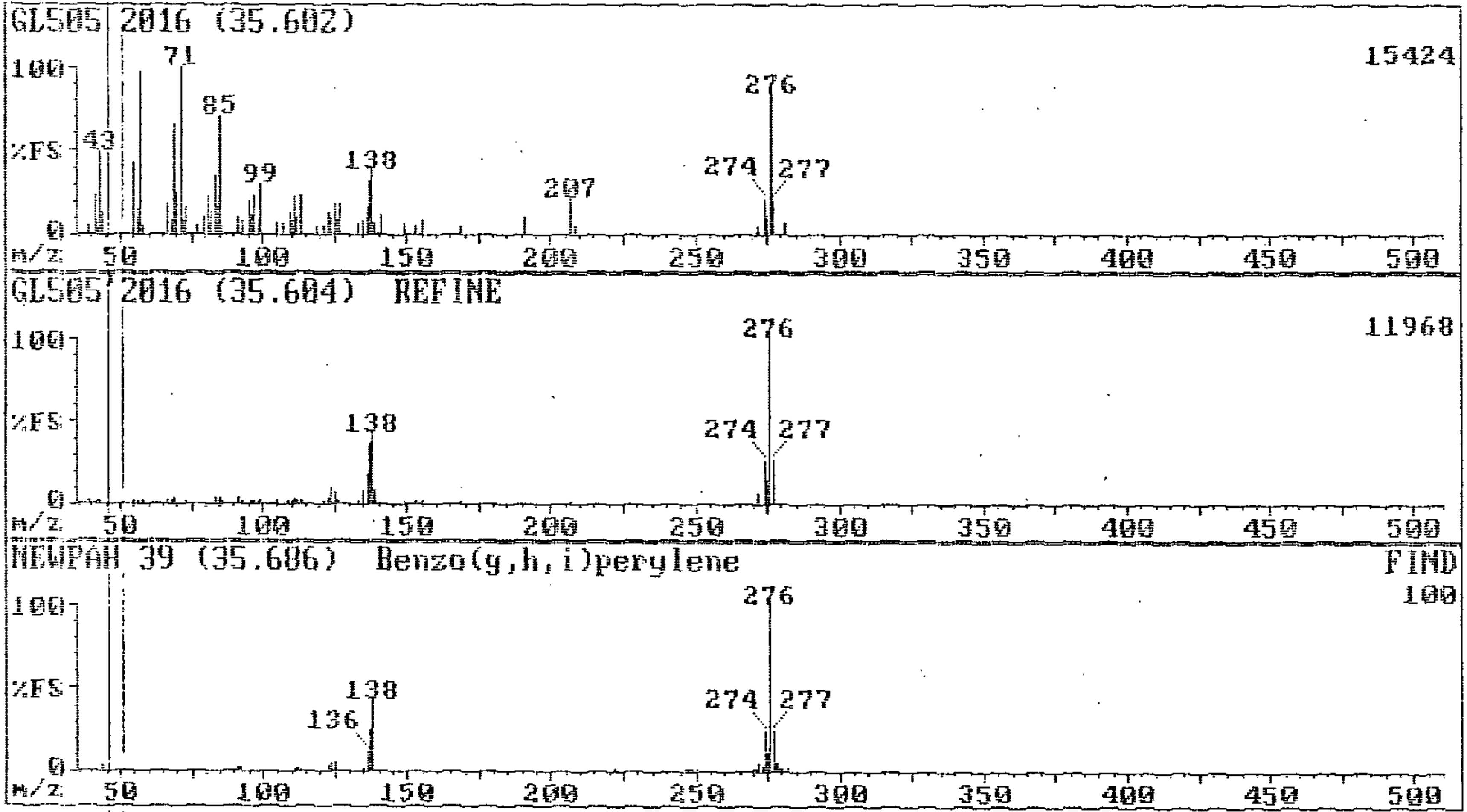


03-Jan-93 23:51 Triangle Laboratories of RTP, Inc. (919) 544-5729

Sample: RUN #1 (1:4 DIL.) 22680 Instrument G



03-Jan-93 23:51 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #1 (1:4 DIL.) 22680 Instrument G



Triangle Laboratories of RTP, Inc.
801 Capitola Dr.
Durham, NC 27713
(919) 544-5729

Sample File : GL506
Response File : GL500
Date Analyzed : 01/04/93
Date Reported : 01/05/93
Project Number: 22680

Sample ID: RUN#2

TLI ID: 62.51.2A-I
Dilution Factor: 4.00

Quantitation Results Method 8270

Analyte	Area	RF	SCAN	ISID	Amt. (ug)	Code	Quan Limit	FLAG
1,4-Dichlorobenzene-d4	4012		420	1		I		
Naphthalene-d8	17425		599	2		I		
2-Methylnaphthalene	9852	0.679	705	2	133.23	D	40.0	
Naphthalene	9987	1.001	602	2	91.61	D	40.0	
Acenaphthene-d10	7835		857	3		I		
Acenaphthene	0	0.957	0	3	0.43	ND	40.0	
Fluorene	0	1.180	0	3	0.35	ND	40.0	
2-Chloronaphthalene	0	0.971	0	3	0.42	ND	40.0	
Acenaphthylene	0	1.680	0	3	0.24	ND	40.0	
Phenanthrene-d10	13104		1076	4		I		
Phenanthrene	9763	0.921	1080	4	129.43	D	40.0	
Anthracene	0	0.944	0	4	0.26	ND	40.0	
Fluoranthene	11941	1.115	1256	4	130.76	D	40.0	
Chrysene-d12	8812		1471	5		I		
Chrysene	0	0.995	0	5	0.36	ND	40.0	
Pyrene	23332	1.167	1289	5	363.00	D	40.0	
Benzo(a)anthracene	0	0.978	0	5	0.37	ND	40.0	
Perylene-d12	8499		1742	6		I		
Benzo(b)fluoranthene	0	1.380	0	6	0.27	ND	40.0	
Benzo(k)fluoranthene	0	1.785	0	6	0.21	ND	40.0	
Benzo(e)pyrene	0	1.423	0	6	0.26	ND	40.0	
Benzo(a)pyrene	0	1.321	0	6	0.28	ND	40.0	
Perylene	0	0.688	0	6	0.55	ND	40.0	
Indeno(1,2,3-cd)pyrene	0	0.876	0	6	0.43	ND	40.0	
Dibenz(a,h)anthracene	0	0.875	0	6	0.43	ND	40.0	
Benzo(g,h,i)perylene	0	1.068	0	6	0.35	ND	40.0	

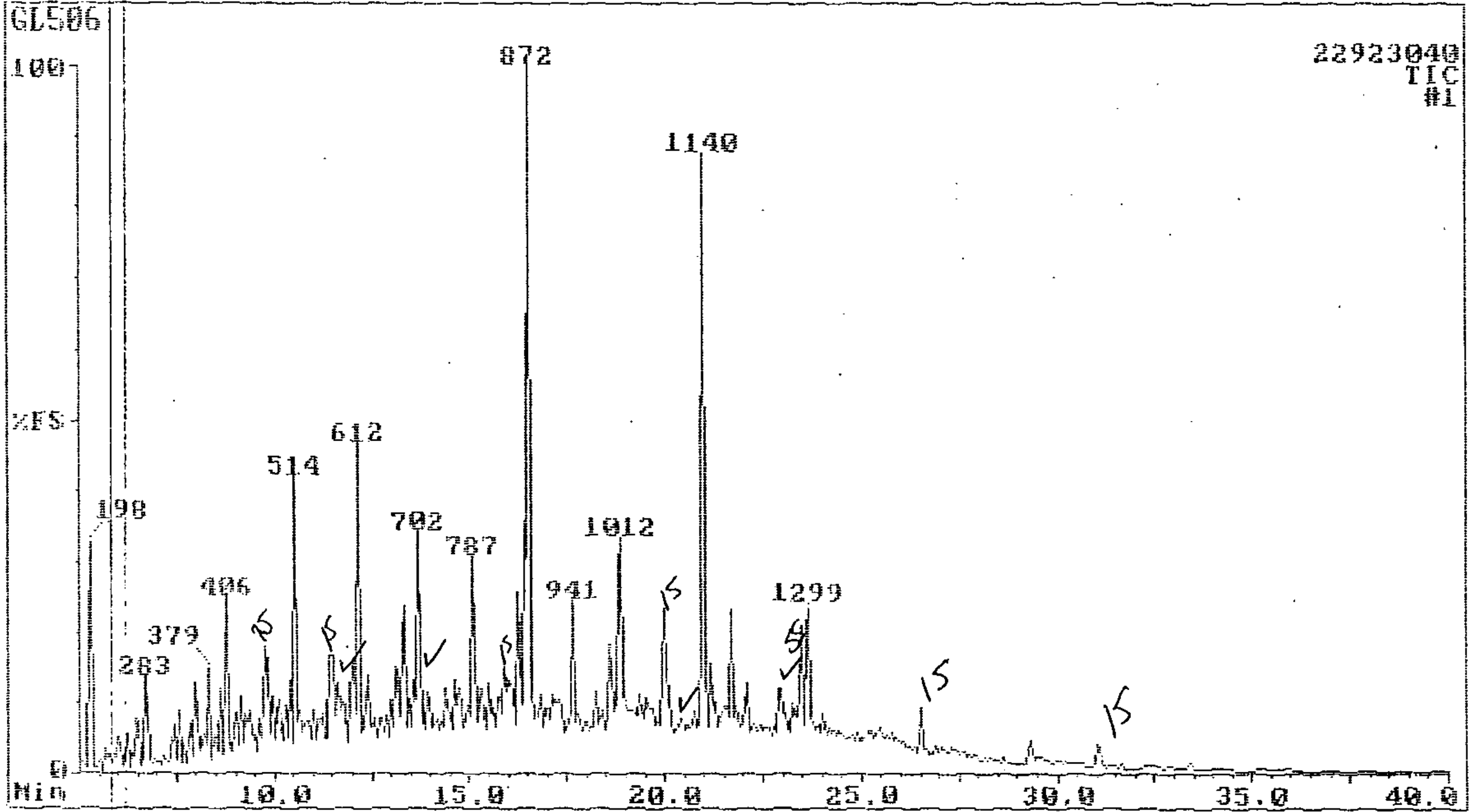
Surrogate Summary	Area	RF	SCAN	ISID	Amount (ug)	Code	%REC
Anthracene-d10	4487	0.508	1084	4	107.86	D	107.9
Pyrene-d10	6062	1.066	1286	5	103.25	D	103.3

Reveiwed by ____________ Date 1/5/93

ND -Not Detected; D- Detected; E- Estimated; I- Internal Standard

Orgrep v2.5

04-Jan-93 00:43 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #2 (1:4 DIL.) 22680 Instrument G



1-5-93

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QUAN 06 : 01506                LAB-BASE  QUAN                   04-Jan-93      08:14

 No. MAT  FOR REV Delta       Area P.Flags  Scan     QM Name
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  1   93   52  97     0     401220 bv        420    152 1,4-Dichlorobenzene-d4
      90   54  90     0    1742500 vv        599    136 Naphthalene-d8
      74   32  87     0     783560 vv        857    164 Acenaphthene-d10
  4   89   48  94     0    1310400 vv       1076    188 Phenanthrene-d10
  5   87   55  95    -1     881240 bb       1471    240 Chrysene-d12
  6   91   60  96     1     849980 bb       1742    264 Perylene-d12
  7    0    0   0     0          0             0    112 2-Fluorophenol
  8    0    0   0     0          0             0    132 2-Chlorophenol-d4
  9    0    0   0     0          0             0     99 Phenol-d5
 10    0    0   0     0          0             0    152 1,2-Dichlorobenzene-d4
 11    0    0   0     0          0             0     82 Nitrobenzene-d5
 12    0    0   0     0          0             0    185 1,3,5-Trichlorobenzene-d3
 13    0    0   0     0          0             0    240 1,4-Dibromobenzene-d4
 14    0    0   0     0          0             0    172 2-Fluorobiphenyl
 15    0    0   0     0          0             0    330 2,4,6-Tribromophenol
 16   71   29  85    -1     443780 vv       1084    188 Anthracene-d10
 17   78   35  90     0     606200 vv       1286    212 Pyrene-d10
 18    0    0   0     0          0             0    244 Terphenyl-d14
 19   81   34  96     0     998720 vv        602    128 Naphthalene
 20   87   53  86     0     985210 vb        705    142 2-Methylnaphthalene
 21    0    0   0     0          0             0    162 2-Chloronaphthalene
 22    0    0   0     0          0             0    152 Acenaphthylene
 23    0    0   0     0          0             0    154 Acenaphthene
 24    0    0   0     0          0             0    166 Fluorene
 25    0    0   0     0          0             0    266 Pentachlorophenol
 26   75   29  91     0     976310 vv       1080    178 Phenanthrene
 27    0    0   0     0          0             0    178 Anthracene
      87   53  97    -1    1194100 vb       1256    202 Fluoranthene
 29   98   62  95     0    2333200 vv       1289    202 Pyrene
 30    0    0   0     0          0             0    228 Benzo(a)anthracene
 31    0    0   0     0          0             0    228 Chrysene
 32    0    0   0     0          0             0    252 Benzo(b)fluoranthene
 33    0    0   0     0          0             0    252 Benzo(k)fluoranthene
 34    0    0   0     0          0             0    252 Benzo(e)pyrene
 35    0    0   0     0          0             0    252 Benzo(a)pyrene
 36    0    0   0     0          0             0    252 Perylene
 37    0    0   0     0          0             0    276 Indeno(1,2,3-cd)pyrene
 38    0    0   0     0          0             0    278 Dibenz(a,h)anthracene
 39    0    0   0     0          0             0    276 Benzo(g,h,i)perylene
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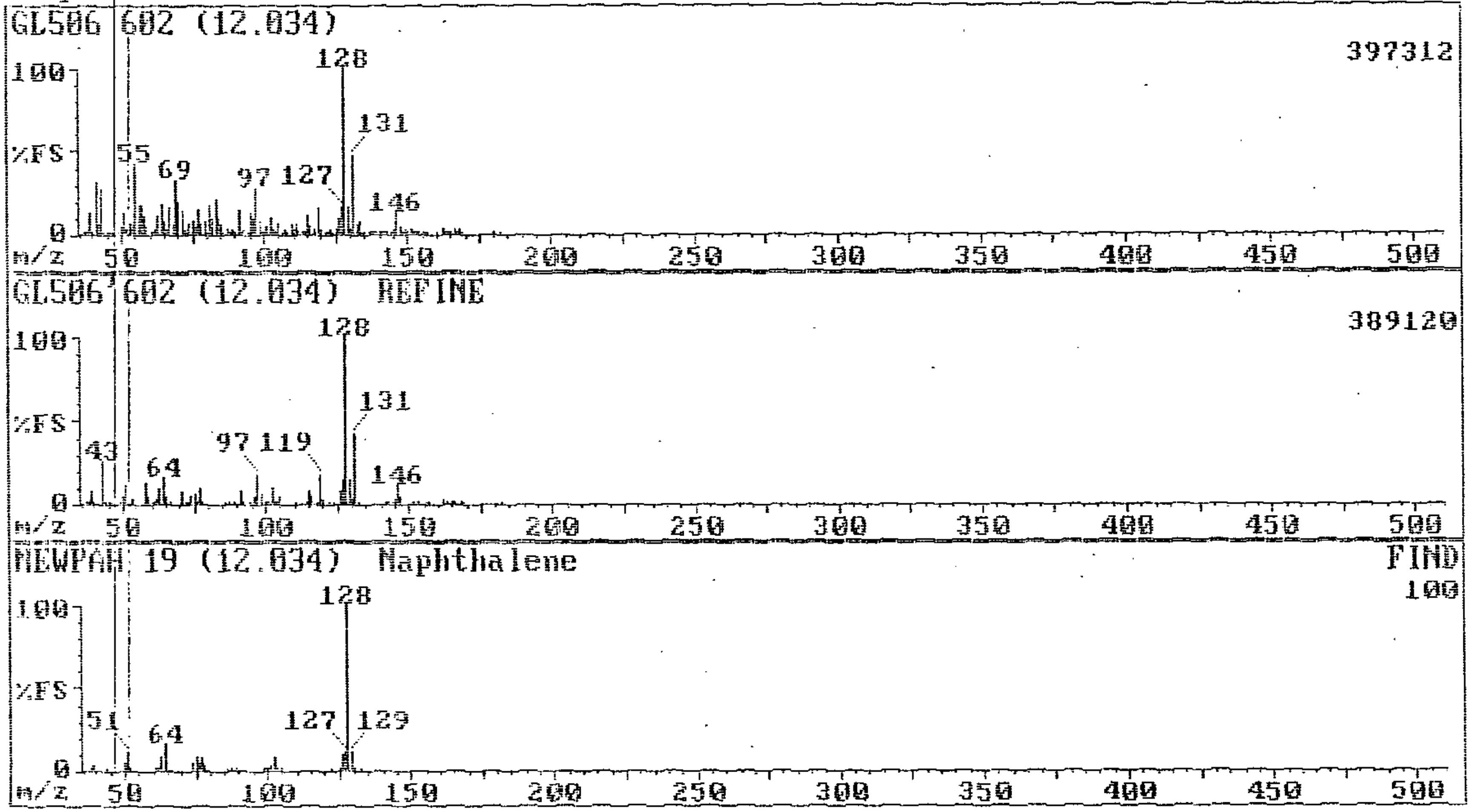
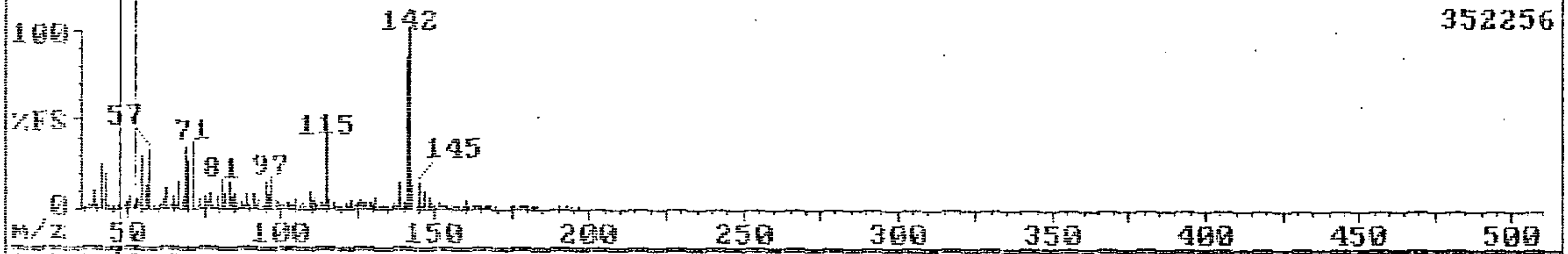
1-5-93

04-Jan-93 00:43 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #2 (1:4 DIL.) 22680 Instrument G

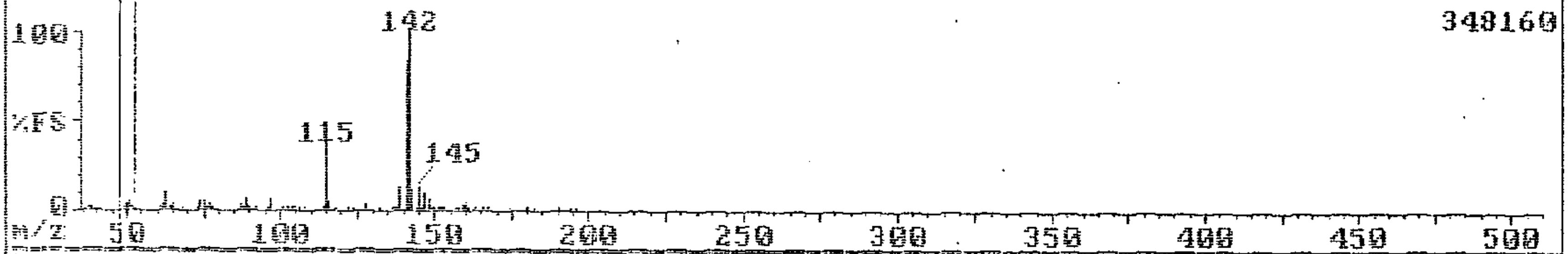


04-Jan-93 00:43 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #2 (1:4 DIL.) 22680 Instrument G

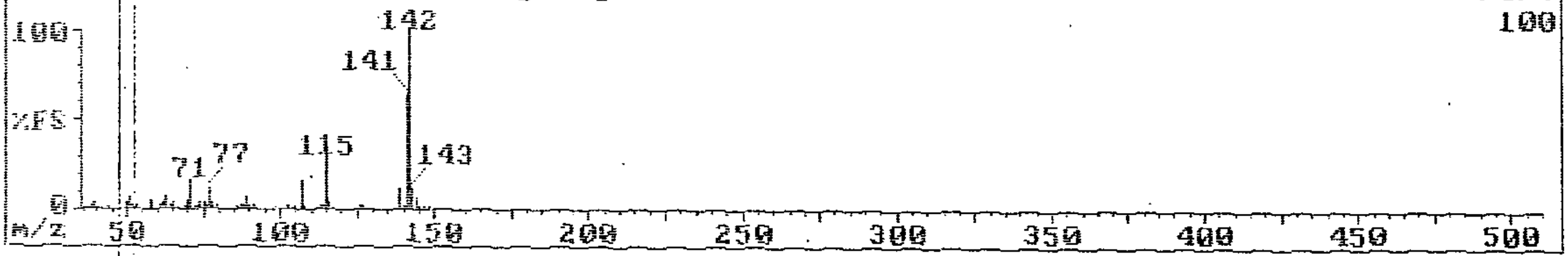
GL506 705 (13.751)



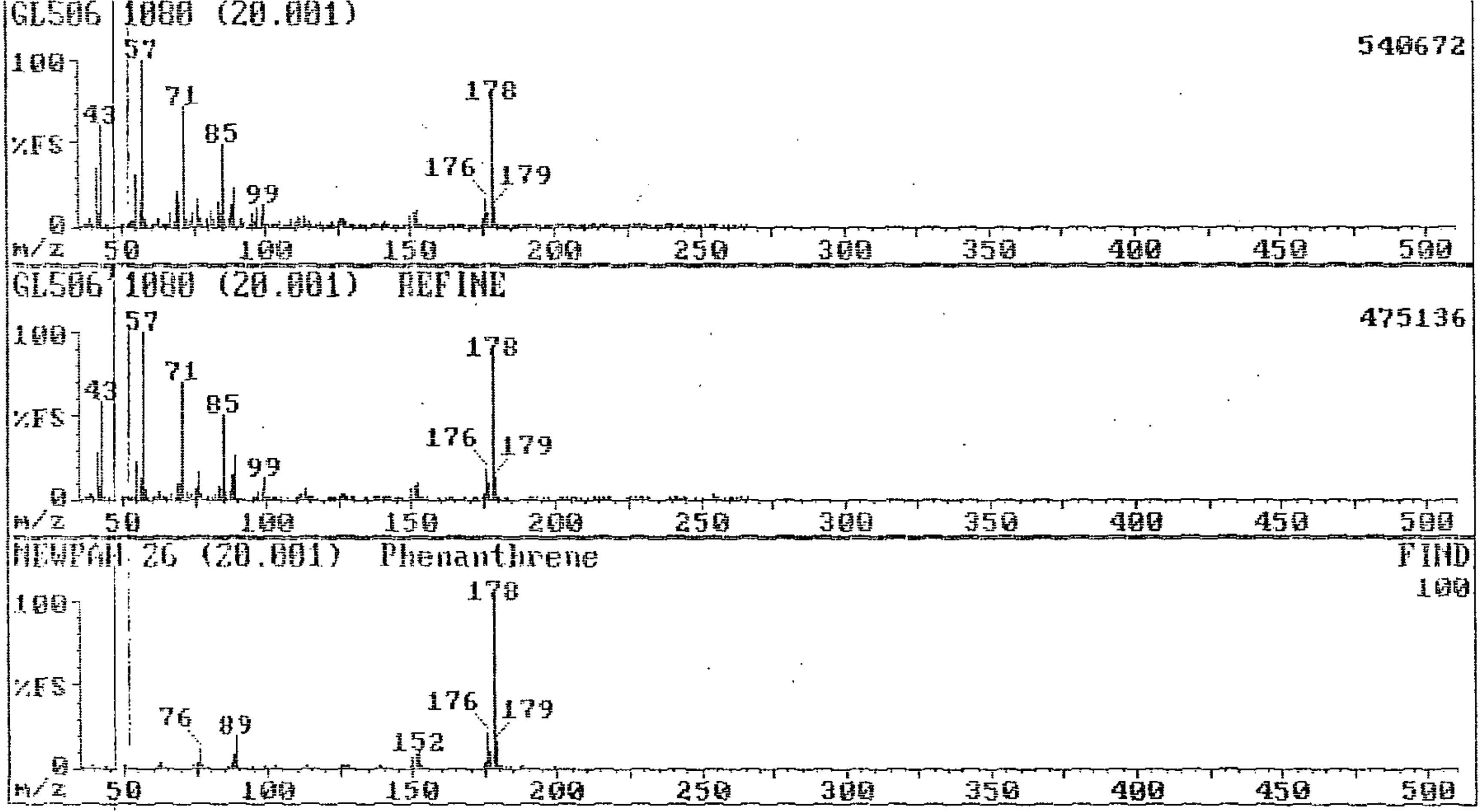
GL506 705 (13.751) REFINE



NEWPAH 20 (13.751) 2-Methylnaphthalene FIND

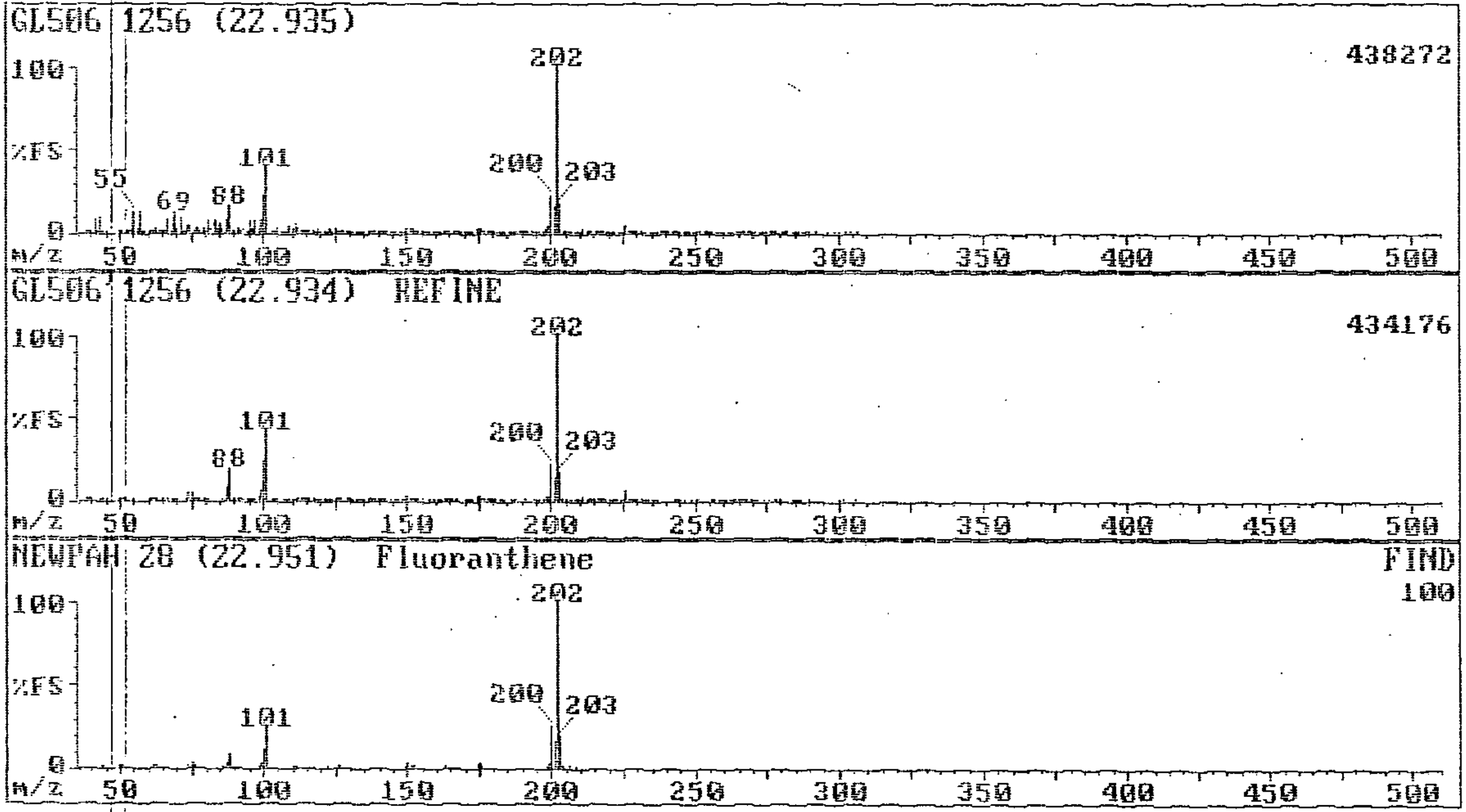


04-Jan-93 00:43 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #2 (1:4 DIL.) 22600 Instrument G

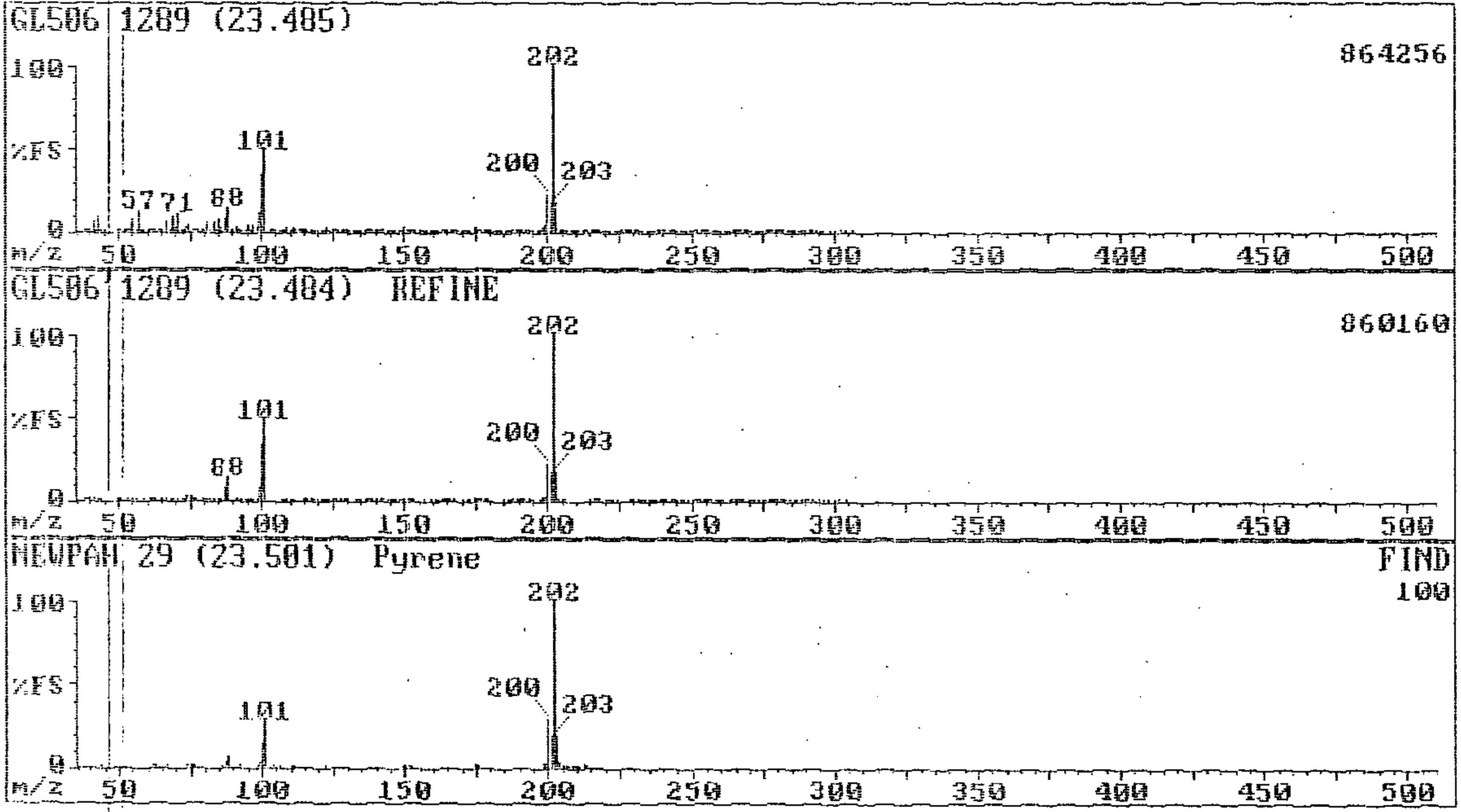


04-Jan-93 00:43 Triangle Laboratories of RTP, Inc. (919) 544-5729

Sample: RUN #2 (1:4 DIL.) 22680 Instrument G



04-Jan-93 00:43 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #2 (1:4 DIL.) 22680 Instrument G



Triangle Laboratories of RTP, Inc.
801 Capitola Dr.
Durham, NC 27713
(919) 544-5729

Sample File : GL515
Response File : GL509
Date Analyzed : 01/04/93
Date Reported : 01/05/93
Project Number: 22680

Sample ID: RUN#3
TLI ID: 62.51.3A-I
Dilution Factor: 10.00

Quantitation Results Method 8270

Analyte	Area	RF	SCAN	ISID	Amt. (ug)	Code	Quan Limit	FLAG
1,4-Dichlorobenzene-d4	6076		420	1		I		
Naphthalene-d8	24949		599	2		I		
2-Methylnaphthalene	7919	0.675	705	2	188.10	D	100.0	
Naphthalene	9273	0.940	602	2	158.17	D	100.0	
Acenaphthene-d10	13174		857	3		I		
Acenaphthene	0	0.969	0	3	0.63	ND	100.0	
Fluorene	0	1.170	0	3	0.52	ND	100.0	
2-Chloronaphthalene	0	1.006	0	3	0.60	ND	100.0	
Acenaphthylene	0	1.697	0	3	0.36	ND	100.0	
Phenanthrene-d10	26096		1076	4		I		
Phenanthrene	4259	0.915	1080	4	71.35	E	100.0	
Anthracene	0	0.959	0	4	0.32	ND	100.0	
Fluoranthene	2726	1.099	1256	4	38.02	E	100.0	
Chrysene-d12	29098		1471	5		I		
Chrysene	0	0.935	0	5	0.29	ND	100.0	
Pyrene	3172	0.996	1289	5	43.78	E	100.0	
Benzo(a)anthracene	0	0.962	0	5	0.29	ND	100.0	
Perylene-d12	20907		1742	6		I		
Benzo(b)fluoranthene	0	1.331	0	6	0.29	ND	100.0	
Benzo(k)fluoranthene	0	1.524	0	6	0.25	ND	100.0	
Benzo(e)pyrene	0	1.341	0	6	0.29	ND	100.0	
Benzo(a)pyrene	0	1.269	0	6	0.30	ND	100.0	
Perylene	0	0.669	0	6	0.57	ND	100.0	
Indeno(1,2,3-cd)pyrene	0	1.271	0	6	0.30	ND	100.0	
Dibenz(a,h)anthracene	0	0.984	0	6	0.39	ND	100.0	
Benzo(g,h,i)perylene	0	1.053	0	6	0.36	ND	100.0	

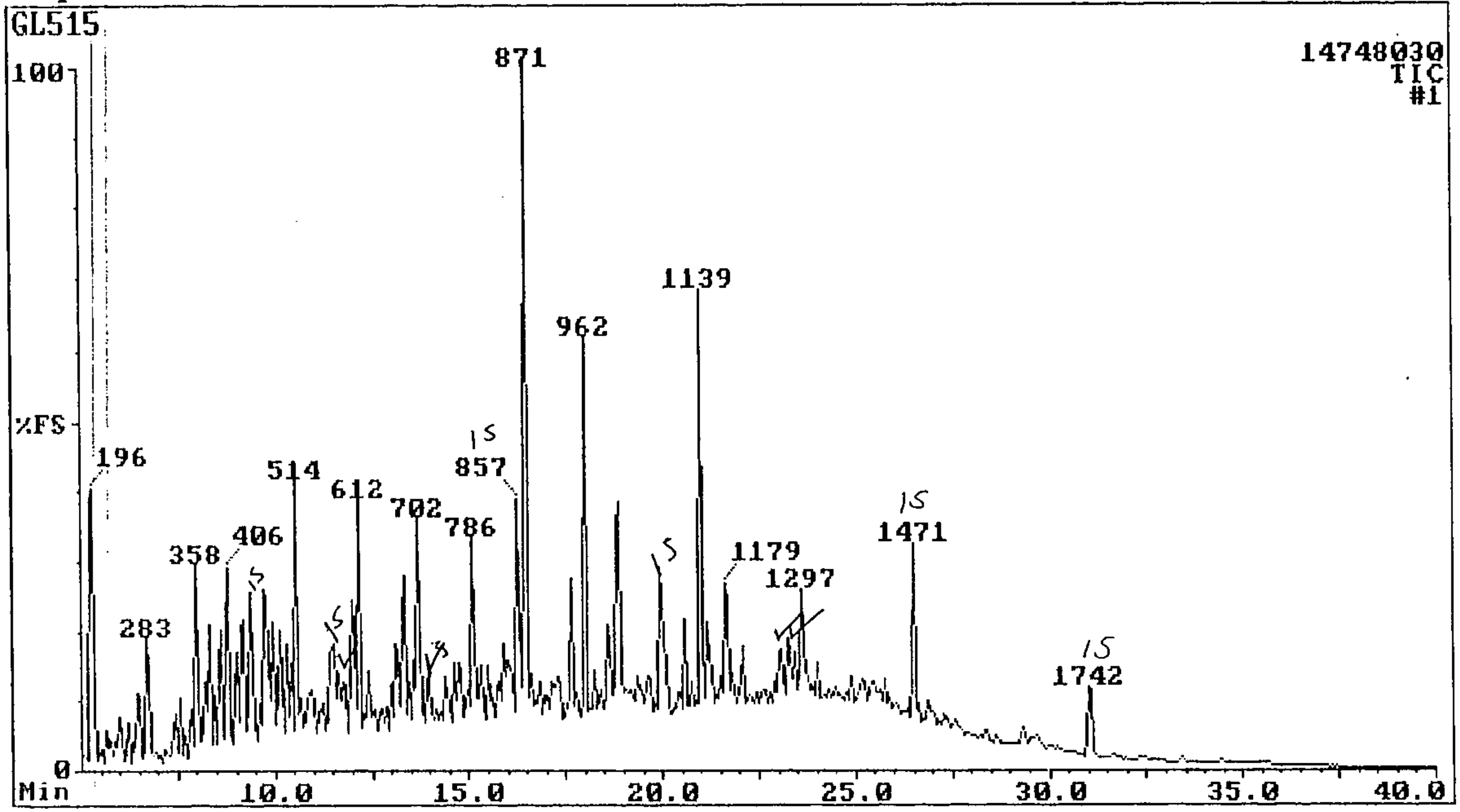
Surrogate Summary	Area	RF	SCAN	ISID	Amount (ug)	Code	%REC
Anthracene-d10	4025	0.492	1084	4	125.42	D	125.4
Pyrene-d10	5950	0.900	1286	5	90.89	D	90.9

Reveiwed by J Lyon Date 1/5/93

ND -Not Detected; D- Detected; E- Estimated; I- Internal Standard

Orgrep v2.5

04-Jan-93 14:02 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #3 (1:10 DIL.) 22680 Instrument G



1-5-93

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QUAN DB : GLS15                LAB-BASE  QUAN                04-Jan-93      14:54

No. MAT FOR REV Delta       Area P.Flags  Scan      QM Name
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  1  92  61  97     1     607620 bv        420     152 1,4-Dichlorobenzene-d4
     98  66  90     0    2494900 vv        599     136 Naphthalene-d8
  3  90  50  94     0    1317400 vv        857     164 Acenaphthene-d10
  4 100  65  97     0    2609500 bv       1076     188 Phenanthrene-d10
  5 100  68  97     0    2909800 bv       1471     240 Chrysene-d12
  6  96  71  95     1    2090700 bv       1742     264 Perylene-d12
  7   0   0   0     0          0             0     112 2-Fluorophenol
  8   0   0   0     0          0             0     132 2-Chlorophenol-d4
  9   0   0   0     0          0             0      99 Phenol-d5
 10   0   0   0     0          0             0     152 1,2-Dichlorobenzene-d4
 11   0   0   0     0          0             0      82 Nitrobenzene-d5
 12   0   0   0     0          0             0     185 1,3,5-Trichlorobenzene-d3
 13   0   0   0     0          0             0     240 1,4-Dibromobenzene-d4
 14   0   0   0     0          0             0     172 2-Fluorobiphenyl
 15   0   0   0     0          0             0     330 2,4,6-Tribromophenol
 16  71  28  85    -1     402600 vv       1084     188 Anthracene-d10
 17  79  36  91     0     595090 vv       1286     212 Pyrene-d10
 18   0   0   0     0          0             0     244 Terphenyl-d14
 19  87  42  97     0     927390 vv        602     128 Naphthalene
 20  89  56  87     0     791950 vv        705     142 2-Methylnaphthalene
 21   0   0   0     0          0             0     162 2-Chloronaphthalene
 22   0   0   0     0          0             0     152 Acenaphthylene
 23   0   0   0     0          0             0     154 Acenaphthene
 24   0   0   0     0          0             0     166 Fluorene
 25   0   0   0     0          0             0     266 Pentachlorophenol
 26  68  21  87     0     425940 vb       1080     178 Phenanthrene
      0   0   0     0          0             0     178 Anthracene
     71  23  90     0     272610 vb       1256     202 Fluoranthene
 29  67  24  83     0     317230 vv       1289     202 Pyrene
 30   0   0   0     0          0             0     228 Benzo(a)anthracene
 31   0   0   0     0          0             0     228 Chrysene
 32   0   0   0     0          0             0     252 Benzo(b)fluoranthene
 33   0   0   0     0          0             0     252 Benzo(k)fluoranthene
 34   0   0   0     0          0             0     252 Benzo(e)pyrene
 35   0   0   0     0          0             0     252 Benzo(a)pyrene
 36   0   0   0     0          0             0     252 Perylene
 37   0   0   0     0          0             0     276 Indeno(1,2,3-cd)pyrene
 38   0   0   0     0          0             0     278 Dibenz(a,h)anthracene
 39   0   0   0     0          0             0     276 Benzo(g,h,i)perylene
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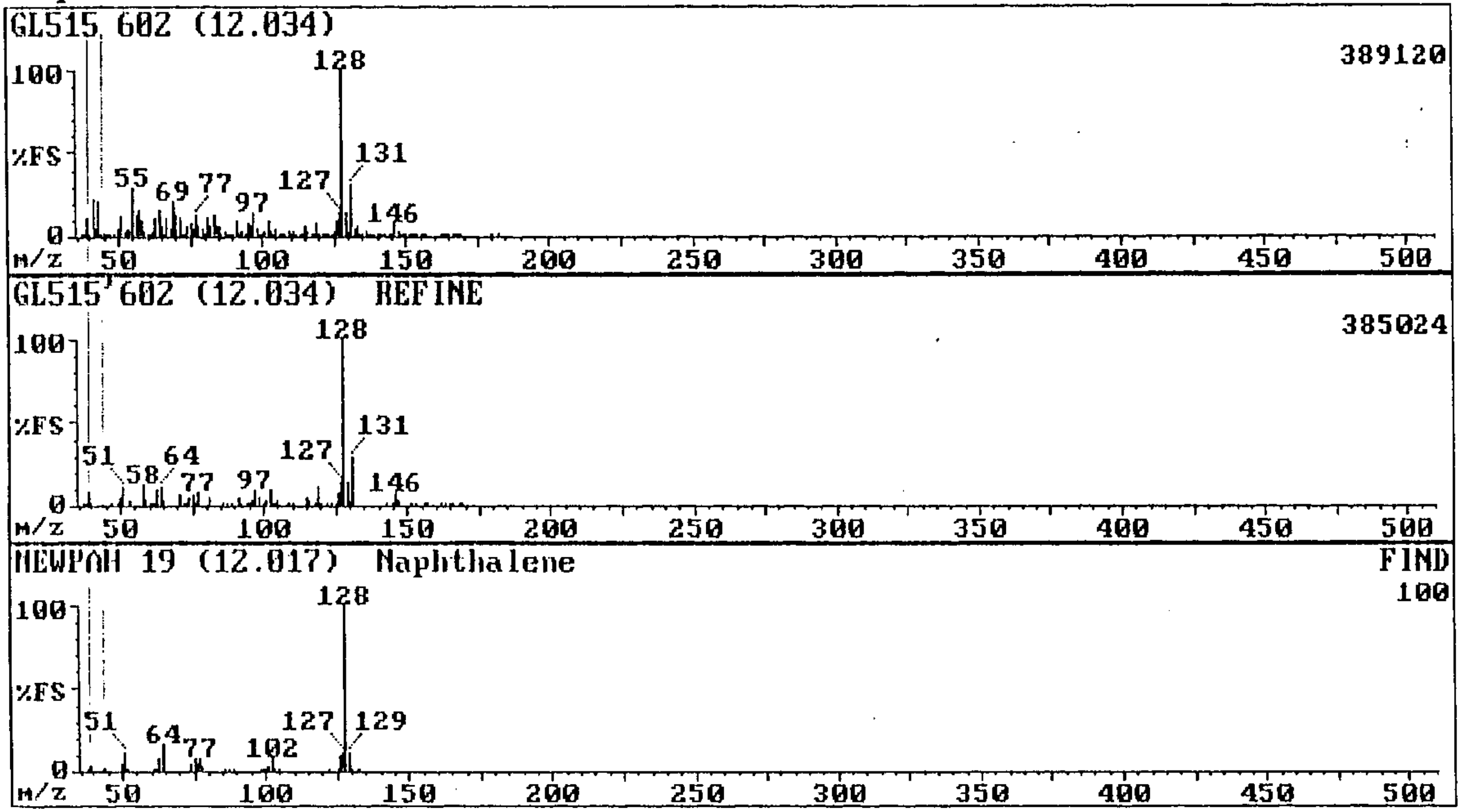
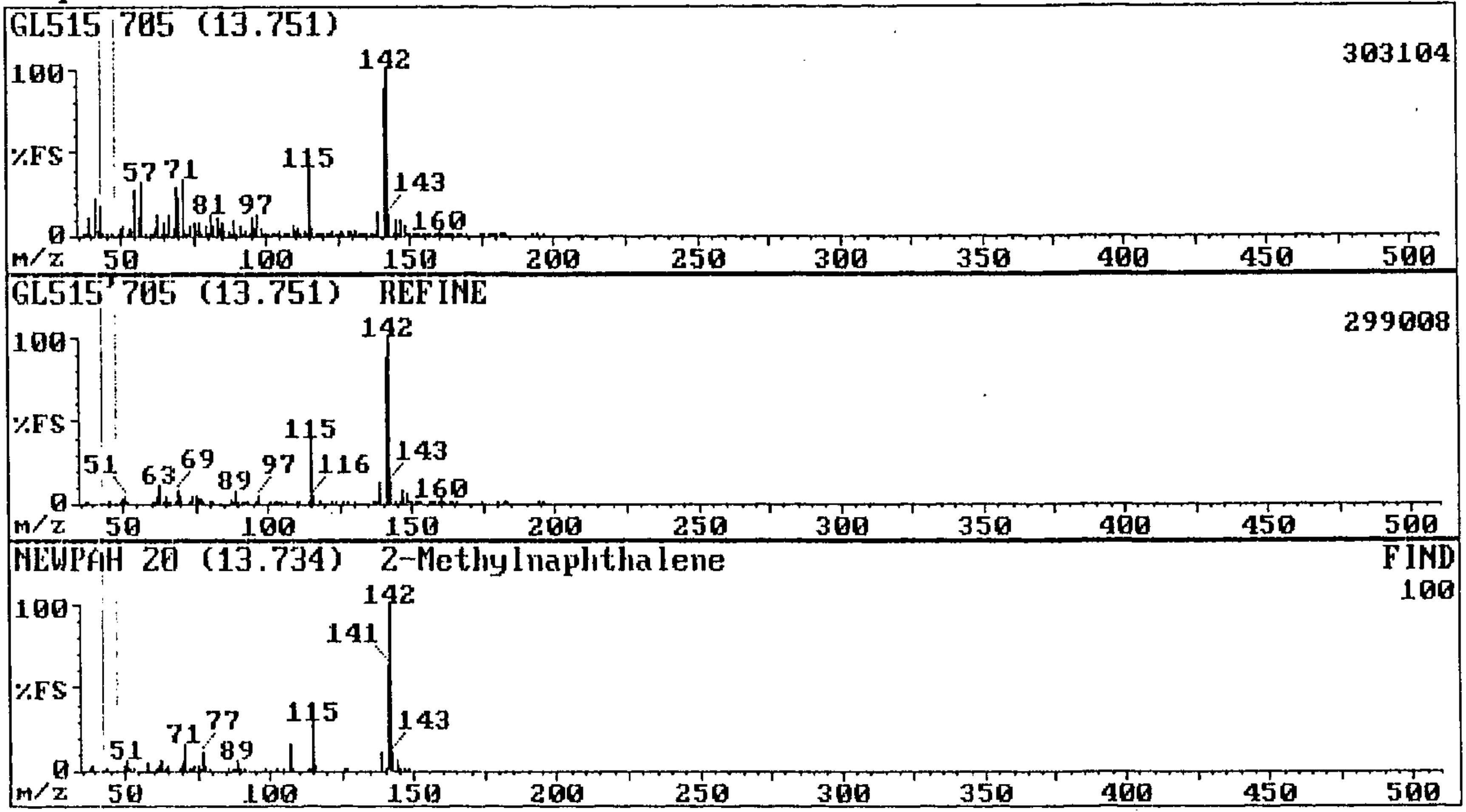
JL 1-5-93

04-Jan-93 14:02 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #3 (1:10 DIL.) 22680 Instrument G



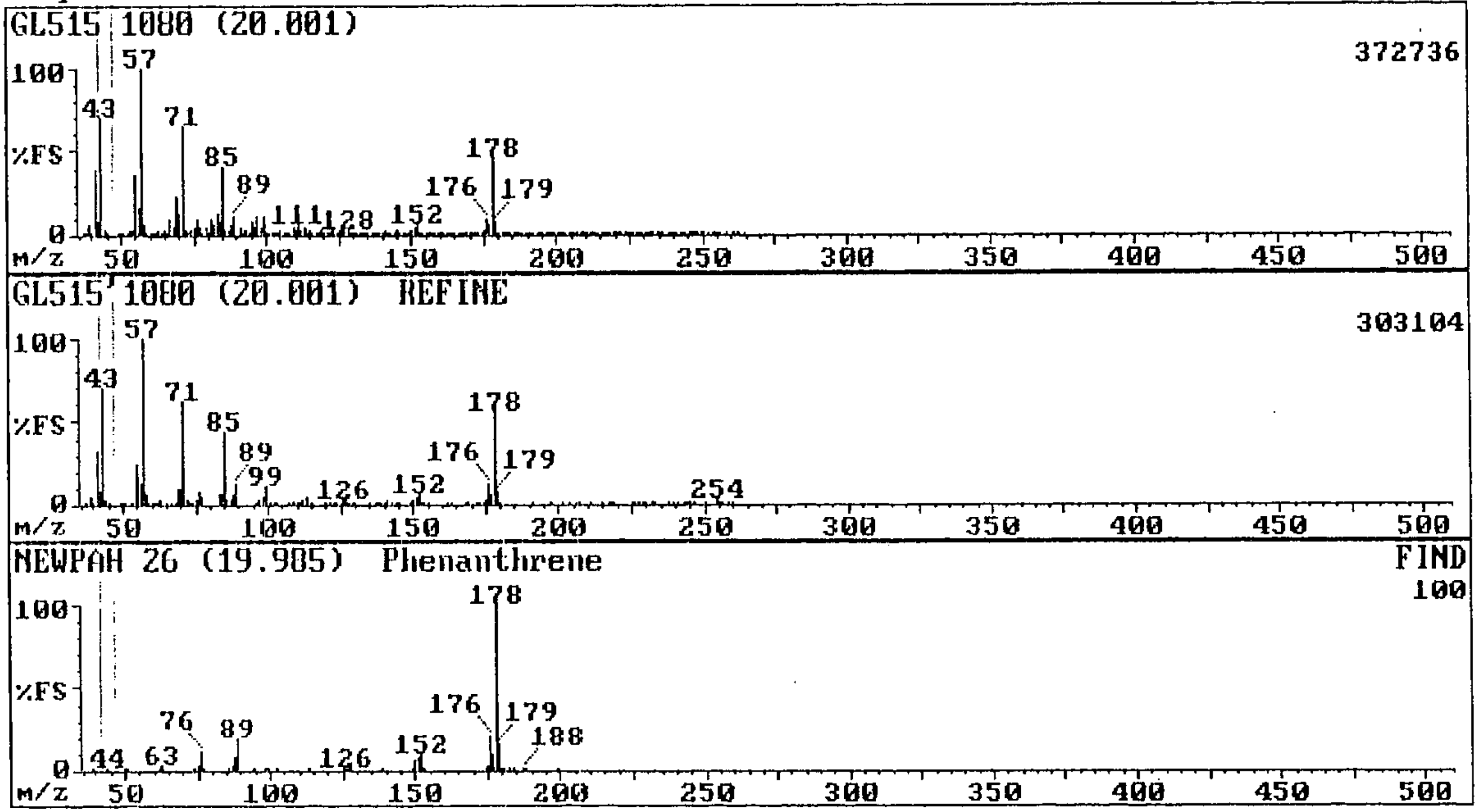
04-Jan-93 14:02 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #3 (1:10 DIL.) 22680 Instrument G


GL515 705 (13.751)

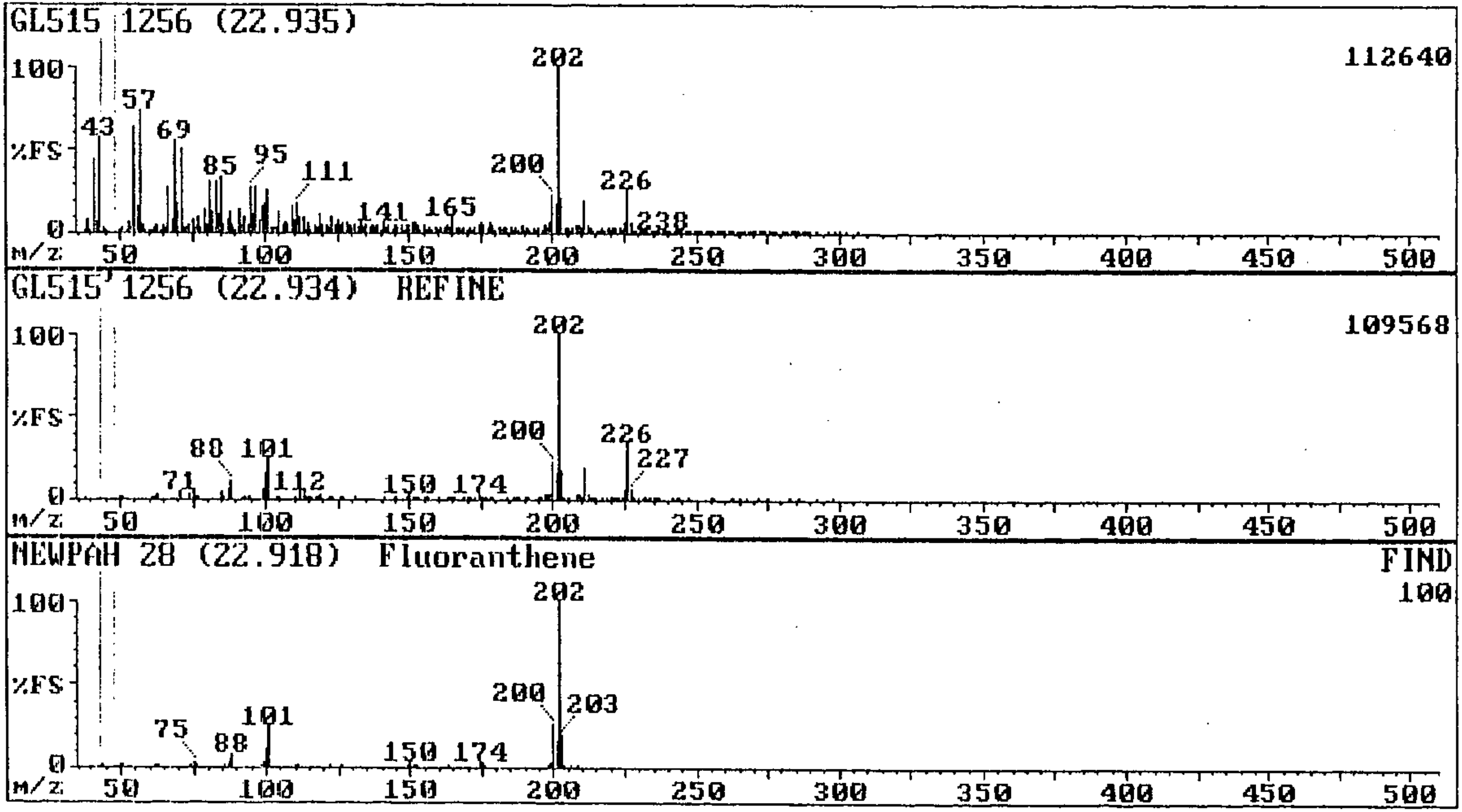
GL515 705 (13.751) REFINE

NEWPAH 20 (13.734) 2-Methylnaphthalene

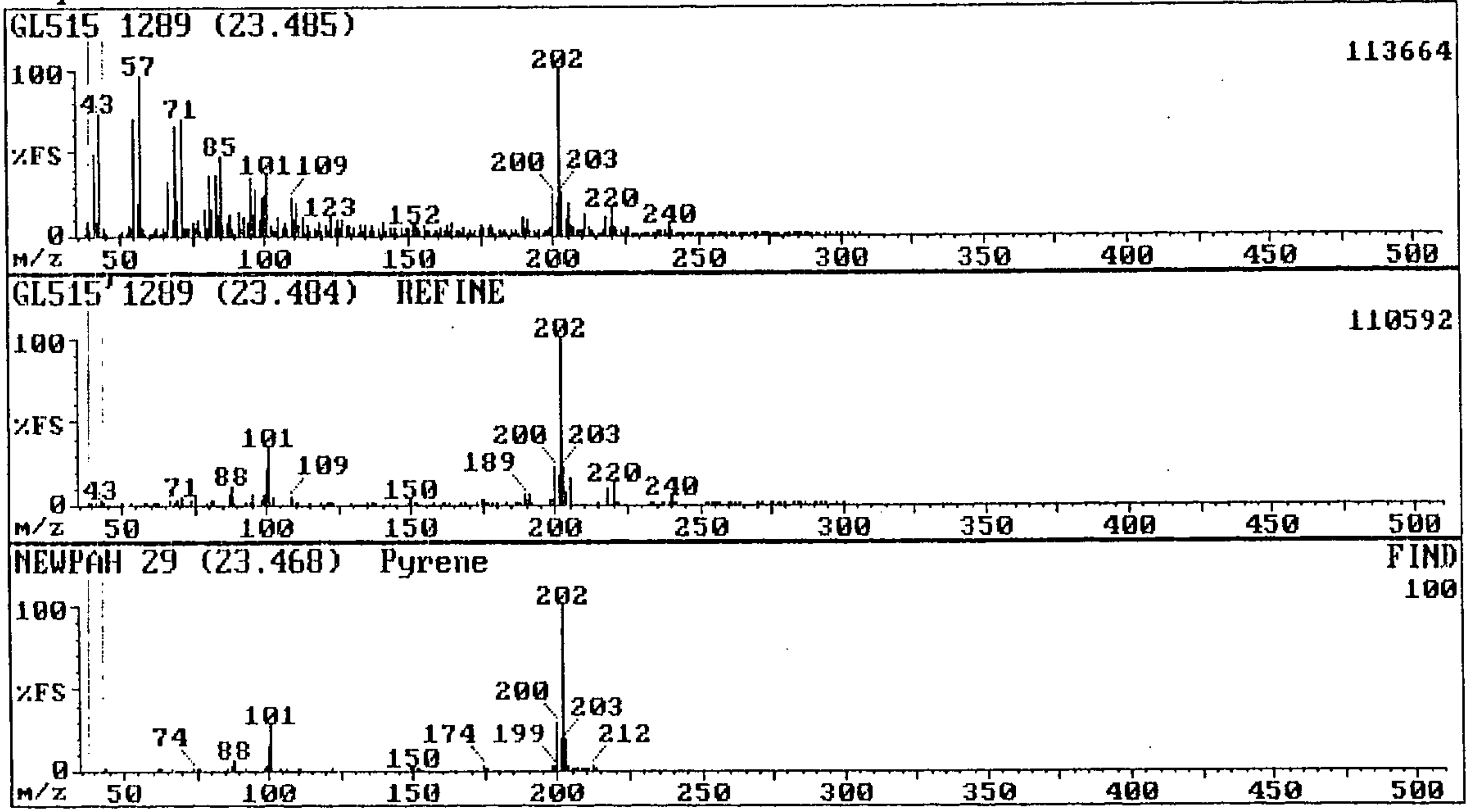
04-Jan-93 14:02 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #3 (1:10 DIL.) 22680 Instrument G



04-Jan-93 14:02 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #3 (1:10 DIL.) 22680 Instrument G



04-Jan-93 14:02 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: RUN #3 (1:10 DIL.) 22680 Instrument G



Triangle Laboratories of RTP, Inc.
801 Capitola Dr.
Durham, NC 27713
(919) 544-5729

Sample File : GL472
Response File : GL467
Date Analyzed : 12/30/92
Date Reported : 01/06/93
Project Number: 22680

Sample ID: BLANK

TLI ID: 62.51.4A-I
Dilution Factor: 1.00

antitation Results Method 8270

Analyte	Area	RF	SCAN	ISID	Amt. (ug)	Code	Quan Limit	FLAG
1,4-Dichlorobenzene-d4	11477		433	1		I		
Naphthalene-d8	47513		612	2		I		
2-Methylnaphthalene	3709	0.449	718	2	6.96	E	10.0	
Naphthalene	4404	0.574	615	2	6.46	E	10.0	
Acenaphthene-d10	32562		871	3		I		
Acenaphthene	0	0.578	0	3	0.04	ND	10.0	
Fluorene	0	0.745	0	3	0.03	ND	10.0	
2-Chloronaphthalene	0	0.600	0	3	0.04	ND	10.0	
Acenaphthylene	0	1.001	0	3	0.02	ND	10.0	
Phenanthrene-d10	45344		1091	4		I		
Phenanthrene	5534	0.552	1095	4	8.84	E	10.0	
Anthracene	0	0.568	0	4	0.03	ND	10.0	
Fluoranthene	0	0.653	0	4	0.03	ND	10.0	
Chrysene-d12	24560		1488	5		I		
Chrysene	0	0.539	0	5	0.06	ND	10.0	
Pyrene	0	0.759	0	5	0.04	ND	10.0	
Benzo(a)anthracene	0	0.576	0	5	0.06	ND	10.0	
Perylene-d12	14917		1769	6		I		
Benzo(b)fluoranthene	0	0.709	0	6	0.08	ND	10.0	
Benzo(k)fluoranthene	0	0.870	0	6	0.06	ND	10.0	
nzo(e)pyrene	0	0.691	0	6	0.08	ND	10.0	
Benzo(a)pyrene	0	0.666	0	6	0.08	ND	10.0	
Perylene	0	0.395	0	6	0.14	ND	10.0	
Indeno(1,2,3-cd)pyrene	0	0.612	0	6	0.09	ND	10.0	
Dibenz(a,h)anthracene	0	0.446	0	6	0.12	ND	10.0	
Benzo(g,h,i)perylene	0	0.540	0	6	0.10	ND	10.0	

Surrogate Summary	Area	RF	SCAN	ISID	Amount (ug)	Code	%REC
Anthracene-d10	30746	0.301	1100	4	90.11	D	90.1
Pyrene-d10	35025	0.672	1302	5	84.88	D	84.9

Reviewed by ____________ Date 1/6/93

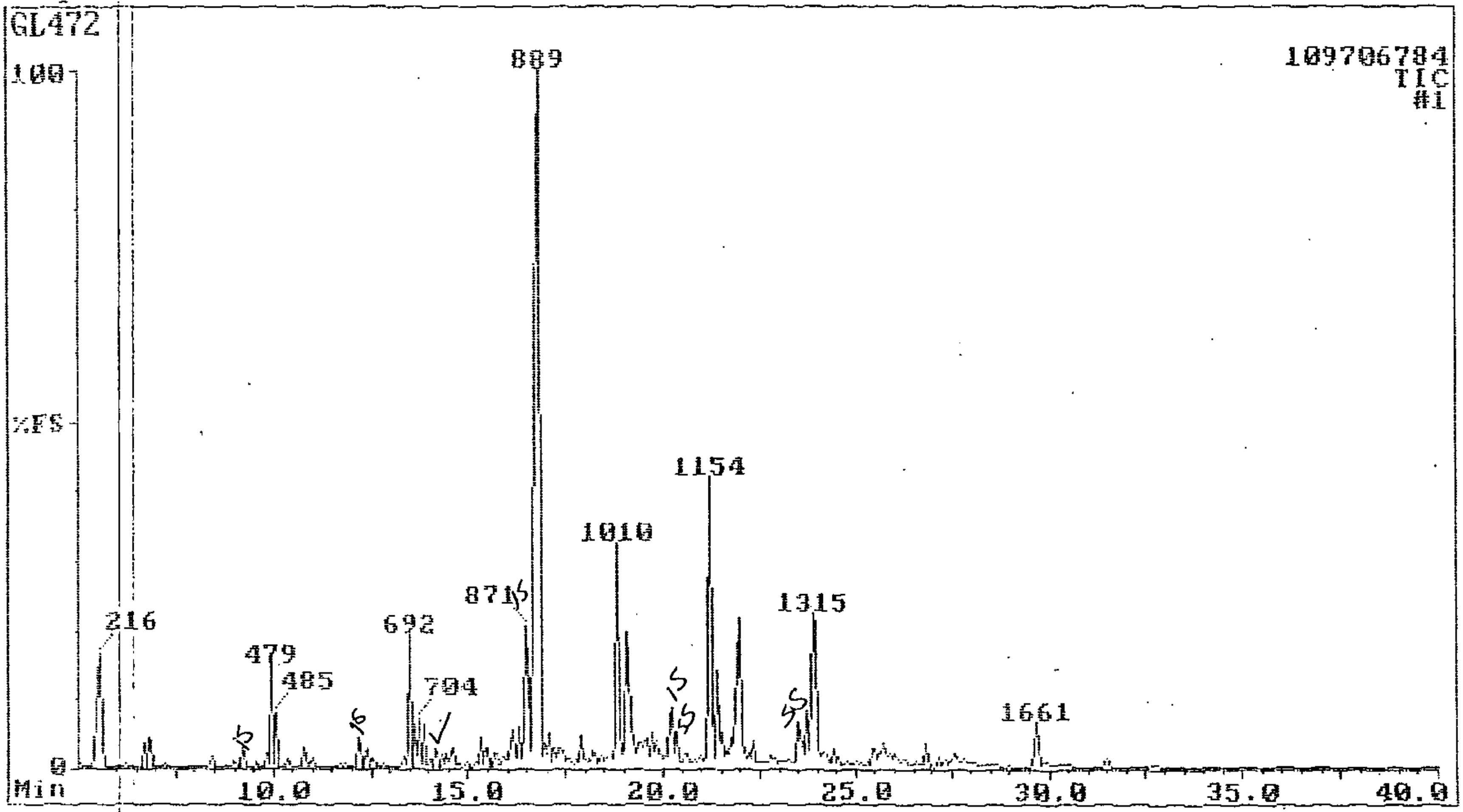
ND -Not Detected; D- Detected; E- Estimated; I- Internal Standard

Orgrep v2.5

~ 12/31/92

30-Dec-92 16:17　　Triangle Laboratories of RTP, Inc.　　(919) 544-5729

Sample: ~~FIELD~~ BLANK 1/6/93　　22680　　Instrument G



1-5-93

~ 12/30/92

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QUAN 08 : GL472                 LAB-BASE  QUAN              30-Dec-92      23:54

 No. MAT  FOR REV Delta        Area P.Flags  Scan     QM Name
-------------------------------------------------------------------------------------
  1 100   79 100     1   1147700 bb          433    152 1,4-Dichlorobenzene-d4
  2 100   83  94     0   4751300 bv          612    136 Naphthalene-d8
     69   29  90     1   3256300 vv          871    164 Acenaphthene-d10
  4  93   53  96     0   4534500 vv         1091    188 Phenanthrene-d10
~~  5 100   65  96     0   2456100 bv         1488    240 Chrysene-d12~~
  6  87   56  93     1   1491700 bv         1769    264 Perylene-d12
  7   0    0   0     0         0               0    112 2-Fluorophenol
  8   0    0   0     0         0               0    132 2-Chlorophenol-d4
  9   0    0   0     0         0               0     99 Phenol-d5
 10   0    0   0     0         0               0    152 1,2-Dichlorobenzene-d4
 11   0    0   0     0         0               0     82 Nitrobenzene-d5
 12   0    0   0     0         0               0    185 1,3,5-Trichlorobenzene-d3
 13   0    0   0     0         0               0    240 1,4-Dibromobenzene-d4
 14   0    0   0     0         0               0    172 2-Fluorobiphenyl
 15   0    0   0     0         0               0    330 2,4,6-Tribromophenol
 16  94   66  96     1   3074600 vv         1100    188 Anthracene-d10
 17  85   55  91     1   3502500 vv         1302    212 Pyrene-d10
 18   0    0   0     0         0               0    244 Terphenyl-d14
 19 100   63  99     0    440420 bv          615    128 Naphthalene
 20  95   62  90     0    370940 vb          718    142 2-Methylnaphthalene
 21   0    0   0     0         0               0    162 2-Chloronaphthalene
 22   0    0   0     0         0               0    152 Acenaphthylene
 23   0    0   0     0         0               0    154 Acenaphthene
 24   0    0   0     0         0               0    166 Fluorene
 25   0    0   0     0         0               0    266 Pentachlorophenol
 26  68   28  89     1    553470 vv         1095    178 Phenanthrene
 27   0    0   0     0         0               0    178 Anthracene
      0    0   0     0         0               0    202 Fluoranthene
  2   0    0   0     0         0               0    202 Pyrene
 30   0    0   0     0         0               0    228 Benzo(a)anthracene
 31   0    0   0     0         0               0    228 Chrysene
 32  26   18  24    -1      ~~4952 bb~~       ~~1686~~    252 Benzo(b)fluoranthene
 33   0    0   0     0         0               0    252 Benzo(k)fluoranthene
 34   0    0   0     0         0               0    252 Benzo(e)pyrene
 35   0    0   0     0         0               0    252 Benzo(a)pyrene
 36   0    0   0     0         0               0    252 Perylene
 37   0    0   0     0         0               0    276 Indeno(1,2,3-cd)pyrene
 38   0    0   0     0         0               0    278 Dibenz(a,h)anthracene
 39   0    0   0     0         0               0    276 Benzo(g,h,i)perylene
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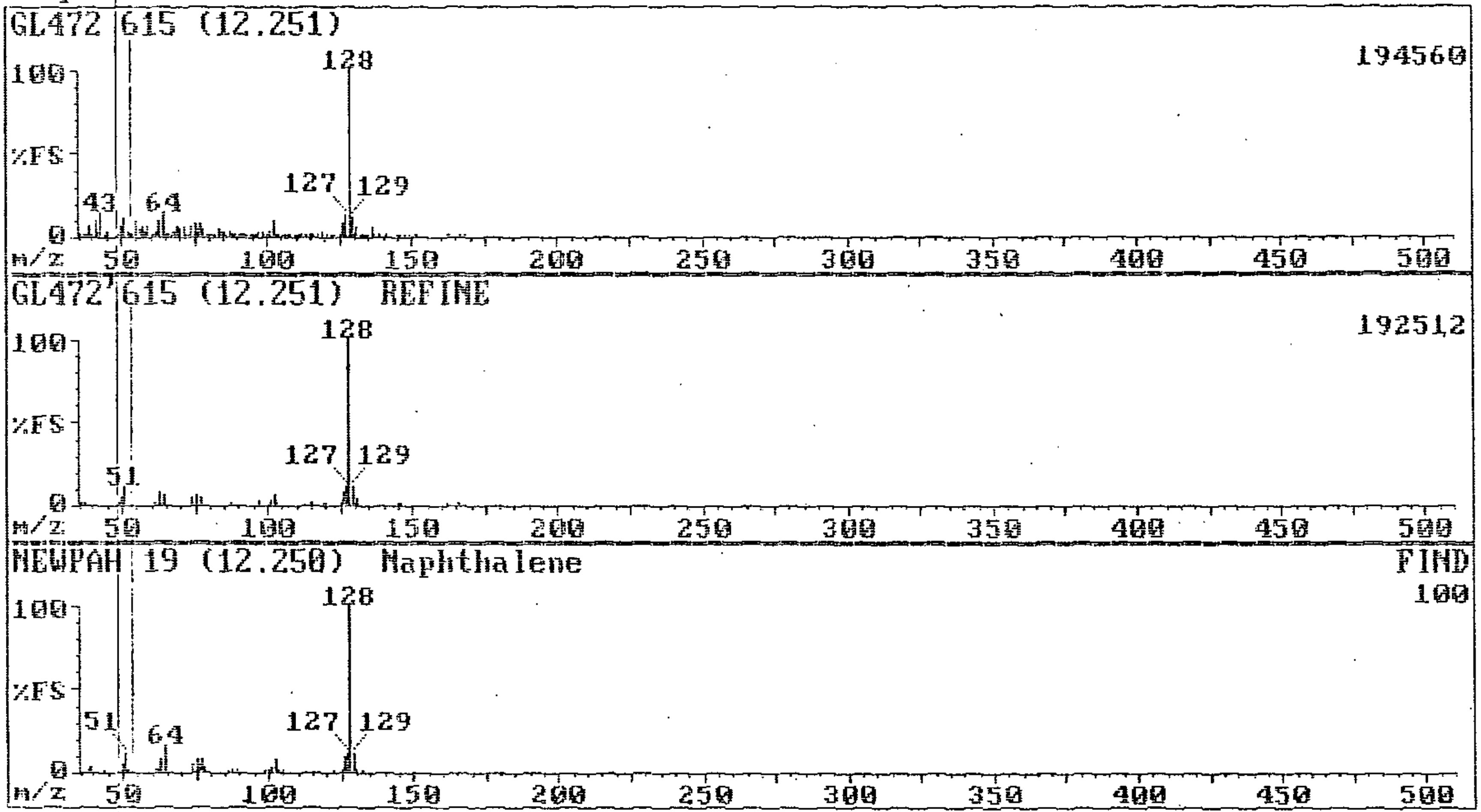
1-5-93

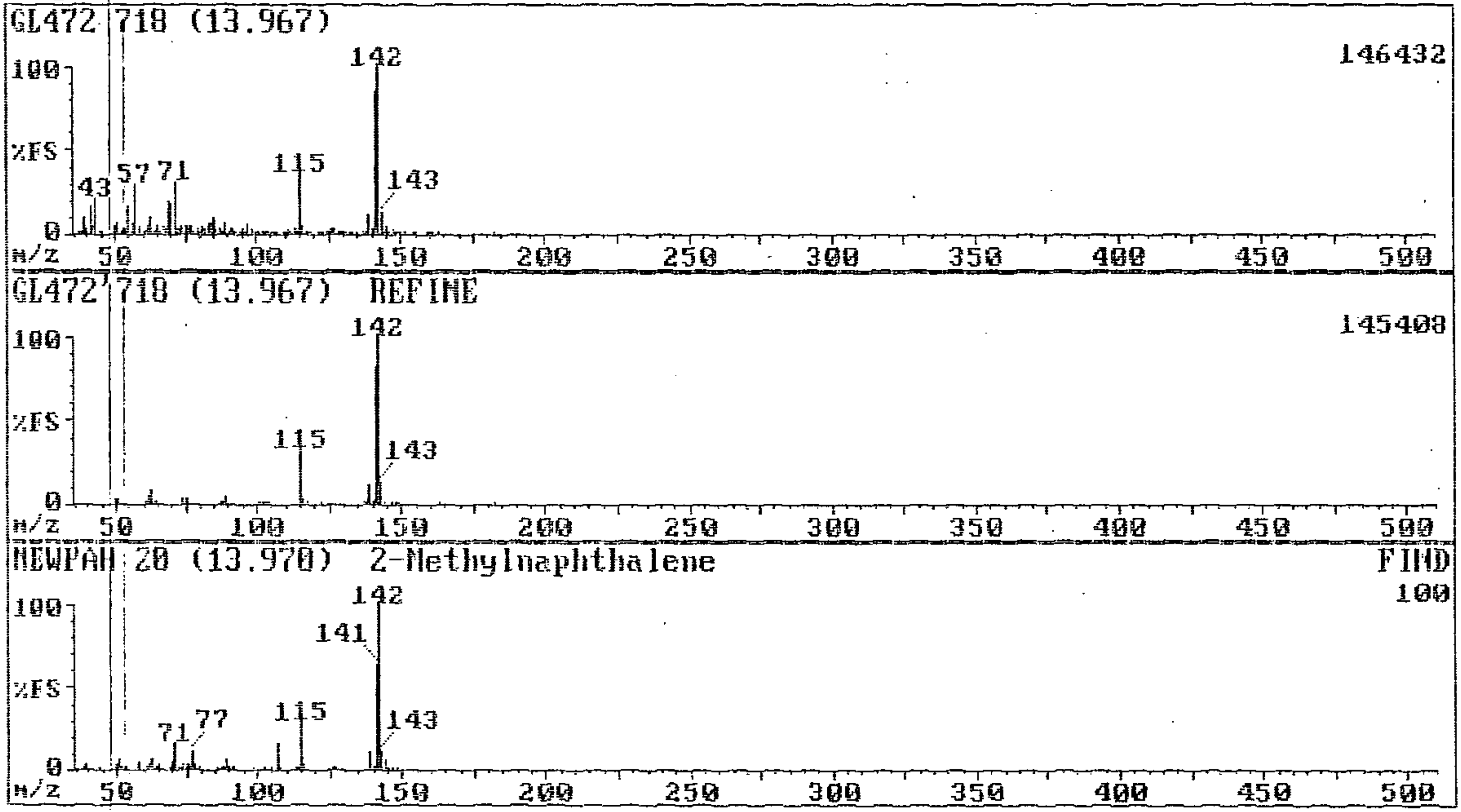
12/30/92

30-Dec-92 16:17 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: FIELD BLANK 22680 Instrument G



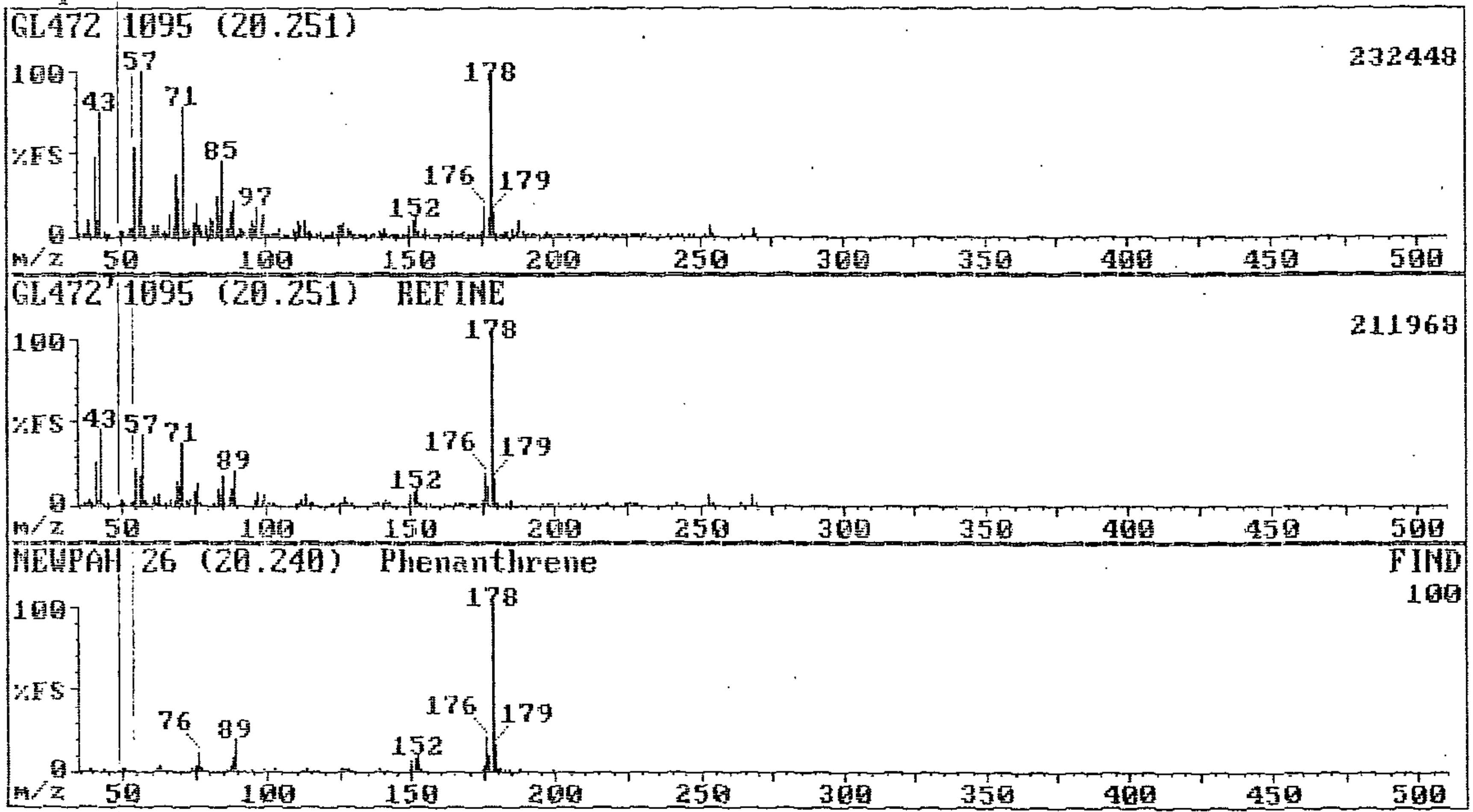
12/30/92

30-Dec-92 16:17 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: FIELD BLANK 22680 Instrument G



✓ 12/30/92

30-Dec-92 16:17 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: FIELD BLANK 22680 Instrument G



Triangle Laboratories of RTP, Inc.
801 Capitola Dr.
Durham, NC 27713
(919) 544-5729

Sample File : GL470
Response File : GL467
Date Analyzed : 12/30/92
Date Reported : 01/05/93
Project Number: 22680

Sample ID: SBLK 122492
TLI ID: N/A
Dilution Factor: 1.00

uantitation Results Method 8270

Analyte	Area	RF	SCAN	ISID	Amt. (ug)	Code	Quan Limit	FLAG
1,4-Dichlorobenzene-d4	9751		433	1		I		
Naphthalene-d8	33764		612	2		I		
2-Methylnaphthalene	0	0.449	0	2	0.05	ND	10.0	___
Naphthalene	849	0.574	615	2	1.75	E	10.0	___
Acenaphthene-d10	25723		870	3		I		
Acenaphthene	0	0.578	0	3	0.05	ND	10.0	___
Fluorene	0	0.745	0	3	0.04	ND	10.0	___
2-Chloronaphthalene	0	0.600	0	3	0.05	ND	10.0	___
Acenaphthylene	0	1.001	0	3	0.03	ND	10.0	___
Phenanthrene-d10	58520		1090	4		I		
Phenanthrene	0	0.552	0	4	0.02	ND	10.0	___
Anthracene	0	0.568	0	4	0.02	ND	10.0	___
Fluoranthene	0	0.653	0	4	0.02	ND	10.0	___
Chrysene-d12	63087		1487	5		I		
Chrysene	0	0.539	0	5	0.02	ND	10.0	___
Pyrene	0	0.759	0	5	0.02	ND	10.0	___
Benzo(a)anthracene	0	0.576	0	5	0.02	ND	10.0	___
Perylene-d12	34005		1767	6		I		
Benzo(b)fluoranthene	0	0.709	0	6	0.03	ND	10.0	___
Benzo(k)fluoranthene	0	0.870	0	6	0.03	ND	10.0	___
enzo(e)pyrene	0	0.691	0	6	0.03	ND	10.0	___
Benzo(a)pyrene	0	0.666	0	6	0.04	ND	10.0	___
Perylene	0	0.395	0	6	0.06	ND	10.0	___
Indeno(1,2,3-cd)pyrene	0	0.612	0	6	0.04	ND	10.0	___
Dibenz(a,h)anthracene	0	0.446	0	6	0.05	ND	10.0	___
Benzo(g,h,i)perylene	0	0.540	0	6	0.04	ND	10.0	___

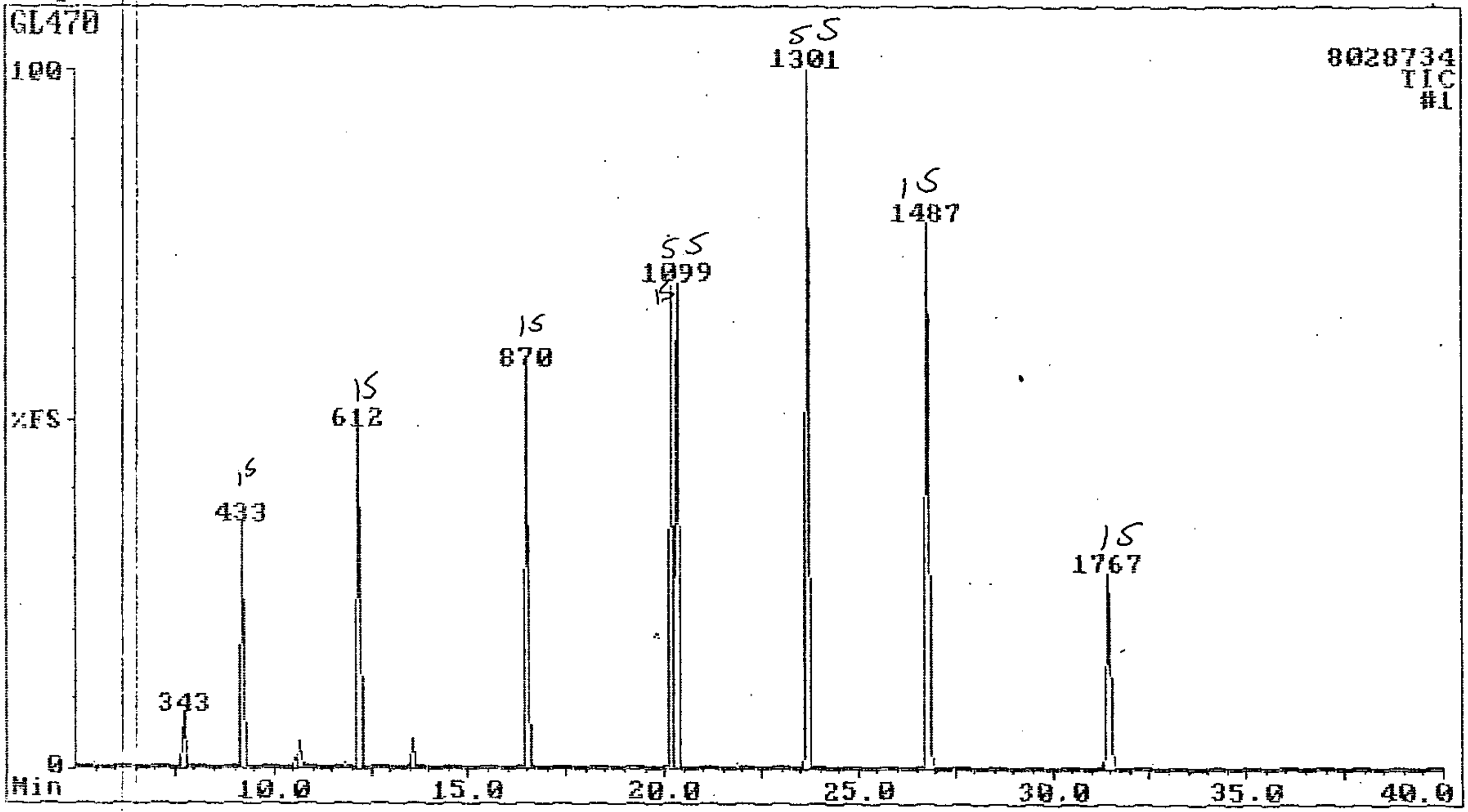
Surrogate Summary	Area	RF	SCAN	ISID	Amount (ug)	Code	%REC
Anthracene-d10	47850	0.301	1099	4	108.66	D	108.7
Pyrene-d10	67201	0.672	1301	5	63.41	D	63.4

Reveiwed by ______________ Date 1 / 5 / 93

ND -Not Detected; D-Detected; E- Estimated; I- Internal Standard

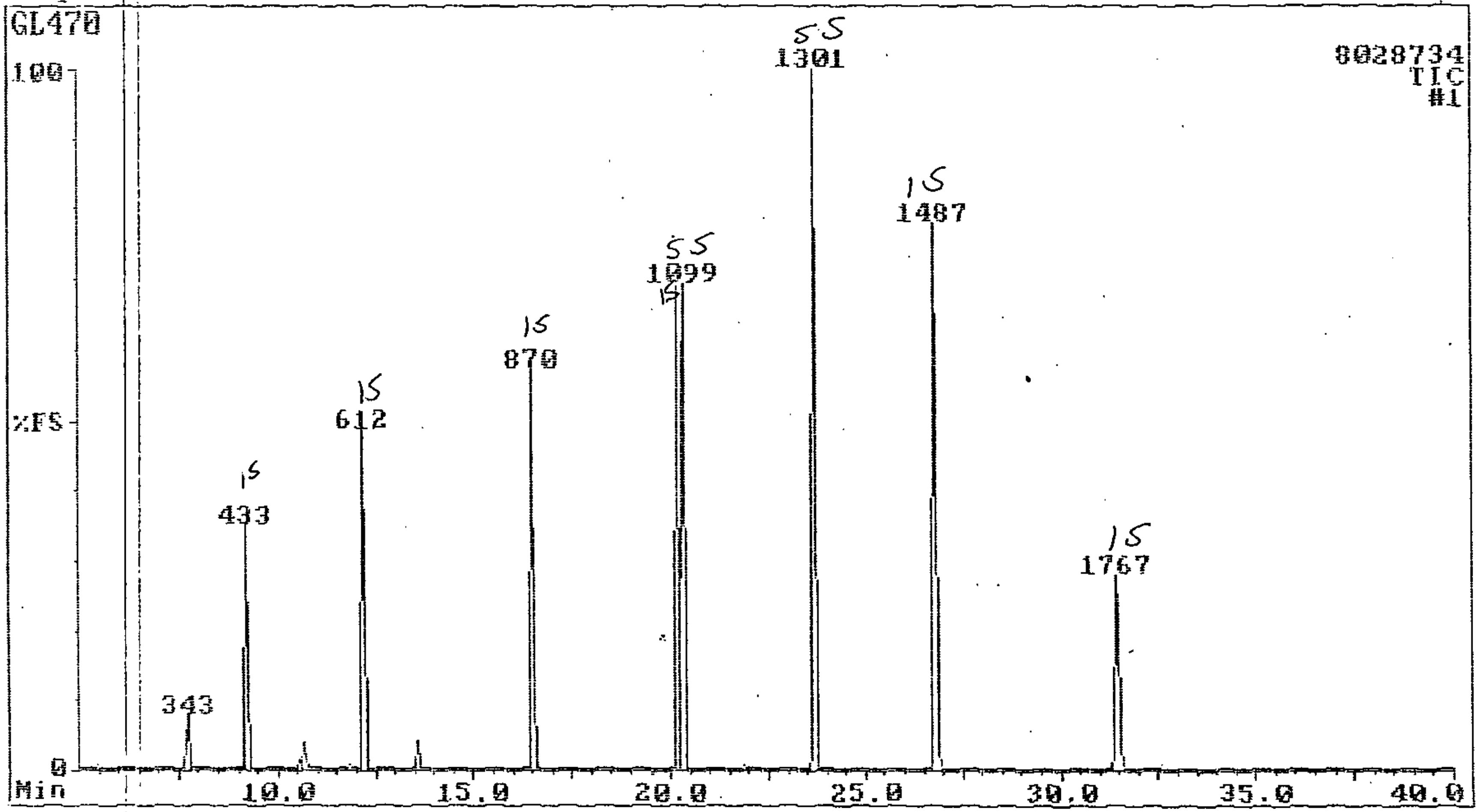
Orgrep v2.5

30-Dec-92 14:32 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SBLK 122492 22680 Instrument G



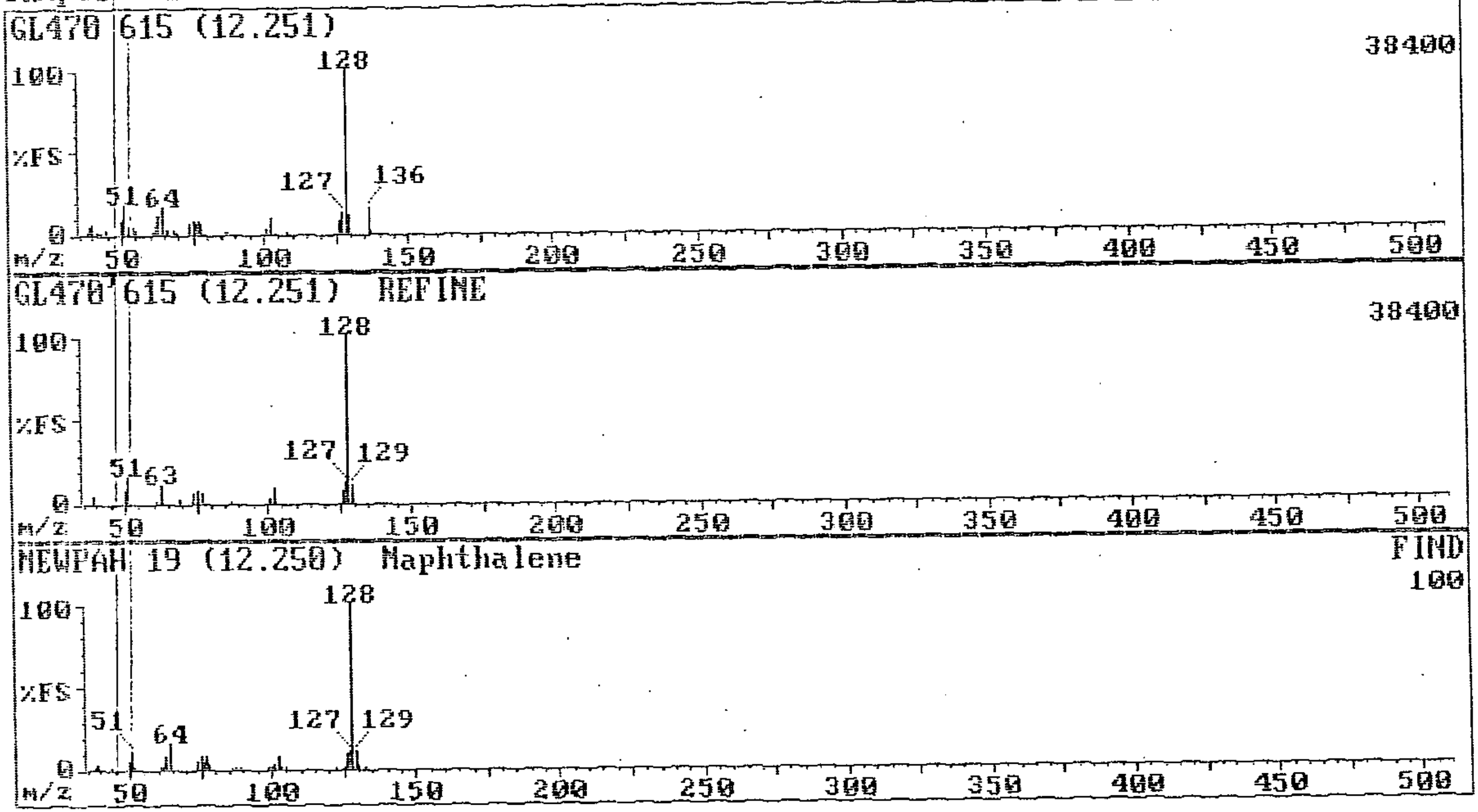
JL 1-5-93

30-Dec-92 14:32 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SBLK 122492 22680 Instrument G



1-5-93

30-Dec-92 14:32 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SBLK 122492 22680 Instrument G



Triangle Laboratories of RTP, Inc.
Continuing Calibration Curve

CCAL File: GL509   Date of Analysis :01/04/93   Analyte List: PAH
CAL File: ICALGJ03

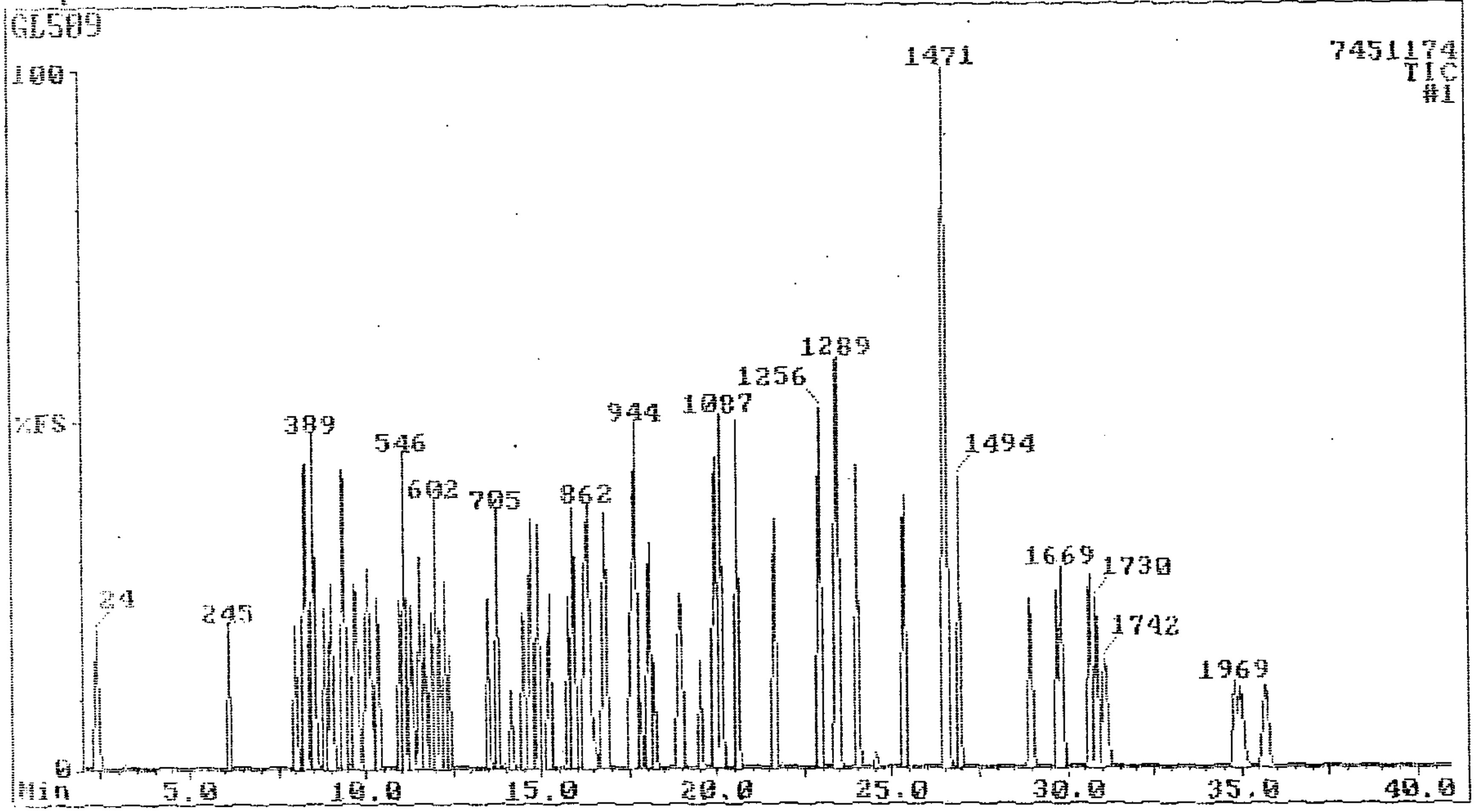
Analyte	Flag	RF50	RFMEAN	%D
1,4-Dichlorobenzene-d4	I			
Naphthalene-d8	I			
2-Methylnaphthalene		0.675	0.729	7.4
Naphthalene		0.940	1.058	11.2
Acenaphthene-d10	I			
Acenaphthene	C	0.969	1.019	4.9
Fluorene		1.170	1.253	6.6
2-Chloronaphthalene		1.006	1.048	4.0
Acenaphthylene		1.697	1.791	5.2
Phenanthrene-d10	I			
Phenanthrene		0.915	0.950	3.7
Anthracene		0.959	0.959	0.0
Fluoranthene	C	1.099	1.152	4.6
Chrysene-d12	I			
Chrysene		0.935	1.011	7.5
Pyrene		0.996	1.176	15.3
Benzo(a)anthracene		0.962	1.048	8.2
Perylene-d12	I			
Benzo(b)fluoranthene		1.331	1.575	15.5
Benzo(k)fluoranthene		1.524	1.704	10.6
enzo(e)pyrene		1.341	1.497	10.4
Benzo(a)pyrene	C	1.269	1.424	10.9
Perylene		0.669	0.755	11.4
Indeno(1,2,3-cd)pyrene		1.271	1.057	-20.2
Dibenz(a,h)anthracene		0.984	1.047	6.0
Benzo(g,h,i)perylene		1.053	1.193	11.7

Surrogate	Flag	RF50	RFMEAN	%D
Anthracene-d10	S	0.492	0.527	6.6
Pyrene-d10	S	0.900	1.103	18.4

Approved by: ____________ Date 1/5/93

*- Fails QC Criteria for %D; << - Rf less then minimum QC RF; >>- RF greater than maximum QC RF   CCAL.EXE v2.5

04-Jan-93 08:50 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SSTD050 Instrument G



jm

```
QUAN 08 · GL309                    CAL-BASE  QUAN               04-Jan-93      10:43

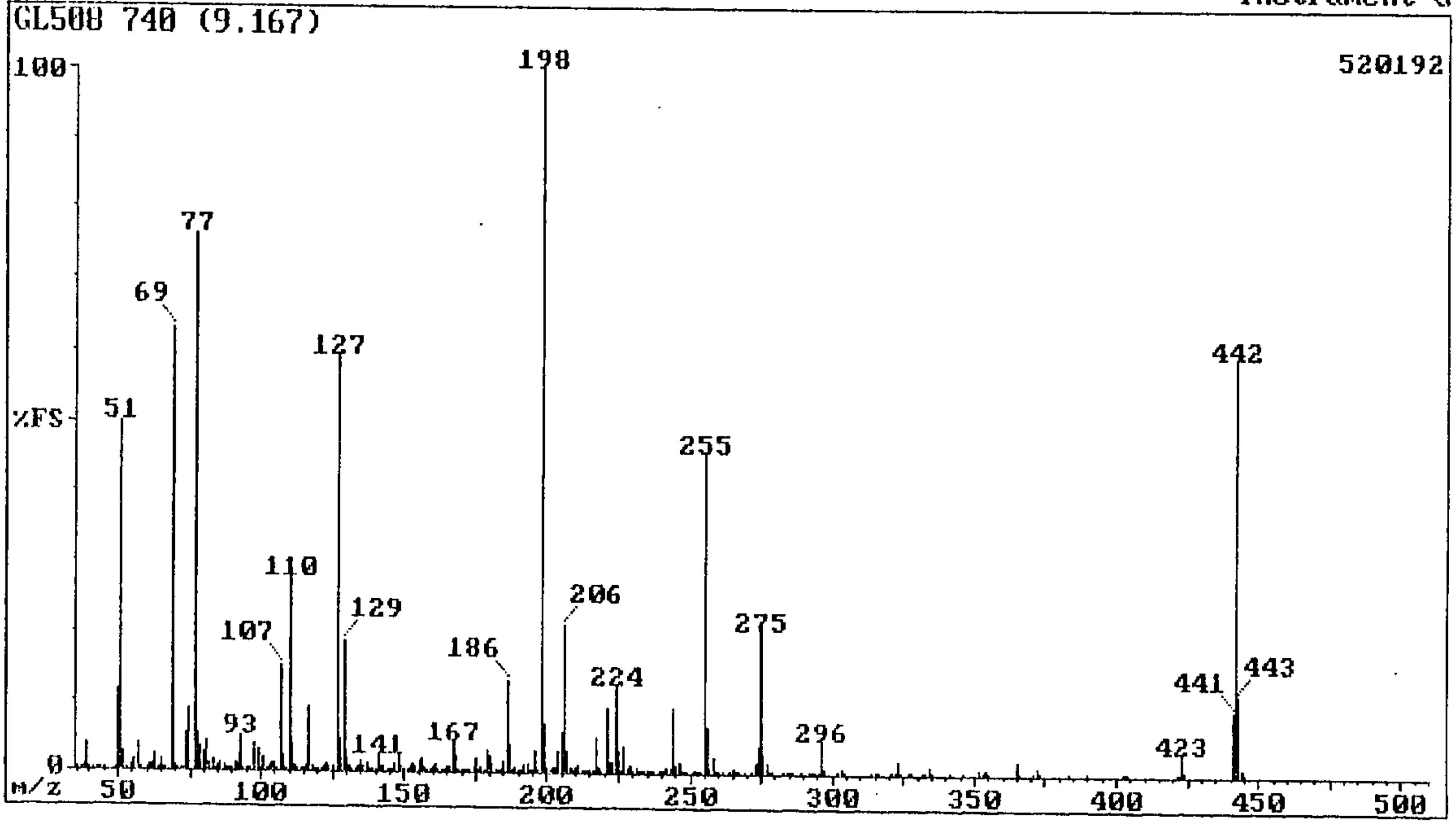
 No. MAT FOR REV Delta        Area F.Flags  Scan      QM Name
-----------------------------------------------------------------------------------------
   1 100  82 100     0     561390 bb        420     152 1,4-Dichlorobenzene-d4
   2 100  86  91     0    2294600 bb        599     136 Naphthalene-d8
[illegible]00  93  97     0    1241800 bb        857     164 Acenaphthene-d10
   4 100  89  96     0    2604000 bv       1076     188 Phenanthrene-d10
   5  83  49  94    -1    3082500 bb       1471     240 Chrysene-d12
   6 100  87  93     1    1796400 bb       1742     264 Perylene-d12
   7 100  95  97    -1    1252000 bb        244     112 2-Fluorophenol
   8  89  55  99    -1    1124100 bb        388     132 2-Chlorophenol-d4
   9  96  67  99    -1    1606500 bv        377      99 Phenol-d5
  10 100  92  99     0     697090 bb        440     152 1,2-Dichlorobenzene-d4
  11 100  81  98     0    1408800 bb        498      82 Nitrobenzene-d5
  12  97  57  98     0     785090 bb        546     185 1,3,5-Trichlorobenzene-d3
  13 100  93  99     0     562160 bb        607     240 1,4-Dibromobenzene-d4
  14 100  90  98     0    1796200 bb        762     172 2-Fluorobiphenyl
  15 100  81 100    -1     306780 bb        973     330 2,4,6-Tribromophenol
  16 100  87  97    -1    1601800 vb       1084     188 Anthracene-d10
  17 100  86  97     0    3467000 vb       1286     212 Pyrene-d10
  18 100  86  97     1    2490700 bb       1320     244 Terphenyl-d14
  19 100  95  98     0    2696500 bb        602     128 Naphthalene
  20 100  89  91    -1    1936500 vb        704     142 2-Methylnaphthalene
  21 100  95  98     0    1561900 bb        775     162 2-Chloronaphthalene
  22 100  94  97     0    2634500 bb        835     152 Acenaphthylene
  23 100  88  90     0    1504600 bb        862     154 Acenaphthene
  24 100  92  97    -1    1816500 vb        938     166 Fluorene
  25 100  83  99     0     378070 bv       1050     266 Pentachlorophenol
  26 100  93  98     0    2976900 bv*      1080     178 Phenanthrene
  27 100  93  98    -1    3121600 vb       1087     178 Anthracene
[illegible]00  95  99    -1    3576100 bb       1256     202 Fluoranthene
  29 100  94  98     0    3835900 bb       1289     202 Pyrene
  30 100  88  98     0    3706300 bv       1469     228 Benzo(a)anthracene
  31 100  93  99     0    3601900 vv       1475     228 Chrysene
  32  82  69  73    -1    2989200 bv       1663     252 Benzo(b)fluoranthene
  33 100  93  98    -2    3423300 vv       1669     252 Benzo(k)fluoranthene
  34 100  94  98    -1    3012300 bv       1719     252 Benzo(e)pyrene
  35 100  94  99    -2    2850300 vv       1730     252 Benzo(a)pyrene
  36 100  94  99    -1    1502900 vv       1747     252 Perylene
  37 100  95 100     0    2853500 bv       1969     276 Indeno(1,2,3-cd)pyrene
  38 100  90  99     1    2210600 bv       1978     278 Dibenz(a,h)anthracene
  39 100  94  99    -1    2364300 bv       2020     276 Benzo(g,h,i)perylene
```

DFTPP TUNE CHECK REPORT

Raw Data File: GL508
Date: 04-Jan-95
Time: 09:33

M/E	ION ABUNDANCE CRITERIA	RELATIVE ABUNDANCE	TUNE
51	30.0 - 60.0% of mass 198	50.00	PASS
68	Less than 2.0% of mass 69	0.00(0.0)1	PASS
69	Mass 69 relative abundance	62.99	PASS
70	Less then 2.0% of mass 69	0.62(1.0)1	PASS
127	40.0 - 60.0% of mass 198	59.06	PASS
197	Less than 1% of mass 198	0.17	PASS
198	Base peak, 100% relative abundance	100.00	PASS
199	5 - 9% of mass 198	6.99	PASS
275	10 - 30% of mass 198	20.08	PASS
365	Greater than 1% of mass 198	1.97	PASS
441	Present, but less then mass 443	9.45	PASS
442	Greater than 40% of mass 198	59.06	PASS
443	17 - 23% of mass 442	11.61(19.7)2	PASS

04-Jan-93 08:33 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: DFTPP
Instrument G



3L503 740 (9.167) 520192

Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int
	36	760	0.15	55	99	17152	3.30	109	154	4352	0.84	163	208	4080	0.78	217	267	952	0.18
2	37	1168	0.22	56	100	1968	0.38	110	155	7232	1.39	164	209	1824	0.35	218	269	800	0.15
3	38	3296	0.63	57	101	7172	1.38	111	156	10816	2.08	165	210	4288	0.82	219	272	928	0.18
4	39	20736	3.99	58	102	1312	0.25	112	157	3680	0.71	166	211	5312	1.02	220	273	8320	1.60
5	40	2304	0.44	59	103	3520	0.68	113	158	2352	0.45	167	212	2096	0.40	221	274	19456	3.74
6	41	2528	0.49	60	104	5696	1.09	114	159	2128	0.41	168	213	1088	0.21	222	275	104448	20.08
7	43	1984	0.38	61	105	6080	1.17	115	160	3600	0.69	169	214	1056	0.20	223	276	14272	2.74
8	44	1248	0.24	62	106	1616	0.31	116	161	5888	1.13	170	215	1504	0.29	224	277	8128	1.56
9	45	736	0.14	63	107	78848	15.16	117	162	2080	0.40	171	216	2624	0.50	225	278	1760	0.34
10	49	1264	0.24	64	108	12224	2.35	118	163	1024	0.20	172	217	27136	5.22	226	279	700	0.13
11	50	61696	11.86	65	109	1616	0.31	119	164	1020	0.20	173	218	4480	0.86	227	283	1424	0.27
12	51	260096	50.00	66	110	143360	27.56	120	165	4928	0.95	174	219	876	0.17	228	284	1216	0.23
13	52	14208	2.73	67	111	21248	4.08	121	166	3952	0.76	175	221	48896	9.40	229	285	2096	0.40
14	53	1648	0.32	68	112	3488	0.67	122	167	22784	4.38	176	222	7360	1.41	230	286	784	0.15
15	55	3232	0.62	69	113	1680	0.32	123	168	12864	2.47	177	223	7424	1.43	231	289	688	0.13
16	56	8640	1.66	70	114	872	0.17	124	169	2944	0.57	178	224	65536	12.60	232	292	704	0.14
17	57	20480	3.94	71	115	1696	0.33	125	170	1216	0.23	179	225	16640	3.20	233	293	2480	0.48
18	58	1472	0.28	72	116	3904	0.75	126	171	1552	0.30	180	226	2176	0.42	234	294	832	0.16
19	60	848	0.16	73	117	47872	9.20	127	172	2208	0.42	181	227	21248	4.08	235	295	704	0.14
20	61	3584	0.69	74	118	4224	0.81	128	173	2944	0.57	182	228	3520	0.68	236	296	23552	4.53
21	62	4224	0.81	75	119	1280	0.25	129	174	4608	0.89	183	229	6272	1.21	237	297	3584	0.69
22	63	11520	2.21	76	120	1568	0.30	130	175	9152	1.76	184	230	1584	0.30	238	302	808	0.16
23	64	2048	0.39	77	121	820	0.16	131	176	2976	0.57	185	231	3280	0.63	239	303	3792	0.73
24	65	7680	1.48	78	122	4416	0.85	132	177	4288	0.82	186	232	1216	0.23	240	304	1168	0.22
25	66	980	0.19	79	123	6720	1.29	133	178	1632	0.31	187	233	924	0.18	241	314	1600	0.31
2	67	956	0.18	80	124	3456	0.66	134	179	15488	2.98	188	234	1808	0.35	242	315	2800	0.54
27	69	327680	62.99	81	125	3648	0.70	135	180	11840	2.28	189	235	2320	0.45	243	316	2096	0.40
28	70	3216	0.62	82	127	307200	59.06	136	181	6592	1.27	190	236	2048	0.39	244	321	1104	0.21
29	71	2128	0.41	83	128	24576	4.72	137	182	2976	0.57	191	237	2480	0.48	245	322	724	0.14
30	72	1728	0.33	84	129	96256	18.50	138	183	1344	0.26	192	239	1360	0.26	246	323	9792	1.88
31	73	1840	0.35	85	130	9600	1.85	139	184	1568	0.30	193	240	1216	0.23	247	324	2048	0.39
32	74	29184	5.61	86	131	3088	0.59	140	185	8000	1.54	194	241	1648	0.32	248	327	1920	0.37
33	75	46080	8.86	87	132	2160	0.42	141	186	69632	13.39	195	242	3968	0.76	249	328	1104	0.21
34	77	397312	76.38	88	133	1632	0.31	142	187	19712	3.79	196	243	3808	0.73	250	332	744	0.14
35	78	27392	5.27	89	134	3312	0.64	143	188	2528	0.49	197	244	49408	9.50	251	333	1088	0.21
36	79	18176	3.49	90	135	8256	1.59	144	189	3712	0.71	198	245	7040	1.35	252	334	6016	1.16
37	80	15104	2.90	91	136	3632	0.70	145	190	1104	0.21	199	246	8256	1.59	253	335	1696	0.33
38	81	21760	4.18	92	137	5568	1.07	146	191	2048	0.39	200	247	2128	0.41	254	341	1136	0.22
39	82	6720	1.29	93	138	1776	0.34	147	192	5440	1.05	201	248	812	0.16	255	346	2560	0.49
40	83	7808	1.50	94	139	1568	0.30	148	193	5696	1.09	202	249	2224	0.43	256	352	3168	0.61
41	84	1968	0.38	95	140	1600	0.31	149	194	1696	0.33	203	251	796	0.15	257	353	2240	0.43
42	85	4288	0.82	96	141	11648	2.24	150	195	1232	0.24	204	252	696	0.13	258	354	3296	0.63
43	86	5888	1.13	97	142	4992	0.96	151	196	15680	3.01	205	253	1200	0.23	259	355	748	0.14
44	87	3376	0.65	98	143	3872	0.74	152	197	868	0.17	206	254	852	0.16	260	365	10240	1.97
45	88	2128	0.41	99	144	1728	0.33	153	198	520192	100.00	207	255	236544	45.47	261	366	1632	0.31
46	89	1568	0.30	100	145	1344	0.26	154	199	36352	6.99	208	256	34816	6.69	262	371	868	0.17
47	90	840	0.16	101	146	2560	0.49	155	200	4608	0.89	209	257	3152	0.61	263	372	5120	0.98
48	91	5440	1.05	102	147	6144	1.18	156	201	2464	0.47	210	258	12288	2.36	264	373	1536	0.30
49	92	4544	0.87	103	148	12928	2.49	157	202	3872	0.74	211	259	2704	0.52	265	383	1424	0.27
50	93	27136	5.22	104	149	3488	0.67	158	203	3456	0.66	212	260	1020	0.20	266	390	768	0.15
51	94	2816	0.54	105	150	1568	0.30	159	204	16192	3.11	213	261	976	0.19	267	402	1904	0.37
5	95	1888	0.36	106	151	2912	0.56	160	205	29696	5.71	214	264	1104	0.21	268	403	2832	0.54
53	96	2528	0.49	107	152	3152	0.61	161	206	109568	21.06	215	265	4864	0.94	269	404	1040	0.20
54	98	19456	3.74	108	153	5376	1.03	162	207	15488	2.98	216	266	1952	0.38	270	421	2208	0.42

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 21539 Ta0 +9.167+                                                                                                          320232
------------------------------------------------------------------------------------------------------------------------------------
Pk#  Mass  Abs Int  Rel Int  |Pk#  Mass  Abs Int  Rel Int  |Pk#  Mass  Abs Int  Rel Int  |Pk#  Mass  Abs Int  Rel Int  |Pk#  Mass  Abs Int  Rel Int
-----------------------------+-----------------------------+-----------------------------+-----------------------------+-----------------------------
27[illegible] [illegible]2    2128     0.41  |273   424     3264     0.63  |275   442   307200    59.06  |277   444     6144     1.18  |
272   423    16896     3.25  |274   441    49152     9.45  |276   443    60416    11.61  |278   445     1024     0.20  |
-----------------------------+-----------------------------+-----------------------------+-----------------------------+-----------------------------
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Triangle Laboratories of RTP, Inc.
Initial Calibration Curve

ICAL File: ICALGD30 Date of Analysis :12/30/92 Analyte List: PAH
RF20 GL462 RF50 GL467 RF80 GL463
RF120 GL464 RF160 GL465

Analyte	Flag	RF20	RF50	RF80	RF120	RF160	RFMEAN	%RSD
1,4-Dichlorobenzene-d4	I							
Naphthalene-d8	I							
2-Methylnaphthalene		0.591	0.449	0.472	0.472	0.484	0.493	11.3
Naphthalene		0.782	0.574	0.600	0.590	0.573	0.624	14.3
Acenaphthene-d10	I							
Acenaphthene	C	0.722	0.578	0.573	0.581	0.593	0.609	10.4
Fluorene		0.920	0.745	0.761	0.758	0.766	0.790	9.3
2-Chloronaphthalene		0.778	0.600	0.625	0.625	0.645	0.655	10.8
Acenaphthylene		1.219	1.001	0.987	0.994	0.959	1.032	10.2
Phenanthrene-d10	I							
Phenanthrene		0.694	0.552	0.553	0.507	0.478	0.557	14.9
Anthracene		0.695	0.568	0.567	0.498	0.468	0.559	15.7
Fluoranthene	C	0.769	0.653	0.648	0.590	0.535	0.639	13.6
Chrysene-d12	I							
Chrysene		0.705	0.539	0.562	0.554	0.524	0.577	12.7
Pyrene		0.948	0.759	0.791	0.621	0.519	0.727	22.6
Benzo(a)anthracene		0.687	0.576	0.597	0.575	0.560	0.599	8.5
Perylene-d12	I							
Benzo(b)fluoranthene		0.644	0.709	0.734	0.835	0.882	0.761	12.7
Benzo(k)fluoranthene		1.200	0.870	0.966	0.942	0.904	0.977	13.4
Benzo(e)pyrene		0.740	0.691	0.745	0.794	0.831	0.760	7.1
Benzo(a)pyrene	C	0.770	0.666	0.728	0.764	0.780	0.742	6.3
Perylene		0.670	0.395	0.431	0.431	0.393	0.464	25.1
Indeno(1,2,3-cd)pyrene		0.478	0.612	0.668	0.763	0.875	0.679	22.2
Dibenz(a,h)anthracene		0.286	0.446	0.477	0.566	0.649	0.485	28.2
Benzo(g,h,i)perylene		0.459	0.540	0.601	0.659	0.718	0.595	16.9

Surrogate	Flag	RF20	RF50	RF80	RF120	RF160	RFMEAN	%RSD
Anthracene-d10	S	0.362	0.301	0.315	0.309	0.316	0.321	7.5
Pyrene-d10	S	0.823	0.672	0.753	0.655	0.575	0.695	13.7

Approved by: J Lyon Date 1/5/93

*- Fails QC Criteria for %RSD; << - Rf less then minimum QC RF; >>- RF greater than maximum QC RF ICAL.EXE v2.5

Triangle Laboratories of RTP, Inc.
Continuing Calibration Curve

CCAL File: GL467   Date of Analysis :12/30/92   Analyte List: PAH
ICAL File: ICALGD30

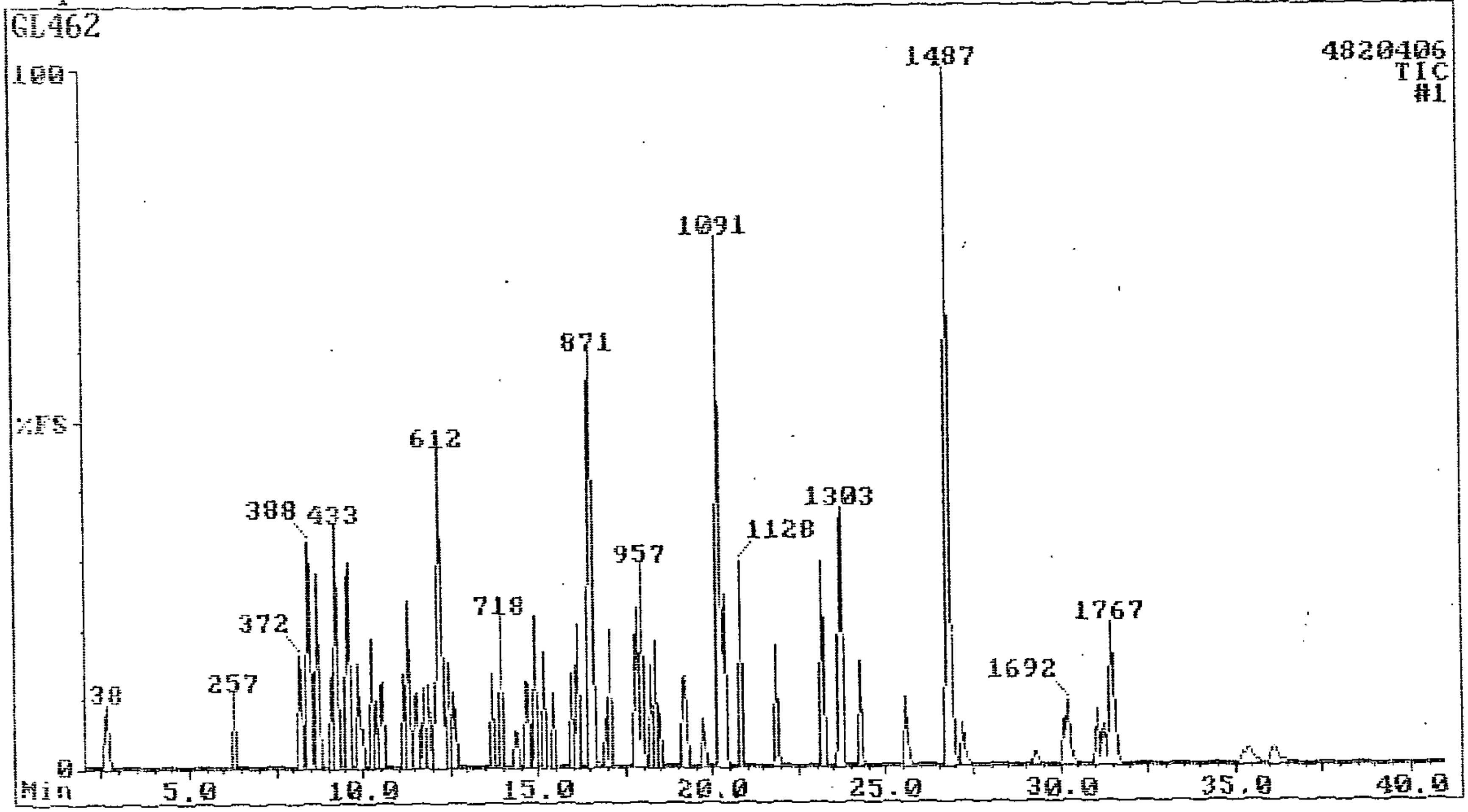
Analyte	Flag	RF50	RFMEAN	%D
1,4-Dichlorobenzene-d4	I			
Naphthalene-d8	I			
2-Methylnaphthalene		0.449	0.493	8.9
Naphthalene		0.574	0.624	8.0
Acenaphthene-d10	I			
Acenaphthene	C	0.578	0.609	5.1
Fluorene		0.745	0.790	5.7
2-Chloronaphthalene		0.600	0.655	8.4
Acenaphthylene		1.001	1.032	3.0
Phenanthrene-d10	I			
Phenanthrene		0.552	0.557	0.9
Anthracene		0.568	0.559	-1.6
Fluoranthene	C	0.653	0.639	-2.2
Chrysene-d12	I			
Chrysene		0.539	0.577	6.6
Pyrene		0.759	0.727	-4.4
Benzo(a)anthracene		0.576	0.599	3.8
Perylene-d12	I			
Benzo(b)fluoranthene		0.709	0.761	6.8
Benzo(k)fluoranthene		0.870	0.977	11.0
Benzo(e)pyrene		0.691	0.760	9.1
Benzo(a)pyrene	C	0.666	0.742	10.2
Perylene		0.395	0.464	14.9
Indeno(1,2,3-cd)pyrene		0.612	0.679	9.9
Dibenz(a,h)anthracene		0.446	0.485	8.0
Benzo(g,h,i)perylene		0.540	0.595	9.2

Surrogate	Flag	RF50	RFMEAN	%D
Anthracene-d10	S	0.301	0.321	6.2
Pyrene-d10	S	0.672	0.695	3.3

Approved by: J Lyon   Date 1/5/93

*- Fails QC Criteria for %D; << - Rf less then minimum QC RF; >>- RF greater than maximum QC RF   CCAL.EXE v2.5

30-Dec-92 08:13 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SSTD020 Instrument G



JMD

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QUAN 08 · GL462                  LAB-BASE  QUAN               30-Dec-92      14:25

 No. MAT  FOR REV Delta        Area P.Flags  Scan      QM Name
-----------------------------------------------------------------------------------
  1 100   82   99     1      605760 bb        433     152 1,4-Dichlorobenzene-d4
  2 100   89   94     0     2338500 bb        612     136 Naphthalene-d8
    100   95   99     1     1642400 bb        871     164 Acenaphthene-d10
  4 100   90   97     0     3708600 bv       1091     188 Phenanthrene-d10
  5  97   69   98    -1     3466100 bv       1487     240 Chrysene-d12
  6 100   88   98    -1     1596700 bv       1767     264 Perylene-d12
  7 100   96   98     0      307160 bb        257     112 2-Fluorophenol
  8  86   41   97     0      354030 bb        401     132 2-Chlorophenol-d4
  9  86   52   96    -1      379160 bb        388      99 Phenol-d5
 10 100   89   98     0      284160 bb        453     152 1,2-Dichlorobenzene-d4
 11 100   83   99     0      352780 bb        510      82 Nitrobenzene-d5
 12 100   64   97     0      348400 bb        559     185 1,3,5-Trichlorobenzene-d3
 13 100   93   98     0      204100 bb        620     240 1,4-Dibromobenzene-d4
 14 100   91   98     0      762820 bb        775     172 2-Fluorobiphenyl
 15 100   81   99    -1       93724 bb        987     330 2,4,6-Tribromophenol
 16 100   86   97     0      672030 vb*      1099     188 Anthracene-d10
 17 100   85   97     0     1426300 bb       1301     212 Pyrene-d10
 18 100   89   98     0      720310 bb       1334     244 Terphenyl-d14
 19 100   95   98     0      914460 bb        615     128 Naphthalene
 20 100   88   90     0      690750 bb        718     142 2-Methylnaphthalene
 21 100   96   98     0      639110 bb        788     162 2-Chloronaphthalene
 22 100   94   97     0     1001000 bb        849     152 Acenaphthylene
 23 100   86   88     0      592620 vb        875     154 Acenaphthene
 24 100   93   98     0      755790 bb        952     166 Fluorene
 25 100   84   98     0       92748 bv       1064     266 Pentachlorophenol
 26 100   93   98     0     1287500 bv       1094     178 Phenanthrene
 27 100   95   98    -1     1289400 vb*      1101     178 Anthracene
    100   95   99     0     1426100 bb       1271     202 Fluoranthene
  2 100   91   98    -1     1642600 bb       1303     202 Pyrene
 30  86   62   75     0     1189700 bv       1486     228 Benzo(a)anthracene
 31  97   75   92    -1     1222400 vv       1491     228 Chrysene
 32  81   68   71    -1      514370 b!✓ JMD   1686     252 Benzo(b)fluoranthene
 33 100   92   97    -1      958380 !v✓ 12-30-92 1692  252 Benzo(k)fluoranthene
 34 100   94   98    -1      590460 bv       1743     252 Benzo(e)pyrene
 35 100   94   97    -1      614730 vv       1754     252 Benzo(a)pyrene
 36  91   69   77     0      534550 vv       1773     252 Perylene
 37  98   76   92    -1      381320 M        1993     276 Indeno(1,2,3-cd)pyrene
 38  95   75   88    -1      228260 A        2002     278 Dibenz(a,h)anthracene
 39  93   80   94    -2      366580 bv       2046     276 Benzo(g,h,i)perylene
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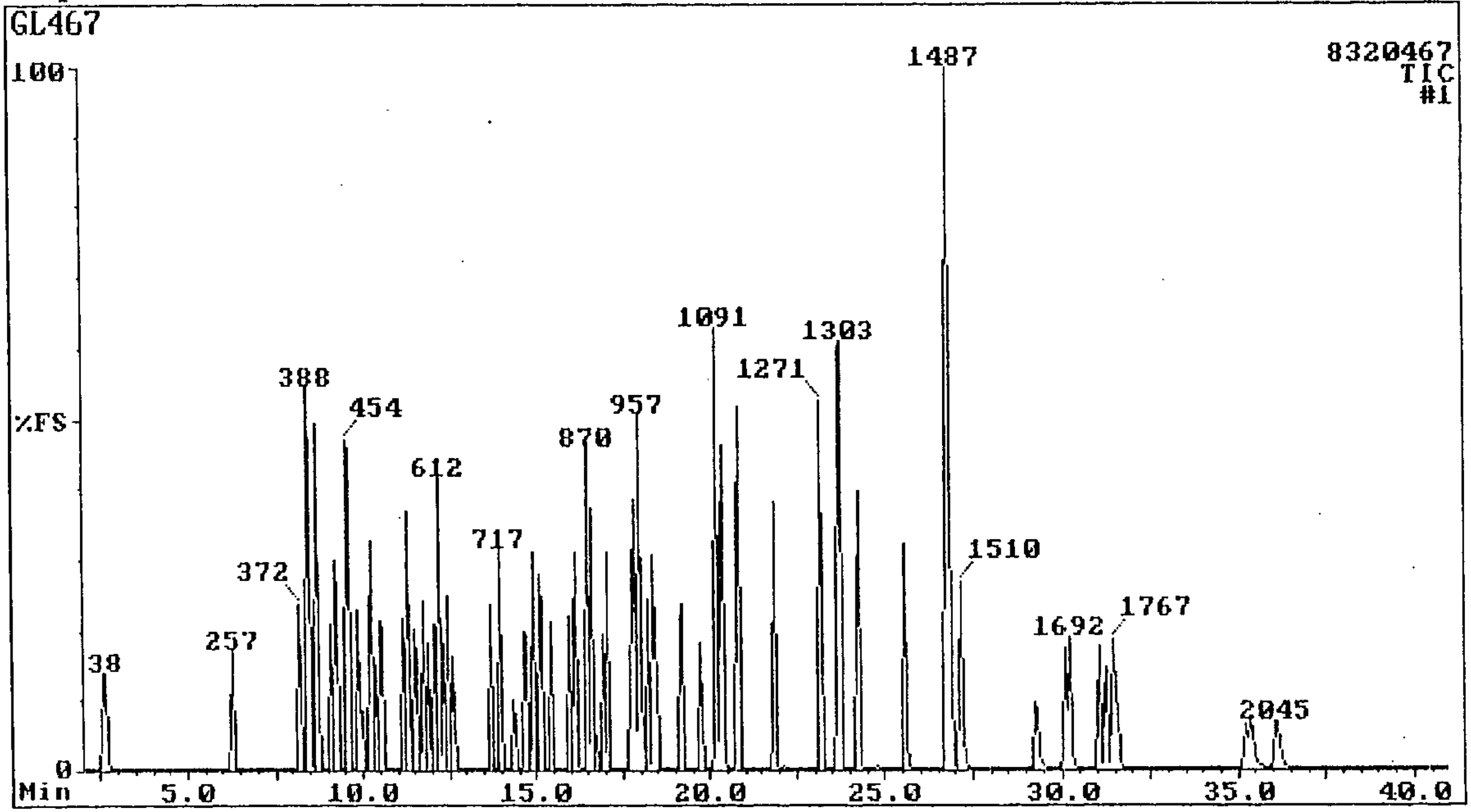
30-Dec-92 11:55 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SSTD050 Instrument G



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QUAN-02 · GL467                    LAB-BASE  QUAN                    30-Dec-92      14:25

 No. MAT  FOR  REV Delta        Area P.Flags   Scan     QM Name
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   1 100   78   99     1      882830 bb         433    152 1,4-Dichlorobenzene-d4
   2 100   88   93     0     3297000 bv         612    136 Naphthalene-d8
[illegible] 100   95   99     0     2183300 bb         870    164 Acenaphthene-d10
   4 100   90   97    -1     5186300 bv        1090    188 Phenanthrene-d10
   5  88   56   96    -1     4784200 bv        1487    240 Chrysene-d12
   6 100   85   93    -1     2429100 bv        1767    264 Perylene-d12
   7 100   95   97     0      933830 bb         257    112 2-Fluorophenol
   8  84   46   98     0      959140 bb         401    132 2-Chlorophenol-d4
   9  85   50   97    -1     1234900 bb         388     99 Phenol-d5
  10 100   80   94     0      729440 bb         453    152 1,2-Dichlorobenzene-d4
  11 100   83   99     0     1237100 bb         510     82 Nitrobenzene-d5
  12  98   59   98     0      852670 bb         559    185 1,3,5-Trichlorobenzene-d3
  13 100   92   98     0      540100 bb         620    240 1,4-Dibromobenzene-d4
  14 100   90   98     0     1905000 bb         775    172 2-Fluorobiphenyl
  15 100   80   99    -1      371440 bb         987    330 2,4,6-Tribromophenol
  16 100   83   96     0     1949800 vb        1099    188 Anthracene-d10
  17 100   85   97     0     4016200 bb        1301    212 Pyrene-d10
  18 100   86   97     0     2578100 bb        1334    244 Terphenyl-d14
  19 100   96   99     0     2364900 bb         615    128 Naphthalene
  20 100   89   91    -1     1848900 bb         717    142 2-Methylnaphthalene
  21 100   96   98     0     1638500 bb         788    162 2-Chloronaphthalene
  22 100   94   97     0     2732300 bb         849    152 Acenaphthylene
  23 100   88   90     0     1576600 vb         875    154 Acenaphthene
  24 100   96   99     0     2032500 bb         952    166 Fluorene
  25 100   85   99    -1      453910 bv        1063    266 Pentachlorophenol
  26 100   93   98     0     3581700 bv*       1094    178 Phenanthrene
  27 100   94   98     0     3684800 vv*       1102    178 Anthracene
[illegible] 100   95   99     0     4231300 bv        1271    202 Fluoranthene
  29 100   93   99    -1     4536900 vv        1303    202 Pyrene
  30 100   85   97     0     3446200 bv        1486    228 Benzo(a)anthracene
  31 100   89   99    -1     3222900 vv        1491    228 Chrysene
  32  81   67   72    -1     2151900 bv        1686    252 Benzo(b)fluoranthene
  33 100   92   97    -1     2643000 vv        1692    252 Benzo(K)fluoranthene
  34 100   93   98    -1     2098300 vv        1743    252 Benzo(e)pyrene
  35 100   94   99    -1     2023500 vv        1754    252 Benzo(a)pyrene
  36 100   89   96     0     1198900 vv        1773    252 Perylene
  37 100   94  100    -2     1857500 b?✓       1992    276 Indeno(1,2,3-cd)pyrene
  38 100   90   97    -2     1352900 b?✓ 12-30-92 2001 278 Dibenz(a,h)anthracene
  39  95   94   99    -3     1639700 bv        2045    276 Benzo(g,h,i)perylene
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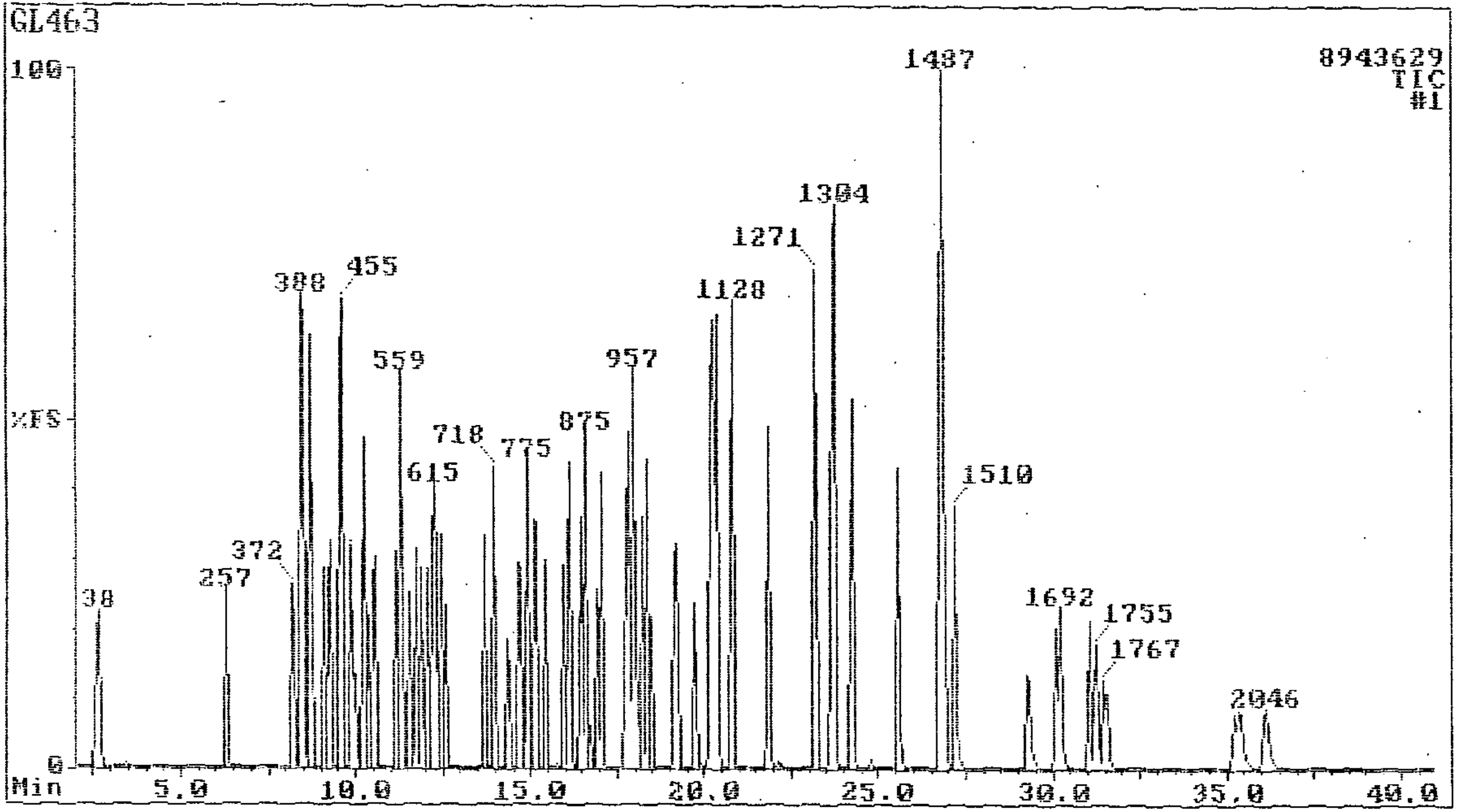
30-Dec-92 09:02 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SSTD080 Instrument G



Jnd

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QUAN DB : GL463                LAB-BASE  QUAN                30-Dec-92     14:25

 No. MAT FOR REV Delta        Area P.Flags  Scan     QM Name
------------------------------------------------------------------------------------
   1 100  76  99     1      764300 bb        433    152 1,4-Dichlorobenzene-d4
   2 100  87  93     0     2708100 bb        612    136 Naphthalene-d8
[illegible] 100  95  99     0     2006700 bv        870    164 Acenaphthene-d10
   4 100  88  97     0     4760500 bv       1091    188 Phenanthrene-d10
   5  96  58  96    -1     4054900 bv       1487    240 Chrysene-d12
   6 100  82  93    -1     1814200 bv       1767    264 Perylene-d12
   7 100  94  96     0     1161700 bb        257    112 2-Fluorophenol
   8  84  39  96     0     1294600 bb        401    132 2-Chlorophenol-d4
   9  84  49  95    -1     1518700 bv        388     99 Phenol-d5
  10 100  85  96     0     1041500 bb        453    152 1,2-Dichlorobenzene-d4
  11 100  82  98     0     1781400 bb        510     82 Nitrobenzene-d5
  12  98  59  98     0     1386900 bb        559    185 1,3,5-Trichlorobenzene-d3
  13 100  92  98     0      881960 bb        620    240 1,4-Dibromobenzene-d4
  14 100  90  98     0     2981600 bb        775    172 2-Fluorobiphenyl
  15 100  78  99    -1      468710 bb        987    330 2,4,6-Tribromophenol
  16 100  84  96     0     3001400 vv       1099    188 Anthracene-d10
  17 100  86  96     0     6102800 bv       1301    212 Pyrene-d10
  18 100  86  97     0     3738300 bb       1334    244 Terphenyl-d14
  19 100  95  98     0     3251500 bb        615    128 Naphthalene
  20 100  89  91     0     2557500 bb        718    142 2-Methylnaphthalene
  21 100  95  98     0     2506600 bb        788    162 2-Chloronaphthalene
  22 100  93  97     0     3961900 bb        849    152 Acenaphthylene
  23 100  88  90     0     2301500 bb        875    154 Acenaphthene
  24 100  95  99     0     3052200 vb        952    166 Fluorene
  25 100  84  99     0      594490 bv       1064    266 Pentachlorophenol
  26 100  93  98     0     5266600 bv*      1094    178 Phenanthrene
  27 100  93  98     0     5394700 vb*      1102    178 Anthracene
[illegible] 100  94  99     0     6173200 bb       1271    202 Fluoranthene
  29 100  94  99     0     6414000 vv       1304    202 Pyrene
  30 100  77  94     0     4844500 bv       1486    228 Benzo(a)anthracene
  31 100  89  99    -1     4559800 vv       1491    228 Chrysene
  32  83  69  74    -1     2662000 bv       1686    252 Benzo(b)fluoranthene
  33 100  92  98    -1     3506200 vv       1692    252 Benzo(k)fluoranthene
  34 100  93  98    -1     2702100 bv       1743    252 Benzo(e)pyrene
  35 100  94  99    -1     2643100 vv       1754    252 Benzo(a)pyrene
  36 100  91  97     0     1564400 vv       1773    252 Perylene
  37 100  94  99    -1     2425500 b?✓      1993    276 Indeno(1,2,3-cd)pyrene
  38 100  88  97    -1     1732500 bv       2002    278 Dibenz(a,h)anthracene
  39 100  94  99    -2     2181100 b?✓      2046    276 Benzo(g,h,i)perylene
```
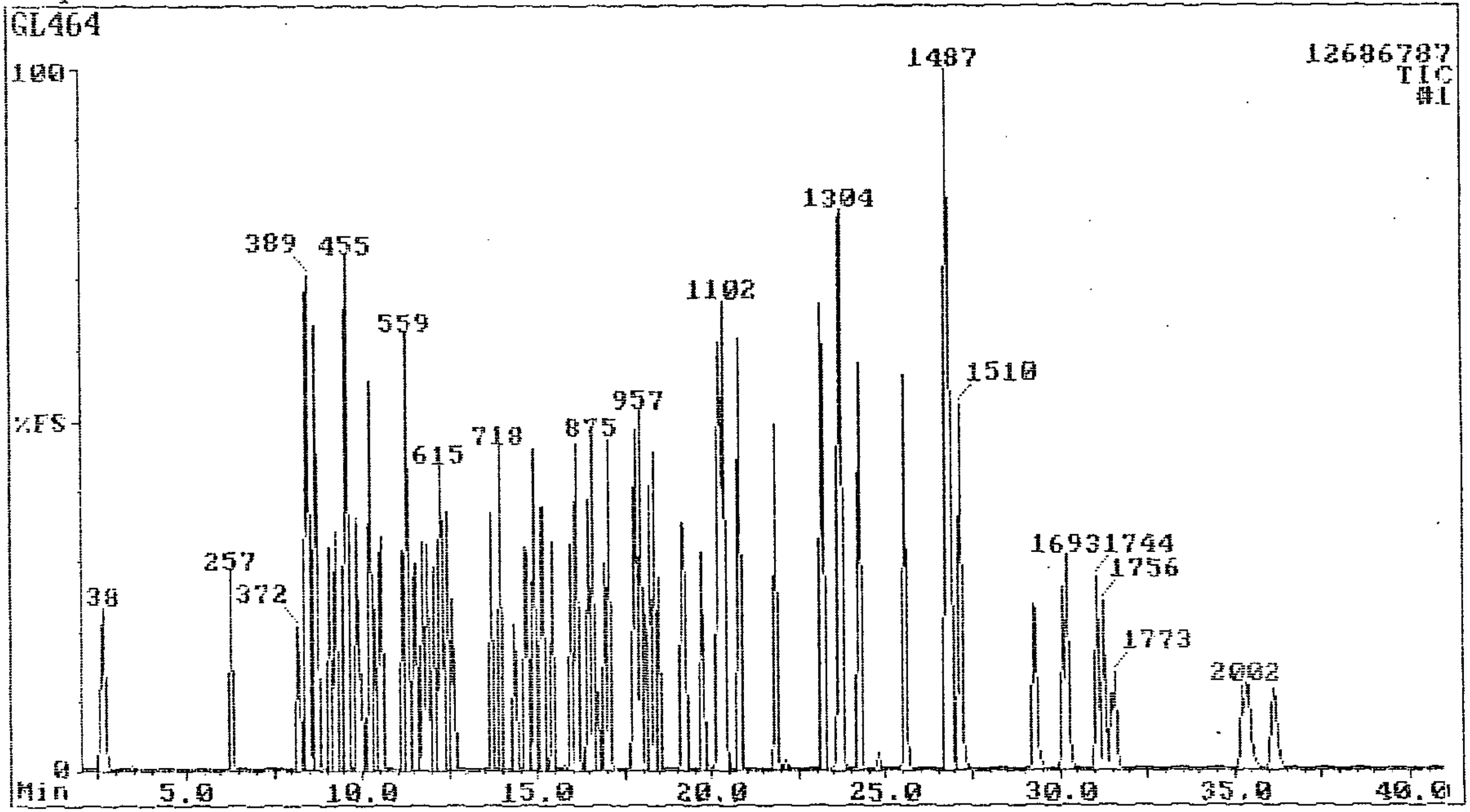

JnO 12-30-92

30-Dec-92 09:54 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SSTD120 Instrument G



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QUAN DB : GL464                    LAB-BASE  QUAN                     30-Dec-92      14:25

 No. MAT  FOR REV Delta         Area P.Flags  Scan     QM Name
------------------------------------------------------------------------------------------

  1   99   71  99     1     766540 bb          433    152 1,4-Dichlorobenzene-d4
  [illegible]100   87  93     0    2795600 bv          612    136 Naphthalene-d8
  [illegible]00   93  99     0    1970900 bv          870    164 Acenaphthene-d10
  4  100   86  97     0    4722600 bv         1091    188 Phenanthrene-d10
  5   88   46  95     0    4362400 bv         1488    240 Chrysene-d12
  6  100   82  93     0    2102900 bv         1768    264 Perylene-d12
  7  100   94  96     0    1884100 bb          257    112 2-Fluorophenol
  8   84   39  96     0    1982200 bb          401    132 2-Chlorophenol-d4
  9   91   49  96     0    2575800 bv          389     99 Phenol-d5
 10  100   84  95     0    1561900 bb          453    152 1,2-Dichlorobenzene-d4
 11  100   82  98     0    2939500 bb          510     82 Nitrobenzene-d5
 12   96   56  98     0    2003500 bb          559    185 1,3,5-Trichlorobenzene-d3
 13  100   92  98     0    1325900 bb          620    240 1,4-Dibromobenzene-d4
 14  100   90  98     0    4310300 bb          775    172 2-Fluorobiphenyl
 15  100   80  99     0     813340 bv          988    330 2,4,6-Tribromophenol
 16  100   84  96     0    4382700 vv         1099    188 Anthracene-d10
 17  100   86  97     0    8571700 bb         1301    212 Pyrene-d10
 18  100   86  97     0    6000300 bv         1334    244 Terphenyl-d14
 19  100   95  98     0    4952300 bv          615    128 Naphthalene
 20  100   88  91     0    3956800 vb          718    142 2-Methylnaphthalene
 21  100   95  98     0    3695300 bb          788    162 2-Chloronaphthalene
 22  100   93  97     0    5875400 bb          849    152 Acenaphthylene
 23  100   87  90     0    3434300 bv          875    154 Acenaphthene
 24  100   95  99     0    4482800 bb          952    166 Fluorene
 25  100   82  98     0    1063900 bv         1064    266 Pentachlorophenol
 26  100   92  97     0    7180800 bv*        1094    178 Phenanthrene
 27  100   93  99     0    7059400 vv*        1102    178 Anthracene
 [illegible]00   93  98     0    8357300 bv         1271    202 Fluoranthene
 29  100   92  98     0    8125200 bv         1304    202 Pyrene
 30  100   81  99     0    7526200 bv         1486    228 Benzo(a)anthracene
 31  100   92  99     0    7249100 vv         1492    228 Chrysene
 32   89   68  74     0    5265400 bv         1687    252 Benzo(b)fluoranthene
 33  100   91  97     0    5940900 v?✓ 12-30-92 1693    252 Benzo(k)fluoranthene
 34  100   93  98     0    5011200 vv         1744    252 Benzo(e)pyrene
 35  100   94  99     0    4819800 vv         1755    252 Benzo(a)pyrene
 36  100   92  99     0    2719800 v?✓        1773    252 Perylene
 37  100   94  99     0    4816000 b?✓ 12-30-92 1994    276 Indeno(1,2,3-cd)pyrene
 38  100   90  98     0    3567700 bb         2003    278 Dibenz(a,h)anthracene
 39  100   94  99     0    4160600 bv         2048    276 Benzo(g,h,i)perylene
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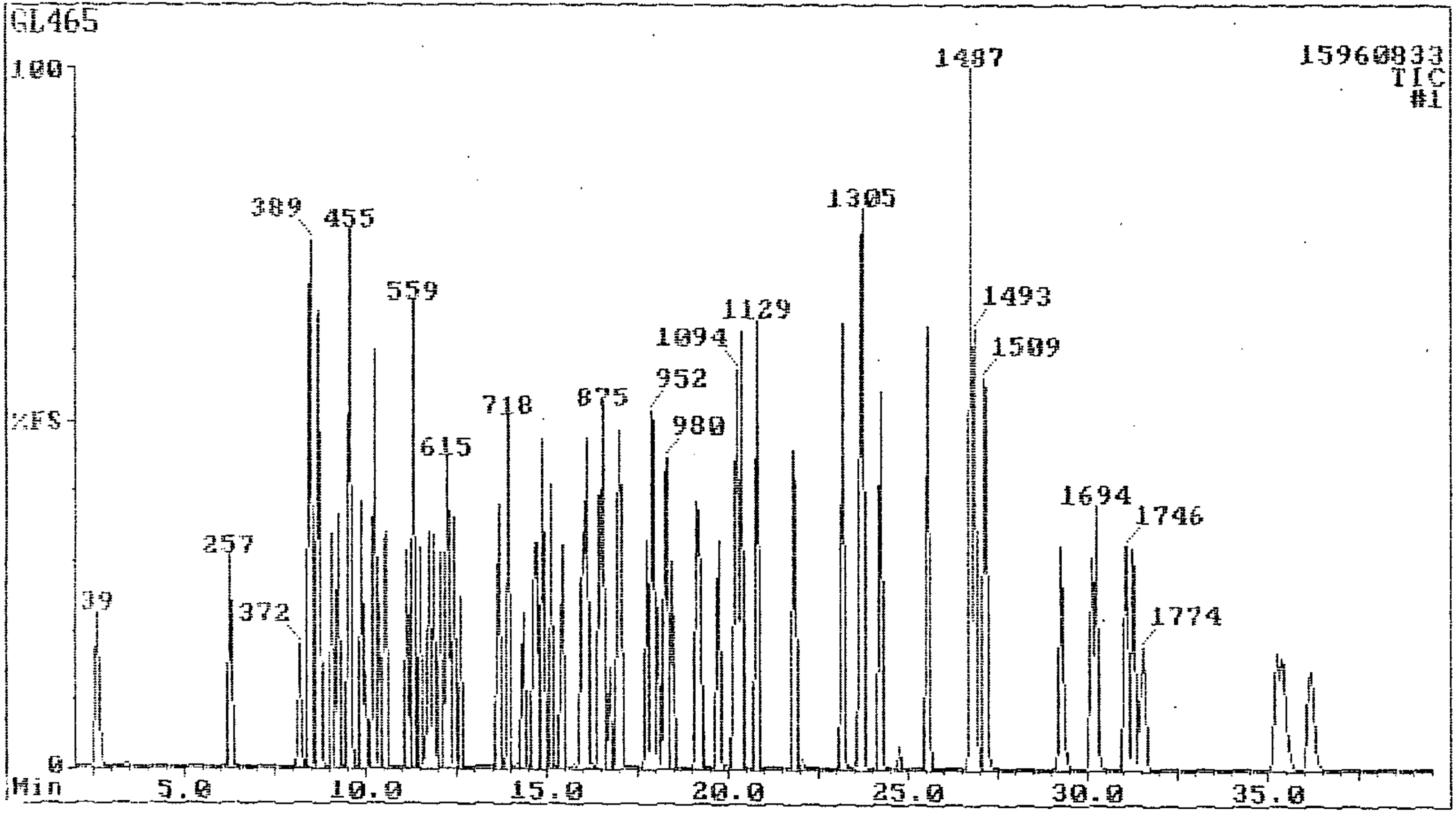
30-Dec-92 10:46 Triangle Laboratories of RTP, Inc. (919) 544-5729

Sample: SSTD160 Instrument G



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QUAN OF · GL465                   LAB-BASE  QUAN                   30-Dec-92      14:25

 No. MAT FOR REV Delta        Area P.Flags  Scan     QM Name
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  1 100  82  99     1       758980 bb        433    152 1,4-Dichlorobenzene-d4
    100  86  94     0      2826100 bv        612    136 Naphthalene-d8
    100  90  98     0      1906200 bv        870    164 Acenaphthene-d10
  4 100  87  97    -1      4492300 bv       1090    188 Phenanthrene-d10
  5  86  53  95     0      4440200 bv       1488    240 Chrysene-d12
  6 100  84  95     1      2587000 vv       1769    264 Perylene-d12
  7 100  94  96     0      2789900 bb        257    112 2-Fluorophenol
  8  55  40  96     0      2786400 bb        401    132 2-Chlorophenol-d4
  9  93  51  97     0      3948100 bv        389     99 Phenol-d5
 10 100  83  95     0      2128800 bb        453    152 1,2-Dichlorobenzene-d4
 11 100  77  98     1      4036800 bb        511     82 Nitrobenzene-d5
 12  95  54  98     0      2583100 bb        559    185 1,3,5-Trichlorobenzene-d3
 13 100  91  98     0      1739900 bb        620    240 1,4-Dibromobenzene-d4
 14 100  89  98     0      5551900 bb        775    172 2-Fluorobiphenyl
 15 100  76  98     0      1248800 bv        988    330 2,4,6-Tribromophenol
 16 100  85  97     0      5675000 vb       1099    188 Anthracene-d10
 17 100  86  97     1     10205000 vv       1302    212 Pyrene-d10
 18 100  85  97     0      7211700 bv       1334    244 Terphenyl-d14
 19 100  95  98     0      6481300 bv        615    128 Naphthalene
 20 100  88  91     0      5471700 vv        718    142 2-Methylnaphthalene
 21 100  95  98     0      4920700 bb        788    162 2-Chloronaphthalene
 22 100  93  97     0      7310800 bb        849    152 Acenaphthylene
 23 100  88  90     0      4524100 bv        875    154 Acenaphthene
 24 100  91  97     0      5841900 bv        952    166 Fluorene
 25 100  82  98     0      1469400 bv       1064    266 Pentachlorophenol
 26 100  91  97     0      8596200 bv*      1094    178 Phenanthrene
 27 100  92  98     0      8404800 vv*      1102    178 Anthracene
    100  92  97     0      9614400 vv       1271    202 Fluoranthene
 29 100  90  96     1      9222100 bv       1305    202 Pyrene
 30 100  82  99     0      9945500 bv       1486    228 Benzo(a)anthracene
 31 100  91  98     1      9301300 vv       1493    228 Chrysene
 32  81  67  73     1      9129500 b! ✓ 12-30-92 1688    252 Benzo(b)fluoranthene
 33 100  91  97     1      9354000 vv       1694    252 Benzo(k)fluoranthene
 34 100  92  98     1      8601700 bv       1745    252 Benzo(e)pyrene
 35 100  93  99     2      8073700 vv       1757    252 Benzo(a)pyrene
 36 100  93  99     1      4063300 vv       1774    252 Perylene
 37 100  93  99     2      9050200 b? ✓ 12-30-92 1996    276 Indeno(1,2,3-cd)pyrene
 38 100  89  98     1      6710900 bb       2004    278 Dibenz(a,h)anthracene
 39 100  94  99     2      7424800 bv       2050    276 Benzo(g,h,i)perylene
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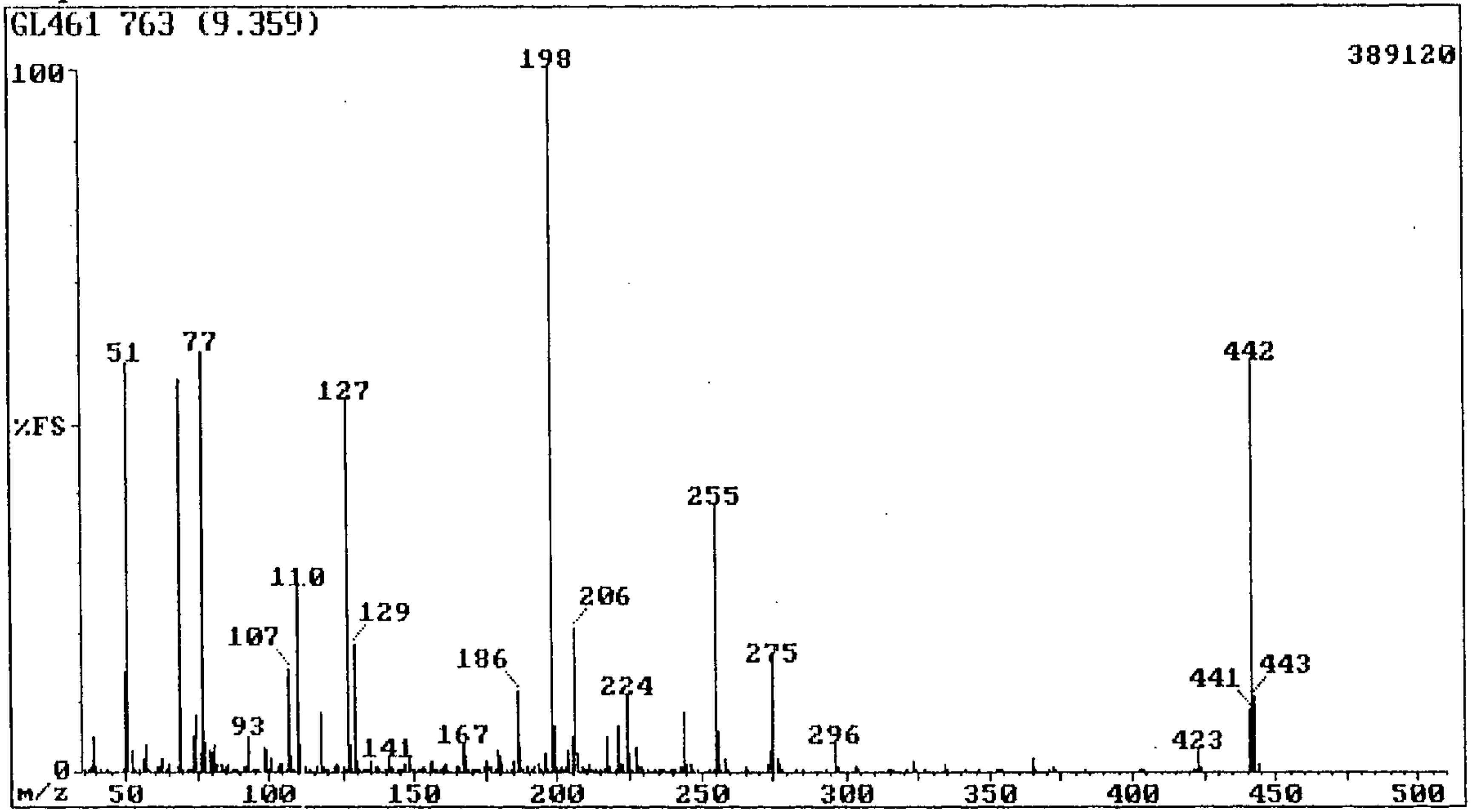
30-Dec-92 07:56 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: DFTPP Instrument G



[illegible]

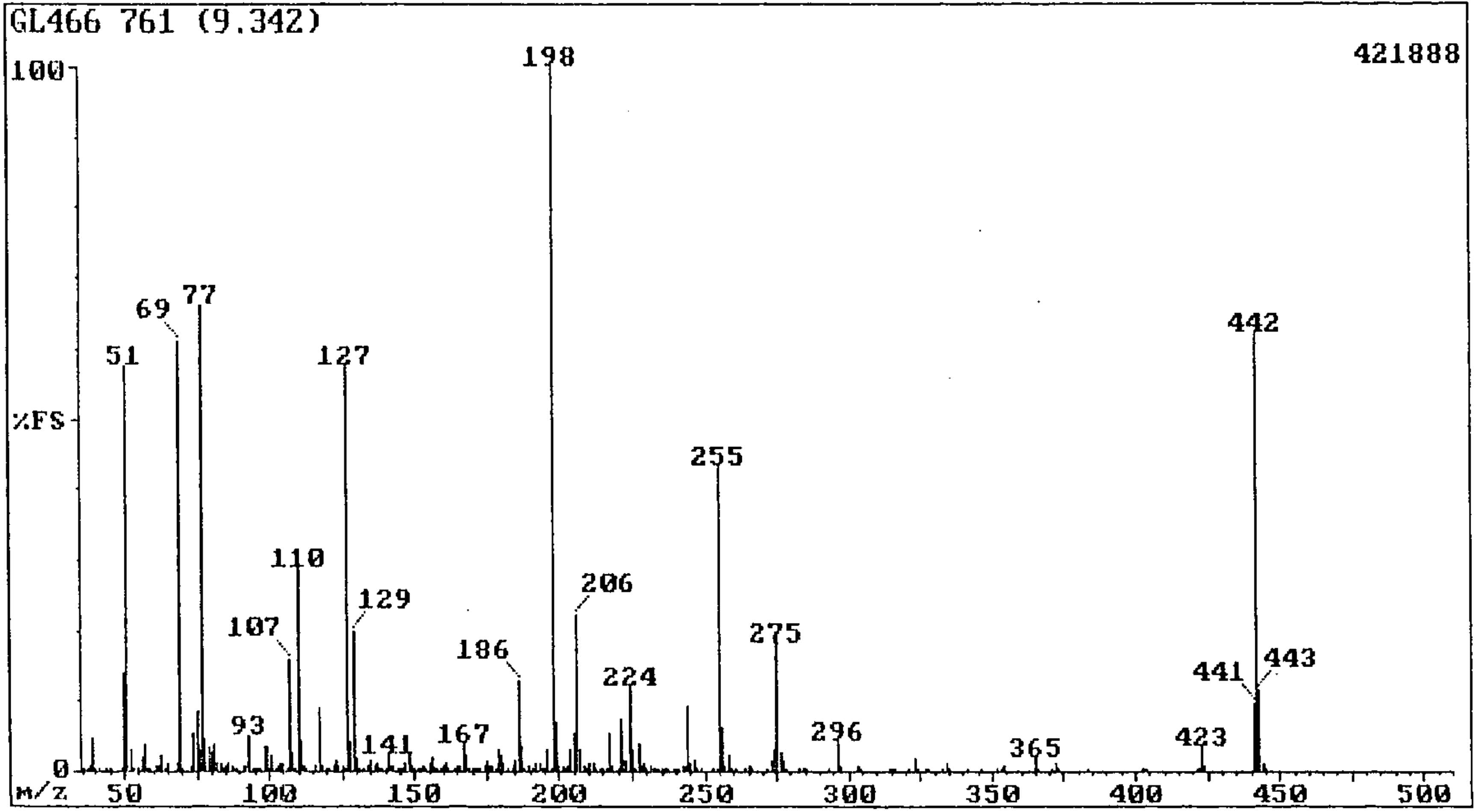
Pk#	mass	Abs Int	Rel Int	Pk#	mass	Abs Int	Rel Int	Pk#	mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int
	36	1440	0.37	49	96	1328	0.34	97	149	2240	0.58	145	202	3008	0.77	193	258	7424	1.91
2	37	1136	0.29	50	98	13440	3.45	98	150	792	0.20	146	202	676	0.17	194	259	1536	0.39
3	38	3136	0.81	51	99	12224	3.14	99	151	1440	0.37	147	203	2816	0.72	195	265	2880	0.74
4	39	19200	4.93	52	100	1296	0.33	100	152	876	0.23	148	204	12288	3.16	196	266	744	0.19
5	40	2384	0.61	53	101	7296	1.88	101	153	2624	0.67	149	205	20224	5.20	197	273	4864	1.25
6	41	812	0.21	54	103	2368	0.61	102	154	2176	0.56	150	206	79872	20.53	198	274	11392	2.93
7	44	1680	0.43	55	104	4224	1.09	103	155	4928	1.27	151	207	10944	2.81	199	275	60672	15.59
8	49	1712	0.44	56	105	3824	0.98	104	156	6784	1.74	152	208	3136	0.81	200	276	8064	2.07
9	50	56320	14.47	57	106	1792	0.46	105	157	1648	0.42	153	209	1408	0.36	201	277	4544	1.17
10	51	228352	58.68	58	107	58112	14.93	106	158	1824	0.47	154	210	2128	0.55	202	278	1056	0.27
11	52	12672	3.26	59	108	9216	2.37	107	159	1408	0.36	155	211	4800	1.23	203	283	800	0.21
12	53	928	0.24	60	109	1824	0.47	108	160	2752	0.71	156	212	1408	0.36	204	285	1232	0.32
13	55	1296	0.33	61	110	103424	26.58	109	161	4032	1.04	157	213	748	0.19	205	293	1360	0.35
14	56	6912	1.78	62	111	15872	4.08	110	162	1504	0.39	158	215	1344	0.35	206	296	14784	3.80
15	57	14848	3.82	63	112	2592	0.67	111	165	2656	0.68	159	216	1872	0.48	207	297	2352	0.60
16	58	1104	0.28	64	113	1120	0.29	112	166	2368	0.61	160	217	19712	5.07	208	303	2320	0.60
17	61	2480	0.64	65	116	3408	0.88	113	167	14848	3.82	161	218	3088	0.79	209	304	680	0.17
18	62	3056	0.79	66	117	33792	8.68	114	168	9024	2.32	162	220	732	0.19	210	314	884	0.23
19	63	7680	1.97	67	118	3216	0.83	115	169	1680	0.43	163	221	26112	6.71	211	315	1760	0.45
20	64	1328	0.34	68	119	764	0.20	116	170	900	0.23	164	222	4928	1.27	212	316	1168	0.30
21	65	4672	1.20	69	120	1072	0.28	117	171	848	0.22	165	223	4928	1.27	213	321	764	0.20
22	68	2992	0.77	70	122	3232	0.83	118	172	1376	0.35	166	224	41984	10.79	214	323	6400	1.64
23	69	220160	56.58	71	123	5056	1.30	119	173	2128	0.55	167	225	10752	2.76	215	324	1216	0.31
24	70	1840	0.47	72	124	2576	0.66	120	174	3184	0.82	168	226	1472	0.38	216	327	1072	0.28
25	71	1120	0.29	73	125	2448	0.63	121	175	6336	1.63	169	227	14208	3.65	217	334	3936	1.01
26	72	780	0.20	74	126	916	0.24	122	176	2384	0.61	170	228	2352	0.60	218	335	1104	0.28
27	73	1376	0.35	75	127	206848	53.16	123	177	3152	0.81	171	229	3552	0.91	219	341	688	0.18
28	74	19456	5.00	76	128	15552	4.00	124	178	1024	0.26	172	230	784	0.20	220	346	1200	0.31
29	75	31232	8.03	77	129	70656	18.16	125	179	11904	3.06	173	231	2256	0.58	221	352	1824	0.47
30	76	11200	2.88	78	130	6464	1.66	126	180	8640	2.22	174	234	1168	0.30	222	353	1344	0.35
31	77	234496	60.26	79	131	1888	0.49	127	181	4480	1.15	175	235	1360	0.35	223	354	1936	0.50
32	78	17408	4.47	80	132	904	0.23	128	182	732	0.19	176	236	1104	0.28	224	365	7360	1.89
33	79	11904	3.06	81	133	832	0.21	129	184	1008	0.26	177	237	1568	0.40	225	366	988	0.25
34	80	10496	2.70	82	134	2064	0.53	130	185	5888	1.51	178	239	848	0.22	226	371	728	0.19
35	81	14720	3.78	83	135	5312	1.37	131	186	45824	11.78	179	240	772	0.20	227	372	3360	0.86
36	82	4224	1.09	84	136	2672	0.69	132	187	13120	3.37	180	241	776	0.20	228	373	820	0.21
37	83	4288	1.10	85	137	3504	0.90	133	188	1472	0.38	181	242	2496	0.64	229	383	872	0.22
38	84	1088	0.28	86	138	1072	0.28	134	189	2384	0.61	182	243	2288	0.59	230	402	1200	0.31
39	85	2416	0.62	87	139	1296	0.33	135	191	1280	0.33	183	244	32768	8.42	231	403	1936	0.50
40	86	3984	1.02	88	140	844	0.22	136	192	3776	0.97	184	245	4416	1.13	232	404	684	0.18
41	87	2208	0.57	89	141	7936	2.04	137	193	4032	1.04	185	246	5120	1.32	233	421	1456	0.37
42	88	1264	0.32	90	142	2992	0.77	138	194	980	0.25	186	247	1504	0.39	234	422	1520	0.39
43	89	1120	0.29	91	143	2224	0.57	139	196	11264	2.89	187	249	1296	0.33	235	423	11712	3.01
44	91	3344	0.86	92	144	808	0.21	140	197	1584	0.41	188	253	712	0.18	236	424	2496	0.64
45	92	3200	0.82	93	145	876	0.23	141	198	389120	100.00	189	254	760	0.20	237	441	35328	9.08
46	93	19200	4.93	94	146	1728	0.44	142	199	26112	6.71	190	255	148480	38.16	238	442	229376	58.95
47	94	1856	0.48	95	147	4160	1.07	143	200	2976	0.76	191	256	22016	5.66	239	443	42240	10.86
48	95	856	0.22	96	148	8256	2.12	144	201	808	0.21	192	257	2160	0.56	240	444	4608	1.18

DFTPP TUNE CHECK REPORT

Raw Data File: CL461
Date. 30-Dec-92
Time: 07:56

M/E	ION ABUNDANCE CRITERIA	RELATIVE ABUNDANCE	TUNE
51	30.0 - 60.0% of mass 198	58.68	PASS
68	Less than 2.0% of mass 69	0.77(1.4)1	PASS
69	Mass 69 relative abundance	56.58	PASS
70	Less then 2.0% of mass 69	0.47(0.8)1	PASS
127	40.0 - 60.0% of mass 198	53.16	PASS
197	Less than 1% of mass 198	0.41	PASS
198	Base peak, 100% relative abundance	100.00	PASS
199	5 - 9% of mass 198	6.71	PASS
275	10 - 30% of mass 198	15.59	PASS
365	Greater than 1% of mass 198	1.89	PASS
441	Present, but less then mass 443	9.08	PASS
442	Greater than 40% of mass 198	58.95	PASS
443	17 - 23% of mass 442	10.86(18.4)2	PASS

30-Dec-92 11:38 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: DFTPP Instrument G



[illegible] 421888

Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int
[illegible]	36	1856	0.44	52	99	14208	3.37	103	154	2384	0.57	154	208	3696	0.88	205	274	13888	3.29
2	37	1040	0.25	53	100	1776	0.42	104	155	5504	1.30	155	209	1680	0.40	206	275	77824	18.45
3	38	3632	0.86	54	101	9088	2.15	105	156	7808	1.85	156	210	4416	1.05	207	276	10816	2.56
4	39	19456	4.61	55	102	944	0.22	106	157	2320	0.55	157	211	4160	0.99	208	277	5760	1.37
5	40	2448	0.58	56	103	3136	0.74	107	158	2224	0.53	158	212	688	0.16	209	278	1360	0.32
6	41	788	0.19	57	104	5440	1.29	108	159	1488	0.35	159	214	716	0.17	210	283	988	0.23
7	44	1424	0.34	58	105	5056	1.20	109	160	3088	0.73	160	215	1312	0.31	211	284	860	0.20
8	45	708	0.17	59	106	2032	0.48	110	161	4416	1.05	161	216	1984	0.47	212	285	1456	0.35
9	49	1472	0.35	60	107	67584	16.02	111	162	1648	0.39	162	217	23040	5.46	213	293	1744	0.41
10	50	58624	13.90	61	108	10944	2.59	112	164	796	0.19	163	218	3696	0.88	214	296	18688	4.43
11	51	242688	57.52	62	109	2288	0.54	113	165	3488	0.83	164	220	712	0.17	215	297	2672	0.63
12	52	13248	3.14	63	110	121856	28.88	114	166	2976	0.71	165	221	30720	7.28	216	303	2912	0.69
13	53	1328	0.31	64	111	18432	4.37	115	167	16640	3.94	166	222	5824	1.38	217	304	832	0.20
14	55	1488	0.35	65	112	2864	0.68	116	168	10496	2.49	167	223	5888	1.40	218	314	1280	0.30
15	56	7616	1.81	66	113	1376	0.33	117	169	2096	0.50	168	224	51200	12.14	219	315	2448	0.58
16	57	16896	4.00	67	116	3744	0.89	118	170	864	0.20	169	225	12736	3.02	220	316	1456	0.35
17	58	1264	0.30	68	117	38144	9.04	119	171	1040	0.25	170	226	1472	0.35	221	321	1008	0.24
18	59	864	0.20	69	118	3792	0.90	120	172	1792	0.42	171	227	17152	4.07	222	323	7936	1.88
19	61	2928	0.69	70	119	1020	0.24	121	173	2336	0.55	172	228	2864	0.68	223	324	1520	0.36
20	62	3520	0.83	71	120	864	0.20	122	174	3744	0.89	173	229	4672	1.11	224	327	1312	0.31
21	63	9088	2.15	72	122	3968	0.94	123	175	7360	1.74	174	230	1056	0.25	225	328	808	0.19
22	64	1824	0.43	73	123	5952	1.41	124	176	2528	0.60	175	231	2528	0.60	226	333	796	0.19
23	65	5568	1.32	74	124	2800	0.66	125	177	3456	0.82	176	232	808	0.19	227	334	4928	1.17
24	68	4352	1.03	75	125	2736	0.65	126	178	1216	0.29	177	233	804	0.19	228	335	1328	0.31
25	69	258048	61.17	76	126	1392	0.33	127	179	13184	3.13	178	234	1328	0.31	229	341	960	0.23
[illegible]	70	1696	0.40	77	127	243712	57.77	128	180	9408	2.23	179	235	1952	0.46	230	346	1600	0.38
27	73	2512	0.60	78	128	18176	4.31	129	181	4928	1.17	180	236	1248	0.30	231	352	2432	0.58
28	74	22784	5.40	79	129	83968	19.90	130	182	1072	0.25	181	237	1968	0.47	232	353	1872	0.44
29	75	36864	8.74	80	130	7744	1.84	131	184	1280	0.30	182	239	1040	0.25	233	354	2640	0.63
30	76	13952	3.31	81	131	2272	0.54	132	185	6656	1.58	183	240	700	0.17	234	365	9024	2.14
31	77	278528	66.02	82	132	1744	0.41	133	186	53504	12.68	184	241	1232	0.29	235	366	1376	0.33
32	78	20480	4.85	83	134	2800	0.66	134	187	15104	3.58	185	242	2880	0.68	236	371	856	0.20
33	79	14144	3.35	84	135	6656	1.58	135	188	1872	0.44	186	243	2944	0.70	237	372	4480	1.06
34	80	12288	2.91	85	136	3040	0.72	136	189	3008	0.71	187	244	39168	9.28	238	373	1088	0.26
35	81	16896	4.00	86	137	4224	1.00	137	191	1632	0.39	188	245	5312	1.26	239	383	1168	0.28
36	82	4992	1.18	87	138	1552	0.37	138	192	4608	1.09	189	246	5824	1.38	240	402	1680	0.40
37	83	5056	1.20	88	139	1004	0.24	139	193	4864	1.15	190	247	1456	0.35	241	403	2176	0.52
38	84	1328	0.31	89	140	1520	0.36	140	194	1104	0.26	191	249	1664	0.39	242	404	820	0.19
39	85	3040	0.72	90	141	9664	2.29	141	195	796	0.19	192	253	840	0.20	243	421	2080	0.49
40	86	4416	1.05	91	142	3504	0.83	142	196	13696	3.25	193	254	956	0.23	244	422	1664	0.39
41	87	2576	0.61	92	143	2800	0.66	143	197	1024	0.24	194	255	182272	43.20	245	423	14016	3.32
42	88	1728	0.41	93	144	1024	0.24	144	198	421888	100.00	195	256	26624	6.31	246	424	2816	0.67
43	89	1216	0.29	94	145	1088	0.26	145	199	29440	6.98	196	257	2672	0.63	247	441	41216	9.77
44	91	3952	0.94	95	146	2000	0.47	146	200	3264	0.77	197	258	9280	2.20	248	442	262144	62.14
45	92	4000	0.95	96	147	4928	1.17	147	201	3104	0.74	198	259	1968	0.47	249	443	48640	11.53
46	93	21248	5.04	97	148	9664	2.29	148	202	2080	0.49	199	261	1020	0.24	250	444	5440	1.29
47	94	2032	0.48	98	149	2288	0.54	149	203	3040	0.72	200	264	820	0.19	251	445	960	0.23
48	95	1168	0.28	99	150	1020	0.24	150	204	13760	3.26	201	265	3824	0.91				
49	96	2032	0.48	100	151	2016	0.48	151	205	23552	5.58	202	266	1168	0.28				
50	97	928	0.22	101	152	1248	0.30	152	206	93184	22.09	203	272	820	0.19				
51	98	14784	3.50	102	153	3216	0.76	153	207	12800	3.03	204	273	6080	1.44				

```
                    DFTPP TUNE CHECK REPORT

                    Raw Data File:      8L466
                    Date:               30-Dec-92
                    Time:               11:38

                                                    RELATIVE
M/E   ION ABUNDANCE CRITERIA                        ABUNDANCE       TUNE
-------------------------------------------------------------------------
 51   30.0 - 60.0% of mass 198                       57.52           PASS
 68   Less than 2.0% of mass 69                       1.03(   1.7)1 PASS
 69   Mass 69 relative abundance                     61.17           PASS
 70   Less then 2.0% of mass 69                       0.40(   0.7)1 PASS
127   40.0 - 60.0% of mass 198                       57.77           PASS
197   Less than 1% of mass 198                        0.24           PASS
198   Base peak. 100% relative abundance            100.00           PASS
199   5 - 9%  of mass 198                             6.98           PASS
275   10  - 30% of mass 198                          18.45           PASS
365   Greater than 1% of mass 198                     2.14           PASS
441   Present, but less then mass 443                 9.77           PASS
442   Greater than 40% of mass 198                   62.14           PASS
443   17  - 23% of mass 442                          11.53( 18.6)2 PASS
-------------------------------------------------------------------------
```

Triangle Laboratories of RTP, Inc.
Initial Calibration Curve

ICAL File: ICALGJ03 Date of Analysis :01/03/93 Analyte List: PAH
F20 GL497 RF50 GL496 RF80 GL495
F120 GL494 RF160 GL498

Analyte	Flag	RF20	RF50	RF80	RF120	RF160	RFMEAN	%RSD
1,4-Dichlorobenzene-d4	I							
Naphthalene-d8	I							
2-Methylnaphthalene		0.684	0.672	0.714	0.773	0.802	0.729	7.7
Naphthalene		1.028	0.975	1.032	1.109	1.148	1.058	6.6
Acenaphthene-d10	I							
Acenaphthene	C	0.975	0.951	1.015	1.097	1.057	1.019	5.8
Fluorene		1.225	1.176	1.234	1.320	1.310	1.253	4.9
2-Chloronaphthalene		1.033	0.982	1.035	1.114	1.078	1.048	4.8
Acenaphthylene		1.705	1.683	1.766	1.952	1.848	1.791	6.2
Phenanthrene-d10	I							
Phenanthrene		0.976	0.919	0.922	0.987	0.947	0.950	3.2
Anthracene		0.981	0.937	0.940	1.005	0.934	0.959	3.3
Fluoranthene	C	1.143	1.117	1.143	1.214	1.143	1.152	3.2
Chrysene-d12	I							
Chrysene		1.038	0.984	0.975	1.020	1.041	1.011	3.0
Pyrene		1.208	1.189	1.250	1.179	1.057	1.176	6.1
Benzo(a)anthracene		1.052	0.989	1.058	1.072	1.068	1.048	3.2
Perylene-d12	I							
Benzo(b)fluoranthene		1.392	1.436	1.587	1.719	1.740	1.575	10.1
Benzo(k)fluoranthene		1.624	1.727	1.720	1.718	1.733	1.704	2.7
enzo(e)pyrene		1.378	1.419	1.505	1.560	1.623	1.497	6.7
Benzo(a)pyrene	C	1.286	1.343	1.399	1.505	1.585	1.424	8.5
Perylene		0.756	0.711	0.753	0.766	0.787	0.755	3.7
Indeno(1,2,3-cd)pyrene		0.733	0.877	1.046	1.234	1.396	1.057	25.2
Dibenz(a,h)anthracene		0.770	0.890	1.007	1.217	1.349	1.047	22.6
Benzo(g,h,i)perylene		0.923	1.046	1.193	1.341	1.462	1.193	18.2

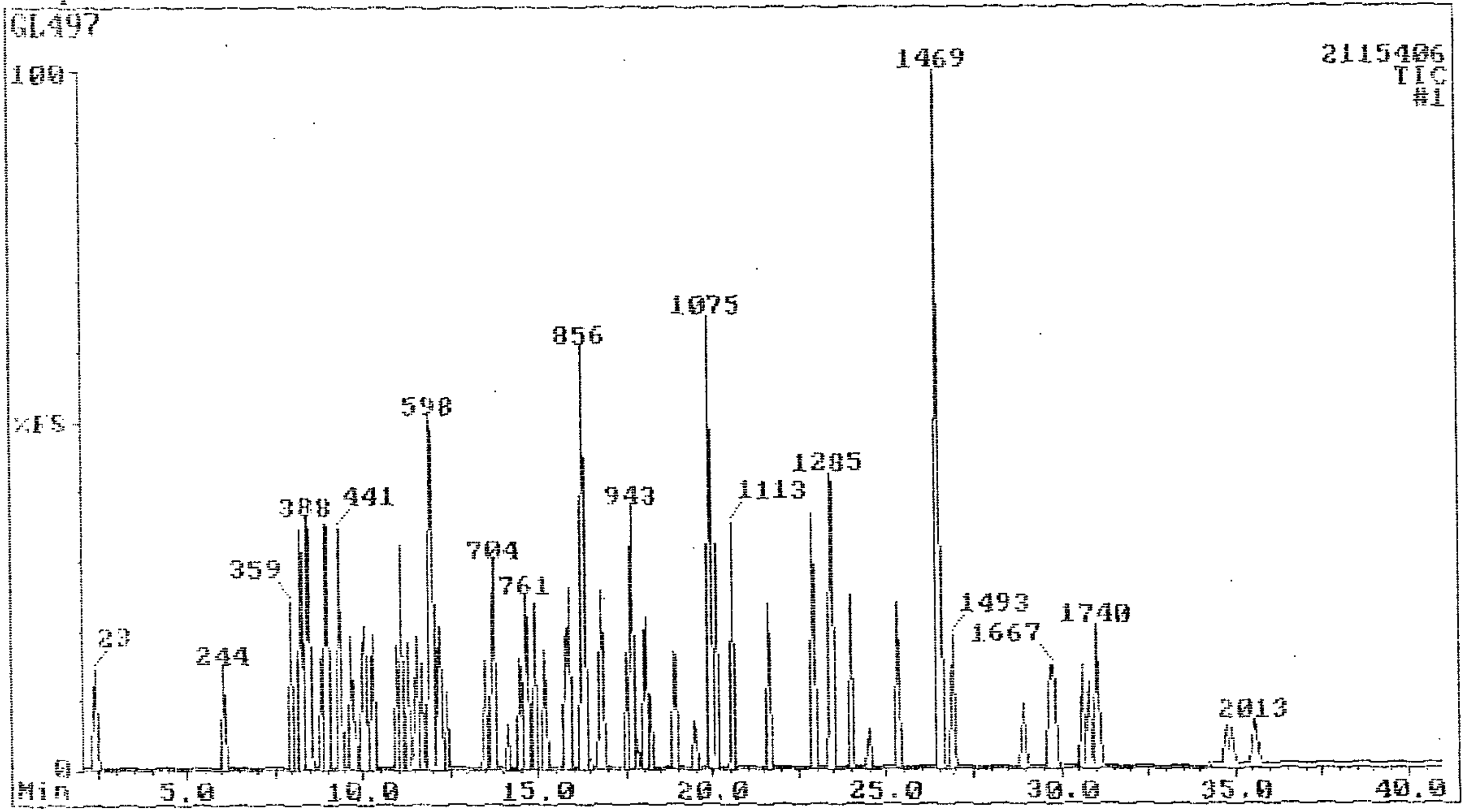
Surrogate	Flag	RF20	RF50	RF80	RF120	RF160	RFMEAN	%RSD
Anthracene-d10	S	0.522	0.508	0.516	0.553	0.537	0.527	3.4
Pyrene-d10	S	1.081	1.081	1.162	1.125	1.065	1.103	3.6

Approved by: ____________ Date 1 / 5 / 93

*- Fails QC Criteria for %RSD; << - Rf less then minimum QC RF; >>- RF greater than maximum QC RF ICAL.EXE v2.5

r 1/3/93

03-Jan-93 16:59 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SSTD020 Instrument G



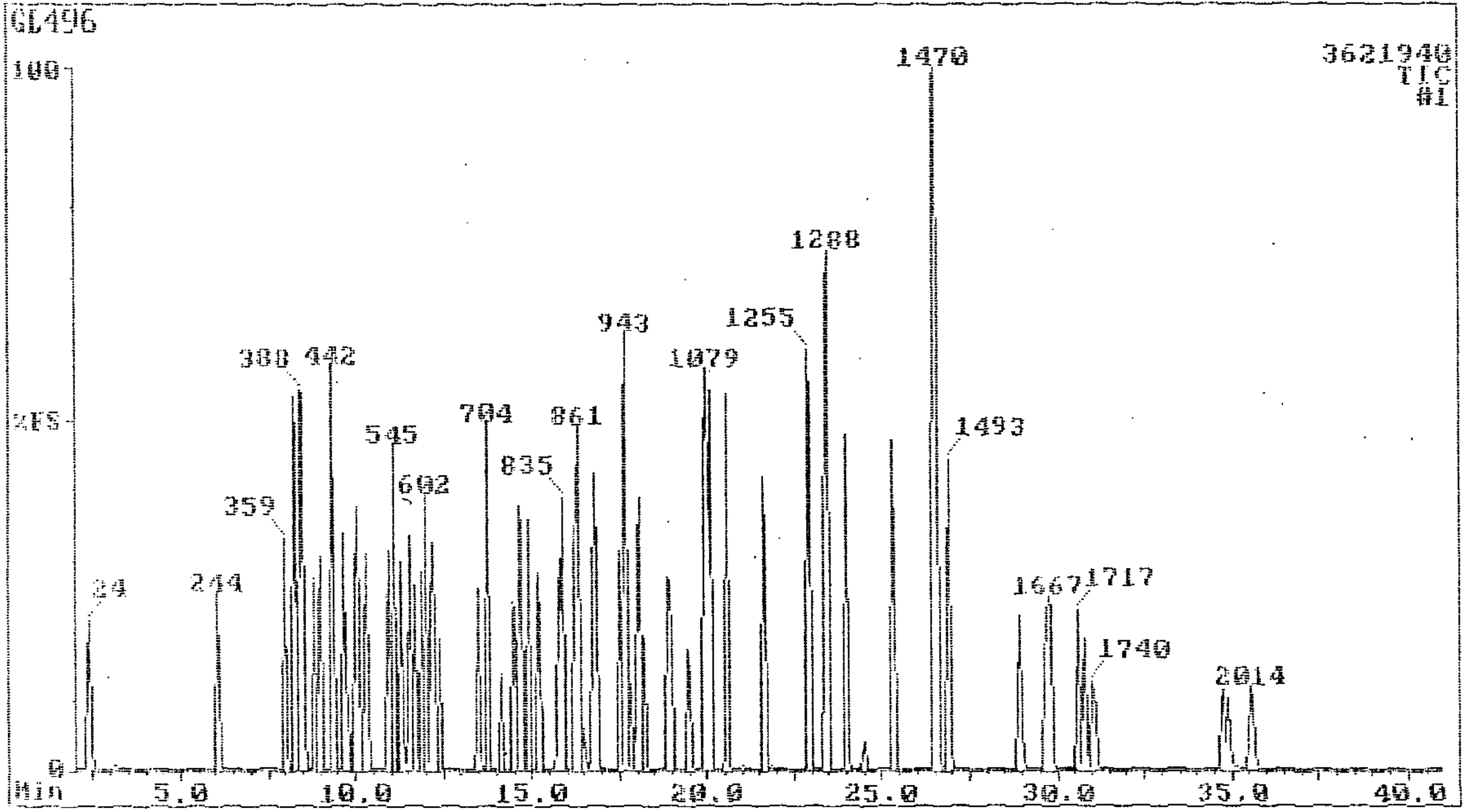
SSTD020 ~ 1/3/93

```
QUAN 'DB : 9L497              S-BASE  QUAN                01-Jan-93        11:27

 no. MAT FOR REV Delta        Area P.Flags  Scan     QM Name
-------------------------------------------------------------------------------------
  1 100  85 100   -1     270610 bb         419    152 1,4-Dichlorobenzene-d4
  2 100  89  93    0    1154300 bb         598    136 Naphthalene-d8
[illegible] 100  94  97    0     630640 bb         856    164 Acenaphthene-d10
  4 100  92  97    0    1301700 bv        1075    188 Phenanthrene-d10
  5  95  68  96   -2    1327100 bb        1469    240 Chrysene-d12
  6  99  90  95    1     667600 bb        1739    264 Perylene-d12
  7 100  97  97   -1     263320 bb         243    112 2-Fluorophenol
  8  90  56  99   -1     235130 bb         387    132 2-Chlorophenol-d4
  9  95  64  99   -1     327920 bb         376     99 Phenol-d5
 10 100  95  99    0     144290 bb         439    152 1,2-Dichlorobenzene-d4
 11 100  84  99    0     306170 bb         497     82 Nitrobenzene-d5
 12  98  60  97    0     180130 bb         545    185 1,3,5-Trichlorobenzene-d3
 13 100  96  99    0     117180 bb         606    240 1,4-Dibromobenzene-d4
 14 100  93  98    0     400560 bb         761    172 2-Fluorobiphenyl
 15 100  81  98    0      56244 bb         973    330 2,4,6-Tribromophenol
 16 100  93  97   -1     339660 vb        1083    188 Anthracene-d10
 17 100  87  96    1     717080 bb        1285    212 Pyrene-d10
 18 100  91  97    2     440590 bb        1319    244 Terphenyl-d14
 19 100  96  98    0     593060 bb         601    128 Naphthalene
 20 100  89  90    0     395050 bb         704    142 2-Methylnaphthalene
 21 100  98  98    0     325760 bb         774    162 2-Chloronaphthalene
 22 100  96  98    0     537570 bb         834    152 Acenaphthylene
 23 100  87  88    0     307360 bb         861    154 Acenaphthene
 24 100  97  99   -1     386320 bb         937    166 Fluorene
 25 100  96  99    0      48328 bb        1049    266 Pentachlorophenol
 26 100  95  97    0     635560 bv*       1079    178 Phenanthrene
 27 100  96  99   -1     638590 vb*       1086    178 Anthracene
[illegible] 100  97  99   -1     743660 bb        1255    202 Fluoranthene
 29 100  96  99    0     801330 bb        1287    202 Pyrene
 30  97  79  88    1     697820 bv        1468    228 Benzo(a)anthracene
 31 100  91  98    0     688860 vb        1473    228 Chrysene
 32  83  65  67    0     464780 bv        1661    252 Benzo(b)fluoranthene
 33 100  95  95   -1     542140 vb*       1667    252 Benzo(k)fluoranthene
 34 100  97  98   -1     459930 bv        1716    252 Benzo(e)pyrene
 35 100  96  96   -2     429150 vv        1727    252 Benzo(a)pyrene
 36 100  89  91    0     252270 vb        1745    252 Perylene
 37  98  89  94   -2     244740 bv        1964    276 Indeno(1,2,3-cd)pyrene
 38 100  86  92   -1     257020 vb        1973    278 Dibenz(a,h)anthracene
 39  73  87  94   -5     307970 bb        2013    276 Benzo(g,h,i)perylene
```

~ 1/3/93

03-Jan-93 16:10 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SSTD050 Instrument G



55D0650

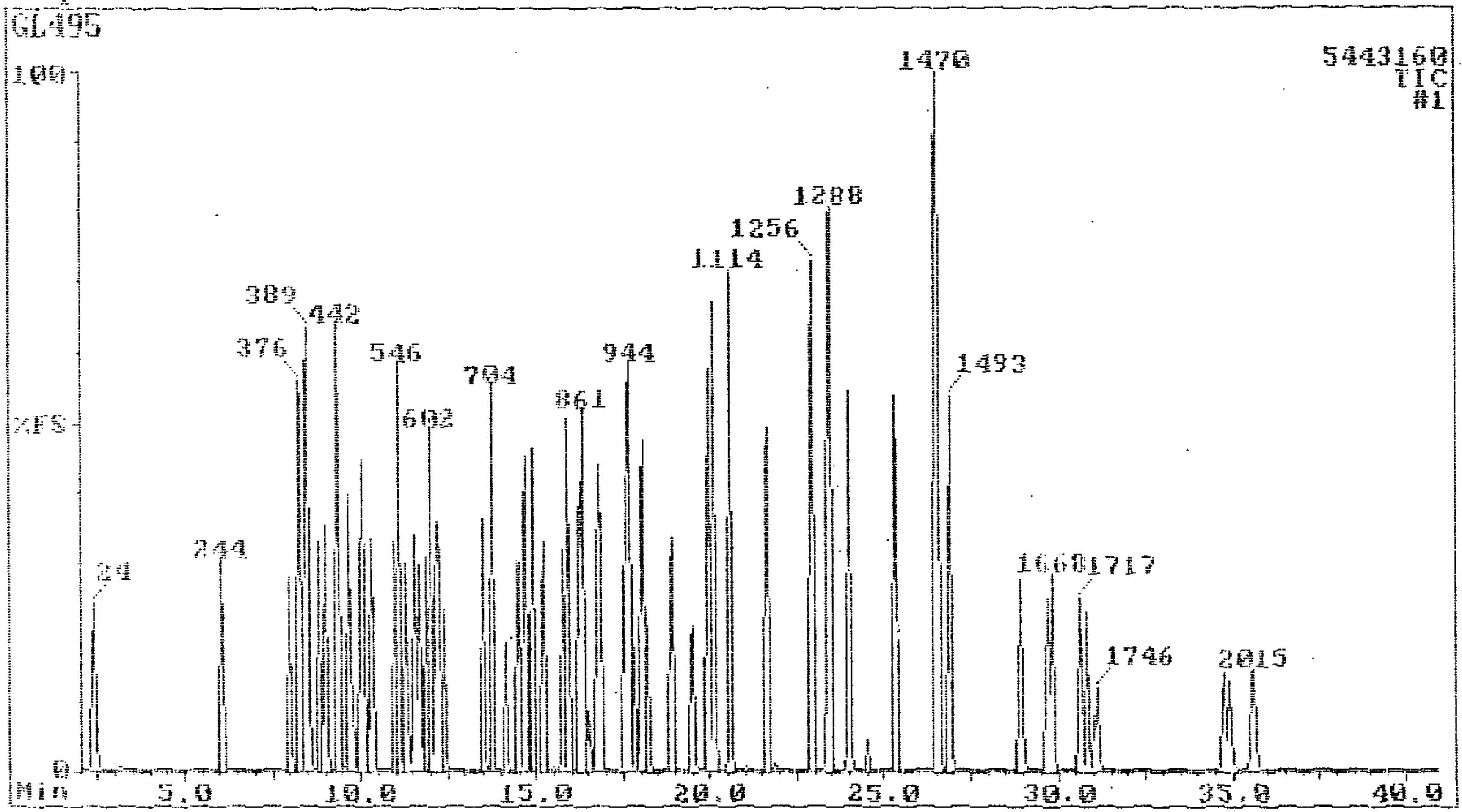
~ 1/2/93

```
QUAN DR : 01496                     LAC-BASE  QUAN                  11-Jan-93        21:28

 No. MAT  FOR REV Delta        Area P.Flags  Scan      Qm Name
---------------------------------------------------------------------------------------------
   1 100   85 100    -1      317900 bb         419    152 1,4-Dichlorobenzene-d4
     100   90  94     0     1300600 bb         598    136 Naphthalene-d8
      00   93  98     0      716270 bb         856    164 Acenaphthene-d10
   4 100   91  97     0     1555900 bv        1075    188 Phenanthrene-d10
   5  83   49  94    -1     1542700 bb        1470    240 Chrysene-d12
   6 100   89  95     0      671920 bb        1740    264 Perylene-d12
   7 100   96  97     0      728240 bb         244    112 2-Fluorophenol
   8  93   61  99     0      651270 bb         388    132 2-Chlorophenol-d4
   9  94   62  99    -1      894450 bv         376     99 Phenol-d5
  10 100   95  99     1      389120 bb         440    152 1,2-Dichlorobenzene-d4
  11 100   85  99     0      825660 bb         497     82 Nitrobenzene-d5
  12  99   59  99     0      462560 bb         545    185 1,3,5-Trichlorobenzene-d3
  13 100   94  99     0      311620 bb         606    240 1,4-Dibromobenzene-d4
  14 100   91  98     0     1038800 bb         761    172 2-Fluorobiphenyl
  15 100   79  99     0      182360 bb         973    330 2,4,6-Tribromophenol
  16 100   84  96     0      987970 vb        1084    188 Anthracene-d10
  17 100   88  97     0     2083800 bb        1285    212 Pyrene-d10
  18 100   88  97     1     1421800 bb        1319    244 Terphenyl-d14
  19 100   97  99     0     1584500 bb         601    128 Naphthalene
  20 100   89  91     0     1092900 vb         704    142 2-Methylnaphthalene
  21 100   97  99     0      878850 bb         774    162 2-Chloronaphthalene
  22 100   95  98     0     1506600 bb         834    152 Acenaphthylene
  23 100   88  89     0      851310 vb         861    154 Acenaphthene
  24 100   95  98     0     1053000 bb         938    166 Fluorene
  25 100   86  99     0      195430 bb        1049    266 Pentachlorophenol
  26 100   93  97     0     1788000 bv*       1079    178 Phenanthrene
  27 100   94  98     0     1822400 vb*       1087    178 Anthracene
     100   96  99    -1     2172400 bb        1255    202 Fluoranthene
  2  100   95  99     0     2292200 bb        1288    202 Pyrene
  30 100   90  99     0     1907600 bv*       1468    228 Benzo(a)anthracene
  31 100   94  99     0     1897700 vv        1474    228 Chrysene
  32  81   68  71    -1     1206000 bv        1661    252 Benzo(b)fluoranthene
  33 100   94  97    -2     1450600 vv        1667    252 Benzo(k)fluoranthene
  34 100   96  98    -1     1192100 bv        1717    252 Benzo(e)pyrene
  35  96   96  99    -3     1127800 vv        1727    252 Benzo(a)pyrene
  36 100   98  99    -1      597010 vb        1745    252 Perylene
  37  96   96  99    -3      736640 bv        1964    276 Indeno(1,2,3-cd)pyrene
  38 100   94  98    -2      747280 vb        1973    278 Dibenz(a,h)anthracene
  39  70   96  99    -6      878350 bv        2013    276 Benzo(g,h,i)perylene
```

~ 1/3/93

03-Jan-93 15:17 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SSTD080 Instrument G



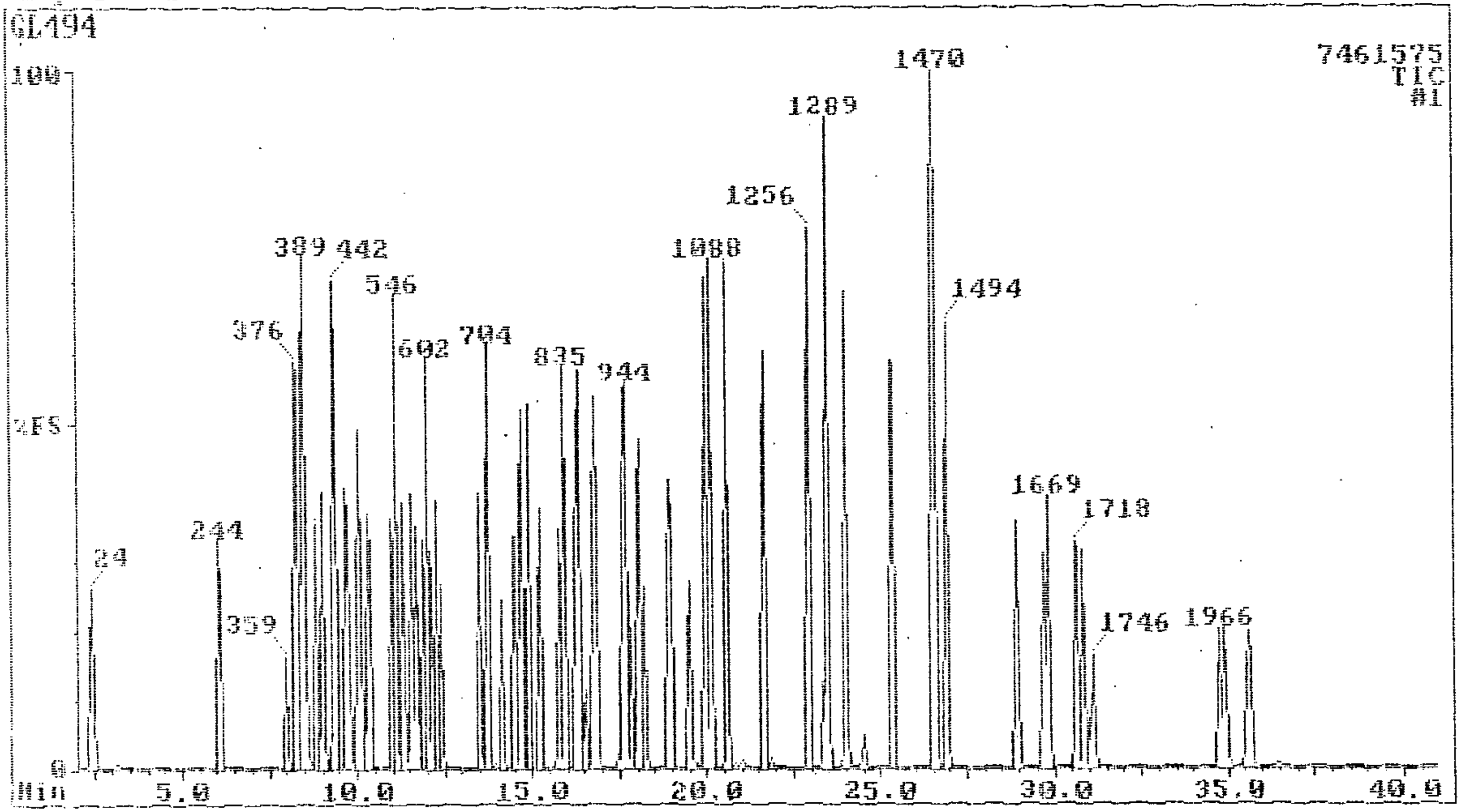
55TD08· ~ 1/3/93

```
DATA:08 . GL495                 LAB-BASE  QUAN                  03-Jan-93      21:18

 NO. MAT  FOR REV Delta        Area P.Flags  Scan     QM Name
----------------------------------------------------------------------------------------
  1 100   85 100     0      320770 bb        420    152 1,4-Dichlorobenzene-d4
    100   87  94     0     1330300 bb        599    136 Napthalene-d8
    100   88  97    -1      737180 bb        856    164 Acenaphthene-d10
  4 100   87  96     1     1633600 bv       1076    188 Phenanthrene-d10
  5  81   45  94    -2     1549000 bb       1470    240 Chrysene-d12
  6 100   87  93     0      665170 bb       1740    264 Perylene-d12
  7 100   95  97    -1     1244700 bb        244    112 2-Fluorophenol
  8  86   49  99    -1     1124600 bb        388    132 2-Chlorophenol-d4
  9  96   66  99    -1     1498300 bv        377     99 Phenol-d5
 10 100   86  97     0      677300 bb        440    152 1,2-Dichlorobenzene-d4
 11 100   86  99    -1     1412100 bb        497     82 Nitrobenzene-d5
 12  97   57  98     0      778180 bb        546    185 1,3,5-Trichlorobenzene-d3
 13 100   94 100    -1      531860 bb        606    240 1,4-Dibromobenzene-d4
 14 100   90  98     1     1768300 bb        762    172 2-Fluorobiphenyl
 15 100   80 100     0      339710 bb        973    330 2,4,6-Tribromophenol
 16 100   86  97    -1     1688000 vb       1084    188 Anthracene-d10
 17 100   84  97     1     3601800 vb       1286    212 Pyrene-d10
 18 100   88  97     1     2551600 bb       1319    244 Terphenyl-d14
 19 100   96  98     0     2756600 bb        602    128 Naphthalene
 20 100   89  92    -1     1906600 vb        704    142 2-Methylnaphthalene
 21 100   95  98     1     1527100 bb        775    162 2-Chloronaphthalene
 22 100   94  97     1     2606600 bb        835    152 Acenaphthylene
 23 100   88  90     0     1498300 bb        861    154 Acenaphthene
 24 100   95  98     0     1821500 bb        938    166 Fluorene
 25 100   86  99    -1      389840 bv       1049    266 Pentachlorophenol
 26 100   93  98    -1     3015800 bv*      1079    178 Phenanthrene
 27 100   93  98    -1     3075000 vb       1087    178 Anthracene
    100   95  98    -1     3740300 bb       1256    202 Fluoranthene
 29 100   93  98     1     3874800 bb       1289    202 Pyrene
 30 100   85  98     1     3278900 bv*      1469    228 Benzo(a)anthracene
 31 100   93  99     0     3021200 vv       1474    228 Chrysene
 32  88   68  72     0     2105500 bv       1662    252 Benzo(b)fluoranthene
 33 100   93  97    -1     2280600 vv       1668    252 Benzo(k)fluoranthene
 34 100   95  98    -1     1996400 bv       1717    252 Benzo(e)pyrene
 35 100   96  99    -2     1856100 vv       1728    252 Benzo(a)pyrene
 36 100   97  99     0      999390 vv       1746    252 Perylene
 37 100   96 100    -2     1387200 bv       1965    276 Indeno(1,2,3-cd)pyrene
 38 100   93  99    -2     1336200 vv       1973    278 Dibenz(a,h)anthracene
 39  87   96  99    -4     1582100 bv       2015    276 Benzo(g,h,i)perylene
```

~ 1/3/93

03-Jan-93 14:13 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SSTD120 Instrument G



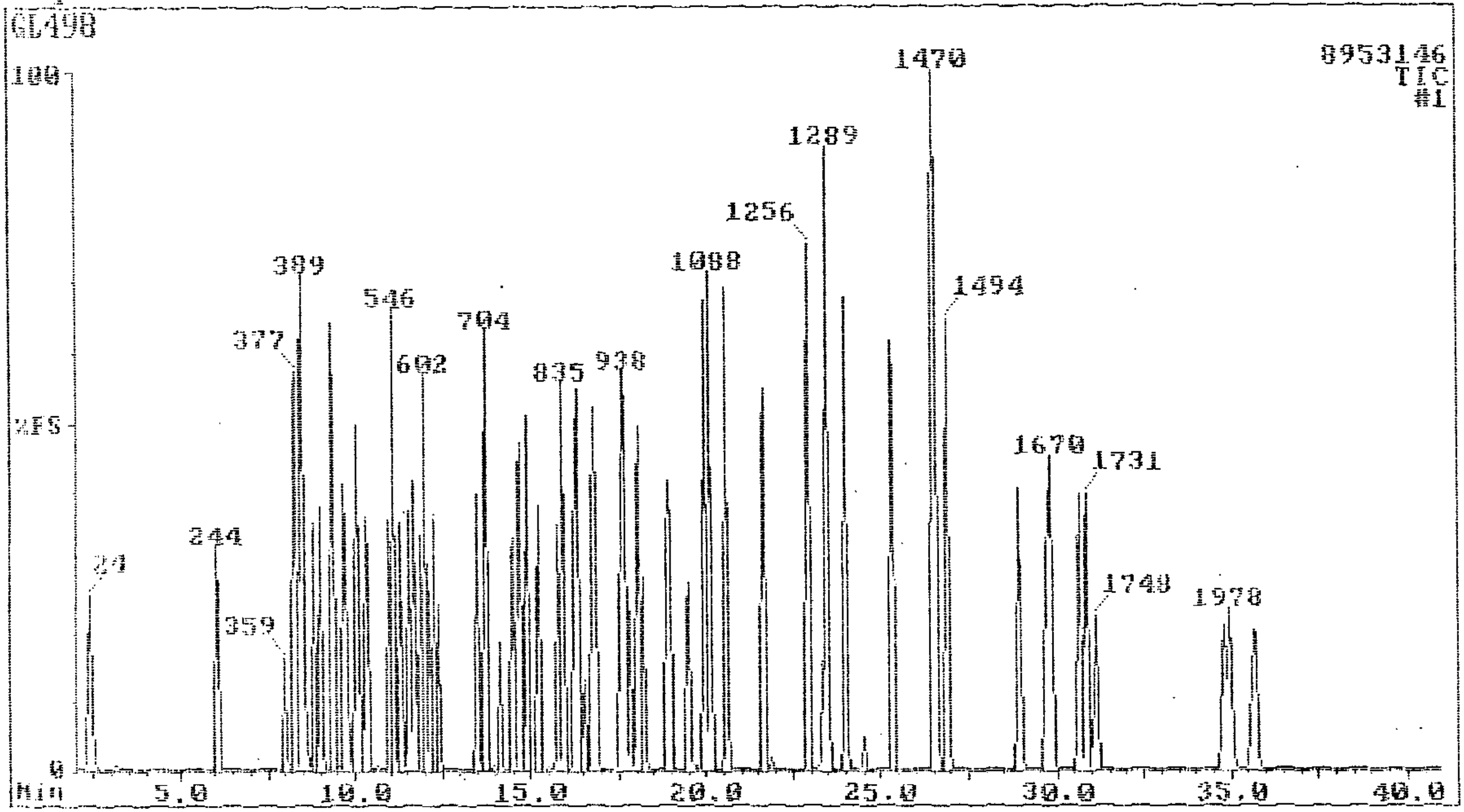
55TD120 ~ 1-5-93

```
SCAN 08 : GL494            LAB-BASE  QUAN               05-Jan-93        11:28

No. MAT FOR REV Delta        Area P.Flags  Scan     QM Name
--------------------------------------------------------------------------------
  1 100  83 100     0      312450 bb        420    152 1,4-Dichlorobenzene-d4
  2 100  86  94     0     1336500 bb        599    136 Naphthalene-d8
    100  90  97     0      703760 bb        857    164 Acenaphthene-d10
  4 100  85  96     0     1512300 bv       1076    188 Phenanthrene-d10
  5  73  32  94    -1     1559600 bb       1471    240 Chrysene-d12
  6 100  86  95     0      776940 bb       1741    264 Perylene-d12
  7 100  95  97    -1     1967600 bv        244    112 2-Fluorophenol
  8  89  54  99    -1     1814700 bb        388    132 2-Chlorophenol-d4
  9  95  65  99    -1     2378600 bv        377     99 Phenol-d5
 10 100  87  98     0     1073100 bb        440    152 1,2-Dichlorobenzene-d4
 11 100  81  99     0     2239200 bb        498     82 Nitrobenzene-d5
 12  96  55  98     0     1177200 bb        546    185 1,3,5-Trichlorobenzene-d3
 13 100  92  99     0      858880 bb        607    240 1,4-Dibromobenzene-d4
 14 100  89  98     0     2656800 bb        762    172 2-Fluorobiphenyl
 15 100  77  99     0      544160 bb        974    330 2,4,6-Tribromophenol
 16 100  86  97     0     2510600 vb       1085    188 Anthracene-d10
 17 100  86  97     0     5262000 vb       1286    212 Pyrene-d10
 18 100  85  96     1     3952700 vb       1320    244 Terphenyl-d14
 19 100  96  98     0     4445700 bb        602    128 Naphthalene
 20 100  89  92    -1     3098300 vb        704    142 2-Methylnaphthalene
 21 100  95  98     0     2351600 bb        775    162 2-Chloronaphthalene
 22 100  94  97     0     4120900 bb        835    152 Acenaphthylene
 23 100  88  90     0     2316000 bb        862    154 Acenaphthene
 24 100  95  98    -1     2786400 bb        938    166 Fluorene
 25 100  83  99     0      637220 bv       1050    266 Pentachlorophenol
 26 100  92  97     0     4475700 bv*      1080    178 Phenanthrene
 27 100  93  97     0     4558200 vv*      1088    178 Anthracene
    100  94  98    -1     5509800 bb       1256    202 Fluoranthene
    100  94  99     0     5514500 vb       1289    202 Pyrene
 30 100  88  99     0     5017300 bv       1469    228 Benzo(a)anthracene
 31 100  93  99     0     4770100 vv       1475    228 Chrysene
 32  88  68  72     0     4006500 bv       1663    252 Benzo(b)fluoranthene
 33 100  93  97    -1     4003400 vv       1669    252 Benzo(k)fluoranthene
 34 100  94  98    -1     3635900 bv       1718    252 Benzo(e)pyrene
 35 100  95  99    -2     3508900 vv       1729    252 Benzo(a)pyrene
 36 100  95  99    -1     1785900 vv       1746    252 Perylene
 37 100  96 100    -2     2875900 bv       1966    276 Indeno(1,2,3-cd)pyrene
 38 100  92  99    -2     2837300 bv       1974    278 Dibenz(a,h)anthracene
 39  87  96  99    -4     3126000 b? 1-4-93  2016    276 Benzo(g,h,i)perylene
```

1/3/93

03-Jan-93 18:00 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SSTD160 Instrument G



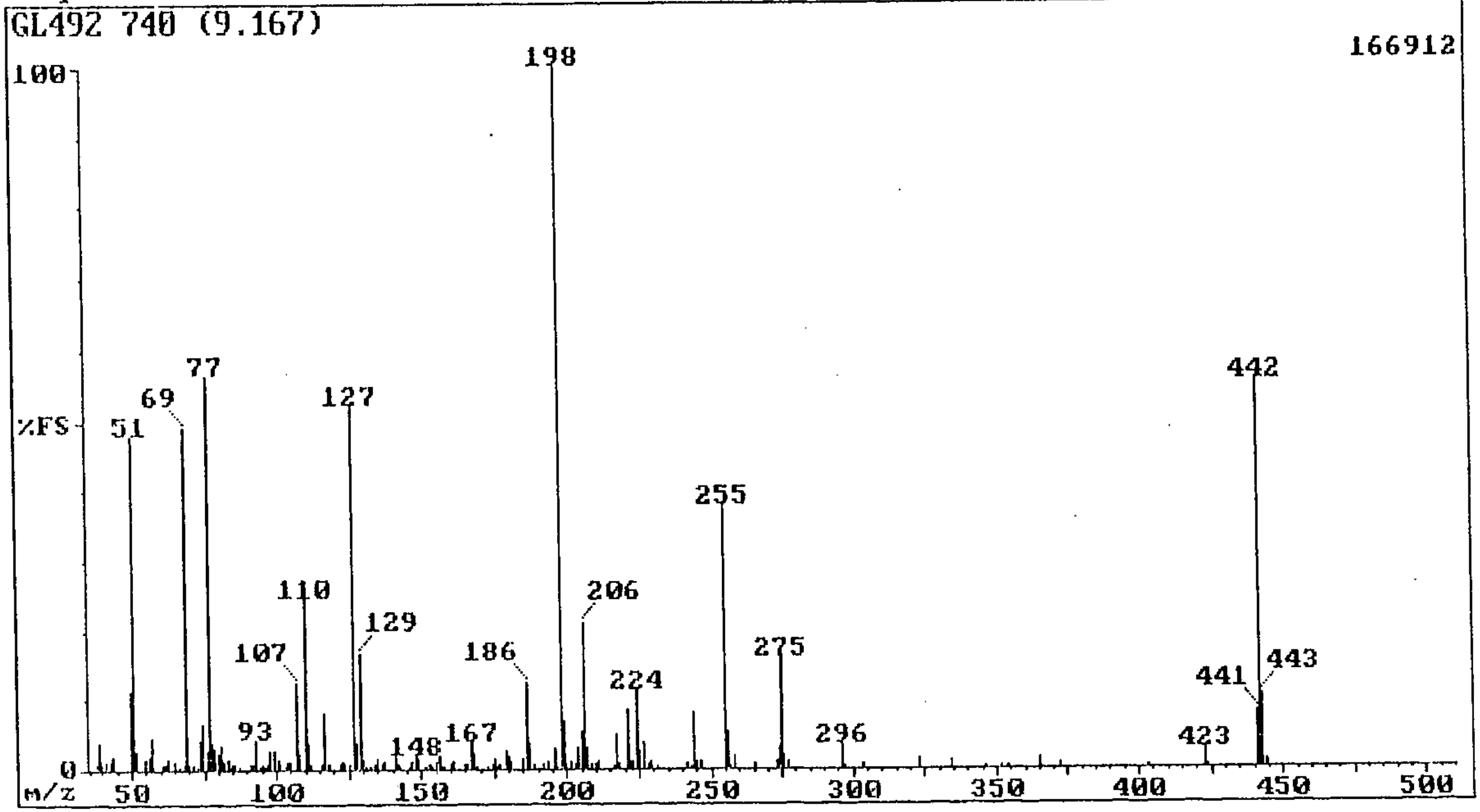
SST0160

~ 1/3/93

```
Quan 08 . 0L495                      LAB-BASE  QUAN                 03-Jan-93      21:27

 No. MAT  FOR REV Delta        Area P.Flags  Scan     Qm Name
-----------------------------------------------------------------------------------------
   1 100   80 100    -1     262360 bb         419    152 1,4-Dichlorobenzene-d4
     100   80  93     1    1093400 bb         597    136 Naphthalene-d8
     100   86  96    -1     643100 bb         856    164 Acenaphthene-d10
   4 100   82  96     1    1458000 bv        1076    188 Phenanthrene-d10
   5  67   24  92    -1    1546600 bb        1471    240 Chrysene-d12
   6 100   86  94     1     875380 bb        1742    264 Perylene-d12
   7 100   95  97     0    2240900 bb         244    112 2-Fluorophenol
   8  94   52  98     0    1995900 bb       . 388    132 2-Chlorophenol-d4
   9 100   61  99     0    2784000 bv         377     99 Phenol-d5
  10 100   84  96     1    1187700 bb         440    152 1,2-Dichlorobenzene-d4
  11 100   79  99     0    2622900 bb         498     82 Nitrobenzene-d5
  12  95   54  98     0    1440000 bb         546    185 1,3,5-Trichlorobenzene-d3
  13 100   94  99     0     937220 bb         606    240 1,4-Dibromobenzene-d4
  14 100   89  98     1    3225400 bb         762    172 2-Fluorobiphenyl
  15 100   76  98     1     632330 bb         974    330 2,4,6-Tribromophenol
  16 100   85  97    -1    3129800 vb        1084    188 Anthracene-d10
  17 100   85  96     0    6587000 vb        1286    212 Pyrene-d10
  18 100   85  96     1    4753100 vb        1320    244 Terphenyl-d14
  19 100   96  98     0    5023000 bb         602    128 Naphthalene
  20 100   89  92    -1    3509500 vb         704    142 2-Methylnaphthalene
  21 100   95  98     1    2773900 bb         775  . 162 2-Chloronaphthalene
  22 100   93  97     1    4754400 bb         835    152 Acenaphthylene
  23 100   88  90     0    2718200 bb         861    154 Acenaphthene
  24 100   94  98     0    3370400 bb       . 938    166 Fluorene
  25 100   84  99    -1     763020 bv        1049    266 Pentachlorophenol
  26 100   91  97     0   .5521400 bv*       1080    178 Phenanthrene
  27 100   92  97     0    5447000 vb*       1088    178 Anthracene
     100   94  98    -1    6663900 vv        1256    202 Fluoranthene
  2  100   93  98     0    6540600 vv        1289    202 Pyrene
  30 100   89  99    ·0    6604700 bv        1469    228 Benzo(a)anthracene
  31 100   92  98     1    6439600 vv        1476    228 Chrysene
  32  86   67  71     0    6094000 b!  ✓     1664    252 Benzo(b)fluoranthene
  33 100   92  97    -1    6066800 vv 1/4/93  1670    252 Benzo(k)fluoranthene
  34 100   93  98     0    5683500 bv        1720    252 Benzo(e)pyrene
  35 100   94  99    -1    5551300 vv        1731    252 Benzo(a)pyrene
  36 100   94  97     0    2755300 vv        1748    252 Perylene
  37 100   95  99     0    4887900 bv        1969    276 Indeno(1,2,3-cd)pyrene
  38 100   92  99     1    4723700 bb        1978    278 Dibenz(a,h)anthracene
  39 100   96  99     0    5120900 bv        2021    276 Benzo(g,h,i)perylene
```

03-Jan-93 12:23 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: DFTPP
Instrument G



DFTPP TUNE CHECK REPORT

Raw Data File: GL492
Date: 03-Jan-93
Time: 10:23

M/E	ION ABUNDANCE CRITERIA	RELATIVE ABUNDANCE	TUNE
51	30.0 - 60.0% of mass 198	47.85	PASS
68	Less than 2.0% of mass 69	0.62(1.3)1	PASS
69	Mass 69 relative abundance	49.08	PASS
70	Less then 2.0% of mass 69	0.68(1.4)1	PASS
127	40.0 - 60.0% of mass 198	52.15	PASS
197	Less than 1% of mass 198	0.42	PASS
198	Base peak, 100% relative abundance	100.00	PASS
199	5 - 9% of mass 198	7.02	PASS
275	10 - 30% of mass 198	15.80	PASS
365	Greater than 1% of mass 198	1.56	PASS
441	Present, but less then mass 443	8.24	PASS
442	Greater than 40% of mass 198	55.21	PASS
443	17 - 23% of mass 442	10.43(18.9)2	PASS

3L490 T40 (9.167)

Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int
[illegible]	38	1088	0.65	34	85	1224	0.73	67	133	684	0.41	100	181	1664	1.00	133	242	1104	0.66
2	39	6400	3.83	35	86	1312	0.79	68	134	992	0.59	101	185	2304	1.38	134	243	940	0.56
3	40	1040	0.62	36	87	784	0.47	69	135	2320	1.39	102	186	20992	12.58	135	244	13568	8.13
4	41	1952	1.17	37	91	1424	0.85	70	136	1120	0.67	103	187	6208	3.72	136	245	1920	1.15
5	43	2160	1.29	38	92	1376	0.82	71	137	1648	0.99	104	189	984	0.59	137	246	2240	1.34
6	44	3120	1.87	39	93	6976	4.18	72	141	3312	1.98	105	192	1440	0.86	138	255	62976	37.73
7	50	18688	11.20	40	94	804	0.48	73	142	1456	0.87	106	193	1728	1.04	139	256	9152	5.48
8	51	79872	47.85	41	95	1000	0.60	74	143	832	0.50	107	196	4928	2.95	140	257	808	0.48
9	52	4416	2.65	42	96	792	0.47	75	146	728	0.44	108	197	704	0.42	141	259	3152	1.89
10	55	2560	1.53	43	97	1040	0.62	76	147	1952	1.17	109	198	166912	100.00	142	265	1216	0.73
11	56	3152	1.89	44	98	4864	2.91	77	148	3472	2.08	110	199	11712	7.02	143	273	2096	1.26
12	57	7680	4.60	45	99	4736	2.84	78	149	2768	1.66	111	200	1360	0.81	144	274	4928	2.95
13	61	1056	0.63	46	101	2592	1.55	79	151	680	0.41	112	201	1840	1.10	145	275	26368	15.80
14	62	1104	0.66	47	103	904	0.54	80	153	1072	0.64	113	203	1184	0.71	146	276	3424	2.05
15	63	2832	1.70	48	104	1648	0.99	81	154	908	0.54	114	204	5056	3.03	147	277	2016	1.21
16	65	2096	1.26	49	105	1808	1.08	82	155	1872	1.12	115	205	9344	5.60	148	296	5760	3.45
17	67	864	0.52	50	107	20992	12.58	83	156	3120	1.87	116	206	35328	21.17	149	297	860	0.52
18	68	1040	0.62	51	108	3616	2.17	84	157	820	0.49	117	207	4992	2.99	150	303	976	0.58
19	69	81920	49.08	52	110	40960	24.54	85	158	736	0.44	118	208	1376	0.82	151	323	2416	1.45
20	70	1136	0.68	53	111	6528	3.91	86	160	1136	0.68	119	210	1232	0.74	152	334	1696	1.02
21	71	1296	0.78	54	112	1040	0.62	87	161	1712	1.03	120	211	2160	1.29	153	346	692	0.41
22	73	912	0.55	55	116	1200	0.72	88	165	1232	0.74	121	216	788	0.47	154	352	800	0.48
23	74	7232	4.33	56	117	13504	8.09	89	166	1040	0.62	122	217	8256	4.95	155	354	944	0.57
24	75	11328	6.79	57	118	1280	0.77	90	167	6720	4.03	123	218	1312	0.79	156	365	2608	1.56
25	76	4224	2.53	58	122	1568	0.94	91	168	4016	2.41	124	221	14208	8.51	157	372	1296	0.78
26	77	94208	56.44	59	123	2256	1.35	92	169	704	0.42	125	222	2160	1.29	158	403	736	0.44
[illegible]	78	6592	3.95	60	124	1120	0.67	93	173	820	0.49	126	223	2272	1.36	159	423	4800	2.88
28	79	4992	2.99	61	125	1168	0.70	94	174	1408	0.84	127	224	18688	11.20	160	424	916	0.55
29	80	3840	2.30	62	127	87040	52.15	95	175	2560	1.53	128	225	4672	2.80	161	441	13760	8.24
30	81	6080	3.64	63	128	6592	3.95	96	176	936	0.56	129	227	6336	3.80	162	442	92160	55.21
31	82	2000	1.20	64	129	27648	16.56	97	177	1136	0.68	130	228	1024	0.61	163	443	17408	10.43
32	83	2624	1.57	65	130	2576	1.54	98	179	4288	2.57	131	229	1664	1.00	164	444	1808	1.08
33	84	716	0.43	66	131	968	0.58	99	180	3472	2.08	132	231	876	0.52				

Triangle Laboratories of RTP, Inc.

Continuing Calibration Curve

CCAL File: GL500   Date of Analysis :01/03/93   Analyte List: PAH
ICAL File: ICALGJ03

Analyte	Flag	RF50	RFMEAN	%D
1,4-Dichlorobenzene-d4	I			
Naphthalene-d8	I			
2-Methylnaphthalene		0.679	0.729	6.9
Naphthalene		1.001	1.058	5.4
Acenaphthene-d10	I			
Acenaphthene	C	0.957	1.019	6.1
Fluorene		1.180	1.253	5.8
2-Chloronaphthalene		0.971	1.048	7.3
Acenaphthylene		1.680	1.791	6.2
Phenanthrene-d10	I			
Phenanthrene		0.921	0.950	3.1
Anthracene		0.944	0.959	1.6
Fluoranthene	C	1.115	1.152	3.2
Chrysene-d12	I			
Chrysene		0.995	1.011	1.6
Pyrene		1.167	1.176	0.8
Benzo(a)anthracene		0.978	1.048	6.7
Perylene-d12	I			
Benzo(b)fluoranthene		1.380	1.575	12.4
Benzo(k)fluoranthene		1.785	1.704	-4.8
Benzo(e)pyrene		1.423	1.497	4.9
Benzo(a)pyrene	C	1.321	1.424	7.2
Perylene		0.688	0.755	8.9
Indeno(1,2,3-cd)pyrene		0.876	1.057	17.1
Dibenz(a,h)anthracene		0.875	1.047	16.4
Benzo(g,h,i)perylene		1.068	1.193	10.5

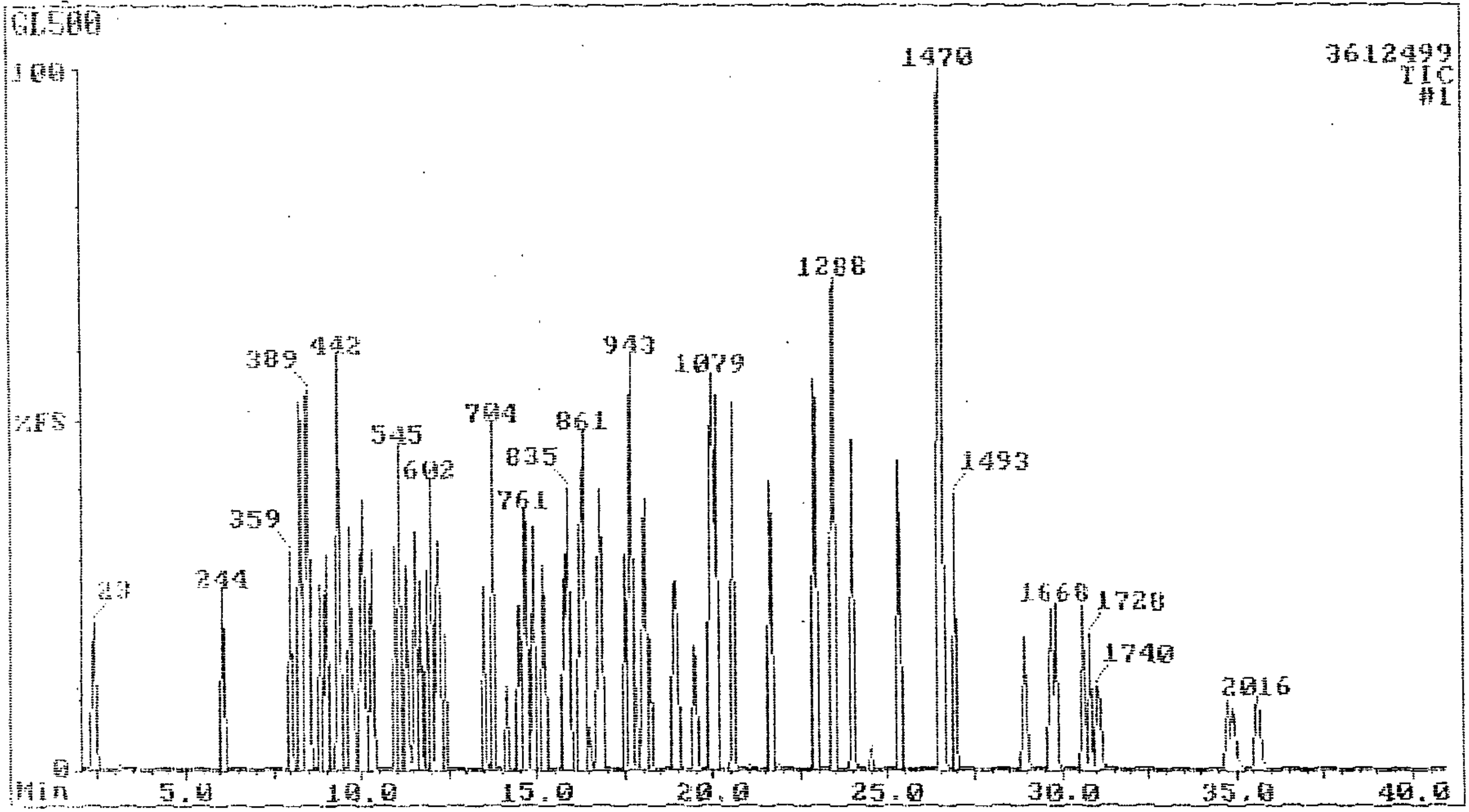
Surrogate	Flag	RF50	RFMEAN	%D
Anthracene-d10	S	0.508	0.527	3.6
Pyrene-d10	S	1.066	1.103	3.4

Approved by: ____________ Date 1/5/93

*- Fails QC Criteria for %D; << - Rf less then minimum QC RF; >>- RF greater than maximum QC RF   CCAL.EXE v2.5

~ 1/3/97

03-Jan-93 19:23 Triangle Laboratories of RTP, Inc. (919) 544-5729
Sample: SSTD050 Instrument G



55TD050

1/3/93

155

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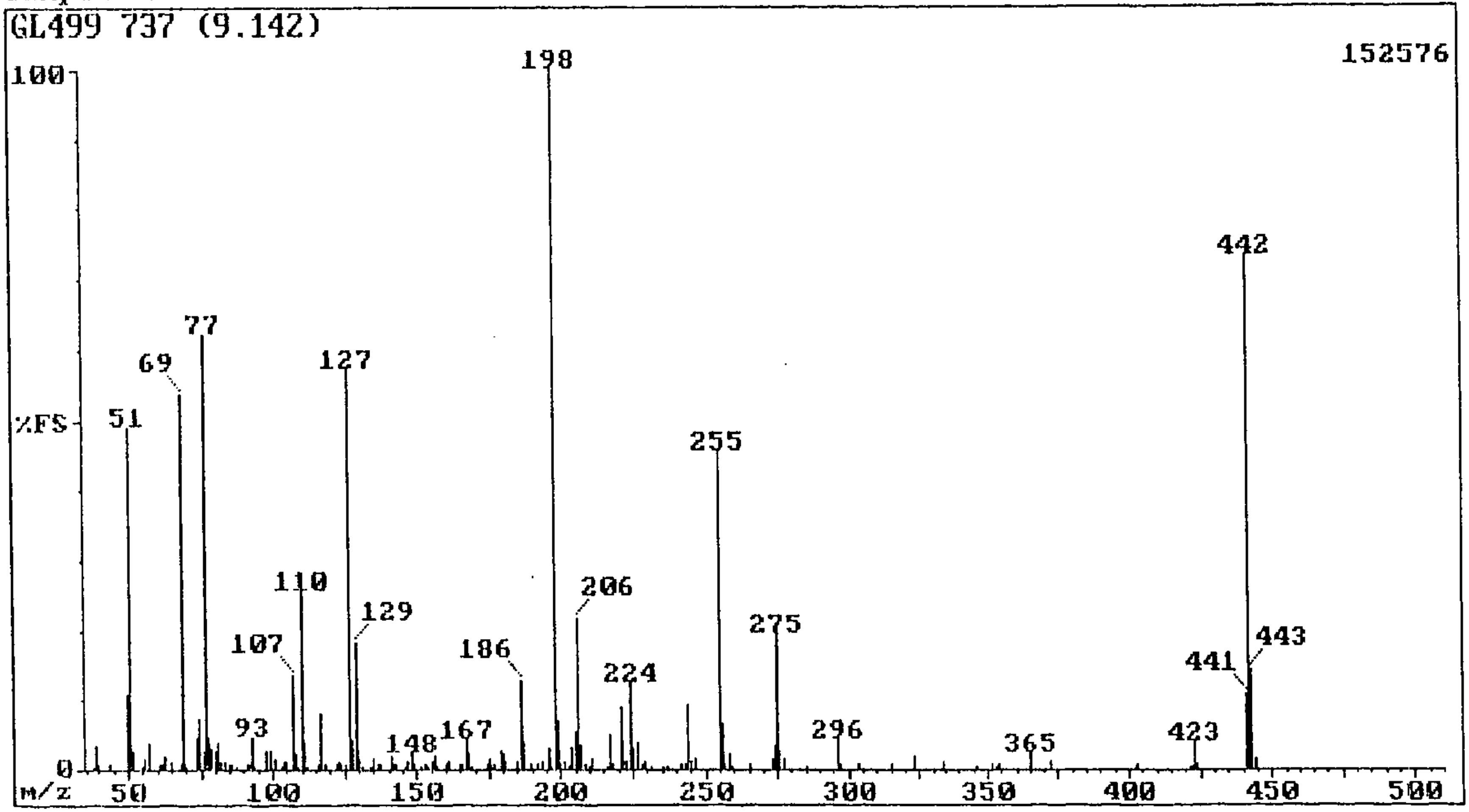
[illegible]  [illegible]              LAB-BASE  QUAN                       03-Jan-93     21:14

 No. MAT FOR REV Delta        Area P.Flags  Scan     QM Name
------------------------------------------------------------------------------------------------
  1 100  85 100    -1     305790 bb          419    152 1,4-Dichlorobenzene-d4
  2 100  86  93     1    1287900 bb          599    136 Naphthalene-d8
[illegible] 100  93  98    -1     712780 bb          856    164 Acenaphthene-d10
  4 100  91  96     1    1491100 bv         1076    188 Phenanthrene-d10
  5  78  49  96    -2    1498800 bb         1470    240 Chrysene-d12
  6 100  89  93     0     672400 bb         1740    264 Perylene-d12
  7 100  96  97     0     718060 bb          244    112 2-Fluorophenol
  8  93  61  99     0     635450 bb          388    132 2-Chlorophenol-d4
  9  94  62  99    -1     882900 bv          376     99 Phenol-d5
 10 100  95  99     1     377340 bb          440    152 1,2-Dichlorobenzene-d4
 11 100  85  99    -1     822920 bb          497     82 Nitrobenzene-d5
 12  91  58  99    -1     454030 bb          545    185 1,3,5-Trichlorobenzene-d3
 13 100  94  99     0     310990 bb          606    240 1,4-Dibromobenzene-d4
 14 100  91  98     0    1025600 bb          761    172 2-Fluorobiphenyl
 15 100  80  99     0     185340 bb          973    330 2,4,6-Tribromophenol
 16 100  84  96    -1     947080 vb         1084    188 Anthracene-d10
 17 100  88  97     0    1997200 bb         1285    212 Pyrene-d10
 18 100  88  97     1    1361400 bb         1319    244 Terphenyl-d14
 19 100  97  98     0    1610700 bb          602    128 Naphthalene
 20 100  89  91    -1    1092700 vb          704    142 2-Methylnaphthalene
 21 100  97  99     0     864960 bb          774    162 2-Chloronaphthalene
 22 100  94  97     1    1496600 bb          835    152 Acenaphthylene
 23 100  88  90     0     852700 vb          861    154 Acenaphthene
 24 100  90  98     0    1051000 bb          938    166 Fluorene
 25 100  85  99    -1     202210 bb         1049    266 Pentachlorophenol
 26 100  93  97    -1    1716600 bv*        1079    178 Phenanthrene
 27 100  94  98    -1    1759100 vb         1087    178 Anthracene
[illegible] 100  96  99    -2    2078800 bb         1255    202 Fluoranthene
 29 100  95  99     0    2185800 bb         1288    202 Pyrene
 30 100  90  99     1    1832600 bv*        1469    228 Benzo(a)anthracene
 31 100  93  99     0    1865000 vv         1474    228 Chrysene
 32  86  67  71     0    1159500 bv         1662    252 Benzo(b)fluoranthene
 33 100  94  97    -2    1500100 vb*        1667    252 Benzo(k)fluoranthene
 34 100  95  98    -1    1195800 bv         1717    252 Benzo(e)pyrene
 35 100  96  99    -2    1110400 vv         1728    252 Benzo(a)pyrene
 36 100  98  99    -1     578120 vb         1745    252 Perylene
 37 100  97 100    -1     736080 bv         1966    276 Indeno(1,2,3-cd)pyrene
 38 100  94  97    -1     735290 bv         1974    278 Dibenz(a,h)anthracene
 39  96  96  99    -3     897850 bv         2016    276 Benzo(g,h,i)perylene
```

03-Jan-93 18:54 Triangle Laboratories of RTP, Inc. (919) 544-5729

Sample: DFTPP Instrument G



[illegible] (9,142) 152576

Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int	Pk#	Mass	Abs Int	Rel Int
	38	504	0.33	34	94	716	0.47	67	147	1696	1.11	100	200	1248	0.82	133	259	648	0.42
2	39	5184	3.40	35	97	4416	2.89	68	148	3360	2.20	101	201	1520	1.00	134	265	1392	0.91
3	40	928	0.61	36	99	4288	2.81	69	149	900	0.59	102	203	748	0.49	135	273	2320	1.52
4	44	1056	0.69	37	101	2560	1.68	70	151	692	0.45	103	204	4864	3.19	136	274	5632	3.69
5	50	16640	10.91	38	103	864	0.57	71	153	968	0.63	104	205	8576	5.62	137	275	29952	19.63
6	51	74752	48.99	39	104	1584	1.04	72	154	828	0.54	105	206	33280	21.81	138	276	4080	2.67
7	52	4160	2.73	40	105	1504	0.99	73	155	1856	1.22	106	207	5056	3.31	139	277	2352	1.54
8	55	840	0.55	41	107	20992	13.76	74	156	3088	2.02	107	208	1296	0.85	140	285	688	0.45
9	56	2454	1.61	42	108	3360	2.20	75	157	712	0.47	108	210	724	0.47	141	296	6784	4.45
10	57	5696	3.73	43	109	648	0.42	76	160	904	0.59	109	211	2096	1.37	142	297	1104	0.72
11	61	956	0.63	44	110	39168	25.67	77	161	1696	1.11	110	216	680	0.45	143	303	1040	0.68
12	62	1016	0.67	45	111	5824	3.82	78	165	1168	0.77	111	217	7808	5.12	144	315	904	0.59
13	63	2752	1.80	46	112	836	0.55	79	166	964	0.63	112	218	1248	0.82	145	325	2976	1.95
14	65	1872	1.23	47	116	1200	0.79	80	167	6464	4.24	113	221	13888	9.10	146	334	1872	1.23
15	68	1088	0.71	48	117	12608	8.26	81	168	3760	2.46	114	222	1920	1.26	147	346	796	0.52
16	69	81920	53.69	49	118	1312	0.86	82	169	648	0.42	115	223	2064	1.35	148	352	1040	0.68
17	70	768	0.50	50	122	1328	0.87	83	174	1136	0.74	116	224	18944	12.42	149	353	708	0.46
18	74	7104	4.66	51	123	1984	1.30	84	175	2464	1.61	117	225	4800	3.15	150	354	1104	0.72
19	75	11456	7.51	52	124	996	0.65	85	176	836	0.55	118	227	6208	4.07	151	365	3376	2.21
20	76	4160	2.73	53	125	1004	0.66	86	177	1120	0.73	119	228	960	0.63	152	372	1696	1.11
21	77	95232	62.42	54	127	87040	57.05	87	179	3920	2.57	120	229	1712	1.12	153	402	640	0.42
22	78	7168	4.70	55	128	6464	4.24	88	180	3360	2.20	121	231	812	0.53	154	403	896	0.59
23	79	4928	3.23	56	129	27904	18.29	89	181	1616	1.06	122	235	676	0.44	155	421	772	0.51
24	80	3904	2.56	57	130	2592	1.70	90	185	2032	1.33	123	237	692	0.45	156	422	780	0.51
25	81	5696	3.73	58	131	688	0.45	91	186	19712	12.92	124	242	1088	0.71	157	423	5952	3.90
	82	1744	1.14	59	134	856	0.56	92	187	5760	3.78	125	243	956	0.63	158	424	1264	0.83
	83	1936	1.27	60	135	2336	1.53	93	189	948	0.62	126	244	14144	9.27	159	441	16384	10.74
28	85	1168	0.77	61	136	988	0.65	94	192	1392	0.91	127	245	2000	1.31	160	442	111616	73.15
29	86	1328	0.87	62	137	1472	0.96	95	193	1584	1.04	128	246	2240	1.47	161	443	21760	14.26
30	87	784	0.51	63	141	3072	2.01	96	196	4544	2.98	129	255	69632	45.64	162	444	2400	1.57
31	91	1152	0.76	64	142	1200	0.79	97	197	784	0.51	130	256	10176	6.67				
32	92	1200	0.79	65	143	900	0.59	98	198	152576	100.00	131	257	940	0.62				
33	93	7040	4.61	66	146	724	0.47	99	199	10688	7.01	132	258	3328	2.18				

DFTPP TUNE CHECK REPORT

Raw Data File: 1L499
Date: 05-Jan-93
Time: 18:54

M/E	ION ABUNDANCE CRITERIA	RELATIVE ABUNDANCE	TUNE
51	30.0 - 60.0% of mass 198	48.99	PASS
68	Less than 2.0% of mass 69	0.71(1.3)1	PASS
69	Mass 69 relative abundance	53.69	PASS
70	Less then 2.0% of mass 69	0.50(0.9)1	PASS
127	40.0 - 60.0% of mass 198	57.05	PASS
197	Less than 1% of mass 198	0.51	PASS
198	Base peak, 100% relative abundance	100.00	PASS
199	5 - 9% of mass 198	7.01	PASS
275	10 - 30% of mass 198	19.63	PASS
365	Greater than 1% of mass 198	2.21	PASS
441	Present, but less then mass 443	10.74	PASS
442	Greater than 40% of mass 198	73.15	PASS
443	17 - 23% of mass 442	14.26(19.5)2	PASS

VII. LABORATORY ANALYSIS RESULTS

C. Particulate Analysis Results

Form REC#8

SAMPLE ANALYTICAL DATA FORM

Company Name Mc ASPHALT NAPA METH. 202 DW

Sample Location MELBORNE, FL

Blank Volume (V_a) 100 ml

Date/Time wt. blank 12/17 4:00P

Date/Time wt. blank 12/21 8:30A

Relative Humidity in Lab 42 %

Density of Acetone (ρ_a) .7857 mg/ml

Gross wt. 99.1794 g

Gross wt. 99.1793 g

Ave. Gross wt. 99.1794 g

Tare wt. 99.1792 g

Weight of blank (m_{ab}) .0002 g

Acetone blank residue concentration (C_a) : (C_a) = (m_{ab}) / (V_a) (ρ_a) = (.000003 mg/g)

Acetone Blank Wt. : $W_a = C_a V_{aw} \rho_a$ = (.000003) (300) (.7857) = (.0007 g)

			Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})		ml	300	300	300
Date/Time of wt. 12/17 4:00P	Gross wt.	g	96.7948	98.5074	107.2859
Date/Time of wt. 12/21 8:30A	Gross wt.	g	96.7952	98.5079	107.2864
	Average Gross wt.	g	96.7950	98.5077	107.2862
	Tare wt.	g	96.7618	98.4438	107.1989
	Less Acetone blank wt. (W_a)	g	.0007	.0007	.0007
Weight of particulate in acetone rinse (m_a)		g	.0325	.0632	.0866

Filter Numbers		#	TS00018	TS6575	TS00025
Date/Time of wt. 12/17 4:00P	Gross wt.	g	.6881	.6600	.6753
Date/Time of wt. 12/21 8:30A	Gross wt.	g	.6876	.6603	.6750
	Average Gross wt.	g	.6879	.6602	.6752
	Tare wt.	g	.5713	.5716	.5735

Weight of particulate on filter (m_f)	g	.1166	.0886	.1017
Weight of particulate in acetone rinse (m_a)	g	.0325	.0632	.0866
Total weight of particulate (m_n)	g	.1491	.1318	.1883

NOTE: In no case should a blank residue greater than 0.01 mg/g (or 0.001% of the blank weight) be subtracted from the sample weight.

Remarks:

Signature of Analyst Thomas South

Signature of Reviewer

COMPANY NAME: MAC ASPHALT MELBORNE, FL

Methylene Chloride Extraction for EPA Method 202

Relative humidity in lab 42 %

Density of Methylene Chloride 1.3255 g/ml

			RUN 1	RUN 2	RUN 3
Methylene Chloride rinse volume		ml	330	300	300
Volume of Solution			700	600	600
Date/time of wt 12/22 10:00A	Gross wt.	g	165.4784	162.1471	167.4280
Date/time of wt 12/22 4:00P	Gross wt.	g	165.4780	162.1469	167.4278
	Avg. Gross wt.	g	165.4782	162.1470	167.4279
	Tare wt.	g	165.4339	162.1190	167.4035
Less Methylene Chloride Blank			.0001	.0001	.0001
Wt./particulate: Methylene Chloride rinse		g	.0442	.0279	.0243
Water evaporation					
Date/time of wt. 12/21 9:00A	Gross wt.	g	164.2958	164.0520	171.8910
Date/time of wt. 12/22 10:00A	Gross wt.	g	164.2955	164.0525	171.8909
	Avg. Gross wt.	g	164.2957	164.0523	171.8910
	Tare wt.	g	164.2380	164.0360	171.8230
Less H_2O blank wt.		g	.0002	.0002	.0002
Weight of particulate from water (m__)		g	.0575	.0161	.0678
Wt./particulate: Methylene Chloride rinse		g	.0442	.0279	.0243
Total weight of particulate (m_n)		g	.1017	.0440	.0921

NOTE: In no case should a blank residue 0.02 mg/g or 0.001% of the weight of Methylene Chloride used be subtracted from the sample weight.

Remarks:

Signature of Analyst: Thomas South

Signature of Reviewer:

VII. LABORATORY ANALYSIS RESULTS

D. Fuel Analysis Results

THORNTON LABORATORIES, INC.
MARINE, ANALYTICAL AND ENVIRONMENTAL SERVICES

1145 EAST CASS STREET, TAMPA, FLORIDA 33602
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24-Dec-1992
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Report For:

National Asphalt Pavement
5100 Forbes rd.
Lanham, MD. 20706-4413

Sample Identification:

Fuel oil APAC Melborne Plant Attn: Tom Brumagin
#6 /bunker C

Date Received: 11-Dec-1992

Laboratory Number: 843619

CERTIFICATE OF ANALYSIS

Method	Parameter	Result	Units
ASTM D287	API Gravity @ 60 oF	11.2	
	Specific Gravity @ 60/60 oF	0.9916	
ASTM D93	Flash Point, (PMCC)	255	oF
ASTM D240	Heating Value (BTU)	18316	BTU/lb
	Heating Value (BTU)	151254	BTU/gal
ASTM D129	Sulfur (S)	1.9	%

THORNTON LABORATORIES, INC.
Fred Hartlage, Jr. Ph.D.

VIII. EQUIPMENT CALIBRATION DATA

A. GC CALIBRATION DATA

Dec 2nd

ANALYSIS OF METHOD 18 FIELD SAMPLES

BENZENE

Date: 12-2-92 Analyst: D S Plant: MAC ASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BTEX
Number of Standards: 2 Date Prepared: ______ Prepared By: ______

GC Used: SRI Column Used: 5% SP-1200/1.75% BENTONE 34
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40 cc/min
Column Temperatures, Initial: 75 Program Rate: – Final: 75
Sample Loop Volume: 1cc Loop Temperature: 75 Inject. Port Temp.: 75
Detector Temp.: ___ Auxiliary Gases: ______

Calibration Data PRE	Standard 1	Standard 2	Standard 3
First analysis/second analysis			
Standard concentration (C_{act})	1.05	10.5	
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	1.464/1.464	1.464/1.464	/
Peak retention time range (min)	1.464	1.464	
Peak area	7.82/7.65	70.85/68.66	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	7.735	69.755	
Percent deviation from average	<5%	<5%	
Calculated concentration (C_{std})	1.05	10.5	
% deviation from actual (%D_{act})	6	0	

Linear regression equation: slope (m): 6.563 y-intercept (b): .844

Sample Analysis Data POST	Sample 1	Sample 2	Sample 3
First analysis/second analysis			
Sample identification	1.05	10.5	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	1.464/1.464	1.464/1.464	/
Peak retention time range (min)	1.464	1.466	
Peak area	7.40/7.59	71.65/67.97	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	7.50	69.81	
% deviation from average (%D_{avg})	<5%	<5%	
Calculated concentration (C_s)	1.05	10.5	

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left|\frac{A_1 - Y}{Y}\right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

ETHYL BENZENE

Date: 12-2-92 Analyst: DS Plant: MAC ASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BETX
Number of Standards: 2 Date Prepared: ______ Prepared By: ______

GC Used: SRI Column Used: 5% SP1200 / 1.75% BENTONE34
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40 CC/MIN
Column Temperatures, Initial: 75C Program Rate: — Final: 75C
Sample Loop Volume: 1cc Loop Temperature: 75C Inject. Port Temp.: 75C
Detector Temp.: ___ Auxiliary Gases: ______

Calibration Data PRE	Standard 1	Standard 2	Standard 3
First analysis/second analysis			
Standard concentration (C_{act})	1.28	9.70	
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	N/A/	N/A/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	N/A/	N/A/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	2.78/2.78	2.78/2.78	/
Peak retention time range (min)	2.78	2.78	
Peak area	9.63/10.11	82.20/85.13	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	9.89	83.67	
Percent deviation from average	<5%	<5%	
Calculated concentration (C_{std})	1.28	9.7	
% deviation from actual (%D_{act})	0	0	

Linear regression equation: slope (m): 8.762 y-intercept (b): -1.326

Sample Analysis Data POST	Sample 1	Sample 2	Sample 3
First analysis/second analysis			
Sample identification	1.28	9.70	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/34	/
Peak retention time (min)	2.78/2.78	2.78/2.78	/
Peak retention time range (min)	2.78	2.78	
Peak area	8.67/9.59	81.92/86.27	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	9.13	84.1	
% deviation from average (%D_{avg})	<5%	<5%	
Calculated concentration (C_s)	1.28	9.7	

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

TOLUENE

Date: 12-2-92 Analyst: DS Plant: MAC ASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BTEX
Number of Standards: 2 Date Prepared: ____ Prepared By: ____

GC Used: SRI Column Used: 5% SP1200 / 1.75% BENTONE 34
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40cc/min
Column Temperatures, Initial: 75C Program Rate: – Final: 75C
Sample Loop Volume: 1cc Loop Temperature: 75C Inject. Port Temp.: 75C
Detector Temp.: ____ Auxiliary Gases: ____

Calibration Data POST	Standard 1	Standard 2	Standard 3
First analysis/second analysis			
Standard concentration (C_{act})	1.18	11	
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	5.08/5.08	5.13/5.13	/
Peak retention time range (min)	5.08	5.13	
Peak area	13.37/13.62	90.63/98.51	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	13.5	94.57	
Percent deviation from average	<5%	<5%	
Calculated concentration (C_{std})	1.18	11	
% deviation from actual ($\%D_{act}$)	0	0	

Linear regression equation; slope (m): 8.254 y-intercept (b): 3.76

Sample Analysis Data PRE	Sample 1	Sample 2	Sample 3
First analysis/second analysis			
Sample identification	1.18	11	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	5.08/5.08	5.11/5.13	/
Peak retention time range (min)	5.08	5.1	
Peak area	14.41/14.34	92.45/97.23	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	14.38	94.84	
% deviation from average ($\%D_{avg}$)	<5%	<5%	
Calculated concentration (C_s)	1.18	11	

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

O XYLENE

Date: 12-2-92 Analyst: DS Plant: MACASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BTEX
Number of Standards: 2 Date Prepared: ____ Prepared By: ____

GC Used: SRI Column Used: 5% SP1200 / 1.75% BENTONE 34
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40cc/min
Column Temperatures, Initial: 75C Program Rate: – Final: 75C
Sample Loop Volume: 1cc Loop Temperature: 75C Inject. Port Temp.: 75C
Detector Temp.: ___ Auxiliary Gases: ____

Calibration Data PRE	Standard 1	Standard 2	Standard 3
First analysis/second analysis			
Standard concentration (C_{act})	1.18	10.2	
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	6.98/6.98	7.03/7.08	/
Peak retention time range (min)	6.98	7.03	
Peak area	13.52/13.16	97.94/105.54	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	13.34	101.75	
Percent deviation from average	<5%	<5%	
Calculated concentration (C_{std})	1.18	10.2	
% deviation from actual ($\%D_{act}$)	0	0	

Linear regression equation: slope (m): 9.802 y-intercept (b): 1.774

Sample Analysis Data POST	Sample 1	Sample 2	Sample 3
First analysis/second analysis			
Sample identification	1.18	10.2	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	6.98/6.98	7.03/7.08	/
Peak retention time range (min)	6.98	7.03	
Peak area	11.88/11.96	97.51/106.07	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	11.92	101.79	
% deviation from average ($\%D_{avg}$)	<5%	<5%	
Calculated concentration (C_s)	1.18	10.2	

C_{std} or $C_s = \frac{(Y - b)}{m}$ $\%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\%$ $\%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$

ANALYSIS OF METHOD 18 FIELD SAMPLES

METHANE

Date: 12-2-92 Analyst: DS Plant: MAC ASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: METHANE
Number of Standards: 3 Date Prepared: ______ Prepared By: ______

GC Used: SRI Column Used: 5% SP 1200 / 1.25% BENTONE34
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40 cc
Column Temperatures, Initial: 75C Program Rate: — Final: 75C
Sample Loop Volume: 1cc Loop Temperature: 75C Inject. Port Temp.: 75C
Detector Temp.: ___ Auxiliary Gases: ______

Calibration Data PRE First analysis/second analysis	Standard 1	Standard 2	Standard 3
Standard concentration (C_{act})	11	310	495
Flow rate through loop (ml/min)	600/600	600/600	600/600
Liquid injection volume (tubes)	NA/	NA/	NA/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	NA/
Detector attenuation	32/32	32/32	32/32
Peak retention time (min)	.433/.433	.433/.450	.433/.433
Peak retention time range (min)	.433	.433	.433
Peak area	15.56/16.05	480.34/472.32	744.77/764.84
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	15.81	476.33	754.81
Percent deviation from average	<5%	<5%	<5%
Calculated concentration (C_{std})	10.35	311.71	493.94
% deviation from actual ($\%D_{act}$)	4.11	.4	.1

Linear regression equation; slope (m): 1.528 y-intercept (b): -0.001

Sample Analysis Data POST First analysis/second analysis	Sample 1	Sample 2	Sample 3
Sample identification	11	310	495
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	600/600
Liquid injection volume (tubes)	NA/	NA/	NA/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	NA/
Detector attenuation	32/32	32/32	32/32
Peak retention time (min)	.433/.433	.433/.450	.433/.43
Peak retention time range (min)	.433	.433	.433
Peak area	15.27/15.13	480.02/472.14	742.63/761.34
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	15.20	476.08	751.99
% deviation from average ($\%D_{avg}$)	<5%	<5%	<5%
Calculated concentration (C_s)	9.948	311.55	492.10

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left|\frac{A_1 - Y}{Y}\right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

BENZENE

Date: 12-3-92 Analyst: D.S Plant: MACASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BETX
Number of Standards: 2 Date Prepared: ____ Prepared By: ____

GC Used: SRI Column Used: 5% SP 1200 / 1.75% BENTONE 34
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40 CC/MIN
Column Temperatures, Initial: 75°C Program Rate: — Final: 75°C
Sample Loop Volume: 1CC Loop Temperature: 75°C Inject. Port Temp.: 75°C
Detector Temp.: ___ Auxiliary Gases: ____

Calibration Data PRE	Standard 1	Standard 2	Standard 3
First analysis/second analysis			
Standard concentration (C_{act})	1.05	10.5	
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	1.383/1.383	1.364/1.383	/
Peak retention time range (min)	1.383	1.364	
Peak area	8.29/8.30	86.41/90.23	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	8.30	88.35	
Percent deviation from average	<5%	<5%	
Calculated concentration (C_{std})	1.05	10.5	
% deviation from actual ($\%D_{act}$)	0	0	

Linear regression equation; slope (m): 8.471 y-intercept (b): -.594

Sample Analysis Data POST	Sample 1	Sample 2	Sample 3
First analysis/second analysis			
Sample identification	1.05	10.5	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	1.383/1.383	1.364/1.383	/
Peak retention time range (min)	1.383	1.364	
Peak area	8.79/8.51	87.03/88.08	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	8.65	87.56	
% deviation from average ($\%D_{avg}$)	<5%	<5%	
Calculated concentration (C_s)	1.05	10.5	

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

ETHYL-BENZENE

Date: 12-3-93 Analyst: D.S. Plant: MACASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BETX
Number of Standards: 2 Date Prepared: ____ Prepared By: ____

GC Used: SRF Column Used: 5% SP 1200 /1.75% BENTON 34
Carrier Gas Used: N2 Carrier Gas Flow Rate: 40cc/min
Column Temperatures, Initial: 75C Program Rate: – Final: 75C
Sample Loop Volume: 1cc Loop Temperature: 75C Inject. Port Temp.: 75C
Detector Temp.: ___ Auxiliary Gases: ____

Calibration Data PRE	Standard 1	Standard 2	Standard 3
First analysis/second analysis			
Standard concentration (C_{act})	1.28	9.70	
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	2.616/2.633	2.600/2.633	/
Peak retention time range (min)	2.616	2.600	
Peak area	9.98/9.82	105.97/106.97	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	9.90	106.47	
Percent deviation from average	<5%	<5%	
Calculated concentration (C_{std})	1.28	9.70	
% deviation from actual ($\%D_{act}$)	0	0	

Linear regression equation: slope (m): 11.47 y-intercept (b): -4.78

Sample Analysis Data POST	Sample 1	Sample 2	Sample 3
First analysis/second analysis			
Sample identification	1.28	9.70	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	2.616/2.633	2.60/2.633	/
Peak retention time range (min)	2.616	2.600	
Peak area	8.79/8.51	87.03/88.08	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	8.65	87.56	
% deviation from average ($\%D_{avg}$)	<5%	<5%	
Calculated concentration (C_s)	1.28	9.70	

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

TOLUENE

Date: 12-3-93 Analyst: D.S. Plant: MARASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BETX
Number of Standards: 2 Date Prepared: ______ Prepared By: ______

GC Used: SRI Column Used: 5% SP 1200 / 1.75% BENTONE 34
Carrier Gas Used: N2 Carrier Gas Flow Rate: 40 cc/min
Column Temperatures, Initial: 75C Program Rate: — Final: 75C
Sample Loop Volume: 1cc Loop Temperature: 75C Inject. Port Temp.: 75C
Detector Temp.: ___ Auxiliary Gases: ______

Calibration Data PRE	Standard 1	Standard 2	Standard 3
First analysis/second analysis			
Standard concentration (C_{act})	1.18	110	
Flow rate through loop (ml/min)	600 / 600	600/600	/
Liquid injection volume (tubes)	NA /	NA /	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA /	NA /	/
Detector attenuation	32 / 32	32 / 32	/
Peak retention time (min)	4.783/4.864	4.800/4.85	/
Peak retention time range (min)	4.783	4.800	
Peak area	14.09 / 13.43	124.87/117.47	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	13.76	121.170	
Percent deviation from average	< 5%	< 5%	
Calculated concentration (C_{std})	1.18	11	
% deviation from actual ($\%D_{act}$)	0	0	

Linear regression equation: slope (m): 10.94 y-intercept (b): .853

Sample Analysis Data POST	Sample 1	Sample 2	Sample 3
First analysis/second analysis			
Sample identification	1.18	11	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA /	NA /	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA /	NA /	/
Detector attenuation	32 / 32	32 / 32	/
Peak retention time (min)	4.783/4.866	4.800/4.85	/
Peak retention time range (min)	4.783	4.800	
Peak area	14.11 / 13.44	126.56/118.20	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	13.78	122.38	
% deviation from average ($\%D_{avg}$)	< 5%	< 5%	
Calculated concentration (C_s)	1.18	11	

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

ORTO XYLENE

Date: 12-3-93 Analyst: DS Plant: MACASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BETX
Number of Standards: 2 Date Prepared: ______ Prepared By: ______

GC Used: SAI Column Used: 5% SP1200 / 1.75% BENTONE 34
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40cc/min
Column Temperatures, Initial: 75C Program Rate: — Final: 75C
Sample Loop Volume: 1cc Loop Temperature: 75C Inject. Port Temp.: 75C
Detector Temp.: ___ Auxiliary Gases: ______

Calibration Data PRE First analysis/second analysis	Standard 1	Standard 2	Standard 3
Standard concentration (C_{act})	1.18	10.2	
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	6.583/6.75	6.600/6.683	/
Peak retention time range (min)	6.583	6.600	
Peak area	12.94/13.30	139.53/131.25	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	13.13	135.64	
Percent deviation from average	<5%	<5%	
Calculated concentration (C_{std})	1.18	10.2	
% deviation from actual ($\%D_{act}$)	0	0	

Linear regression equation: slope (m): 13.58 y-intercept (b): -2.899

Sample Analysis Data POST First analysis/second analysis	Sample 1	Sample 2	Sample 3
Sample identification	1.18	10.2	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	6.583/6.75	6.600/6.683	/
Peak retention time range (min)	6.583	6.600	
Peak area	13.57/13.32	140.92/129.22	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	13.45	135.07	
% deviation from average ($\%D_{avg}$)	<5%	<5%	
Calculated concentration (C_s)	1.18	10.2	

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

METHANE

Date: 12-3-93 Analyst: D.S. Plant: MACASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: METHANE
Number of Standards: 3 Date Prepared: ____ Prepared By: ____

GC Used: SRI Column Used: 5% SP1200 / 1.75% BENTONE 34
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40cc/min
Column Temperatures, Initial: 75C Program Rate: – Final: 75C
Sample Loop Volume: 1cc Loop Temperature: 75C Inject. Port Temp.: 75C
Detector Temp.: ____ Auxiliary Gases: ____

Calibration Data First analysis/second analysis	Standard 1	Standard 2	Standard 3
Standard concentration (C_{act})	11	310	495
Flow rate through loop (ml/min)	600/600	600/600	600/600
Liquid injection volume (tubes)	NA/	NA/	NA/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	NA/
Detector attenuation	32/32	32/32	32/32
Peak retention time (min)	.416/.416	.416/.433	.416/.416
Peak retention time range (min)	.416	.416	.416
Peak area	18.79/18.4	609.45/587.80	842.13/807.12
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	18.40	598.63	827.13
Percent deviation from average	< 5%	< 5%	< 5%
Calculated concentration (C_{std})	-.881	341.083	475.80
% deviation from actual ($\%D_{act}$)	59.41	155.42	100.00

Linear regression equation: slope (m): 6696 y-intercept (b): 30.[illegible]94

Sample Analysis Data First analysis/second analysis	Sample 1	Sample 2	Sample 3
Sample identification	11	310	495
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	600/600
Liquid injection volume (tubes)	NA/	NA/	NA/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	NA/
Detector attenuation	32/32	32/32	32/32
Peak retention time (min)	.416/.416	.416/.433	.416/.416
Peak retention time range (min)	.416	.416	.416
Peak area	18.44/18.19	602.65 586.57	845.61/805.60
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	18.29	597.11	825.61
% deviation from average ($\%D_{avg}$)	< 5%	< 5%	< 5%
Calculated concentration (C_s)	-.831	340.95	475.88

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

BENZENE

Date: 12-4-92 Analyst: D.S. Plant: MACASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BETA
Number of Standards: 2 Date Prepared: ______ Prepared By: ______

GC Used: SRI Column Used: 5% SP1200 / 1.75% BENTONE 34
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40 cc/min
Column Temperatures, Initial: 75C Program Rate: – Final: 75C
Sample Loop Volume: 1cc Loop Temperature: 75C Inject. Port Temp.: 75C
Detector Temp.: ___ Auxiliary Gases: ______

Calibration Data PRE	Standard 1	Standard 2	Standard 3
First analysis/second analysis			
Standard concentration (C_{act})	1.05	10.5	
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	1.35/1.35	1.35/1.35	/
Peak retention time range (min)	1.35	1.35	
Peak area	8.60/8.80	86.52/86.77	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	8.7	86.65	
Percent deviation from average	<5%	<5%	
Calculated concentration (C_{std})	1.05	10.5	
% deviation from actual ($\%D_{act}$)	0	0	

Linear regression equation: slope (m): 8.25 y-intercept (b): .039

Sample Analysis Data POST	Sample 1	Sample 2	Sample 3
First analysis/second analysis			
Sample identification	1.05	10.5	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	1.35/1.35	1.35/1.35	/
Peak retention time range (min)	1.35	1.35	
Peak area	8.63/8.80	87.56/87.06	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	8.72	87.31	
% deviation from average ($\%D_{avg}$)	<5%	<5%	
Calculated concentration (C_s)	1.05	10.5	

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

ETHY BENZENE

Date: 12-4-92 Analyst: D.S. Plant: MACASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BETX
Number of Standards: 2 Date Prepared: ____ Prepared By: ____

GC Used: SRI Column Used: 5% SP1200 / 1.75% BENTONE 34
Carrier Gas Used: N2 Carrier Gas Flow Rate: 40CC/MIN
Column Temperatures, Initial: 75C Program Rate: – Final: 75C
Sample Loop Volume: 1CC Loop Temperature: 75C Inject. Port Temp.: 75C
Detector Temp.: ___ Auxiliary Gases: ____

Calibration Data PRE First analysis/second analysis	Standard 1	Standard 2	Standard 3
Standard concentration (C_{act})	1.28	9.70	
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	2.544/2.550	2.544/2.544	/
Peak retention time range (min)	2.550	2.544	
Peak area	9.87/9.72	104.49/101.05	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	9.80	102.75	
Percent deviation from average	<5%	<5%	
Calculated concentration (C_{std})	1.28	9.70	
% deviation from actual ($\%D_{act}$)	0	0	

Linear regression equation: slope (m): 11.04 y-intercept (b): -4.33

Sample Analysis Data POST First analysis/second analysis	Sample 1	Sample 2	Sample 3
Sample identification	1.28	9.70	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	2.544/2.550	2.544/2.544	/
Peak retention time range (min)	2.550	2.544	
Peak area	10.49/10.71	105.22/103.18	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	10.60	104.20	
% deviation from average ($\%D_{avg}$)	<5%	<5%	
Calculated concentration (C_s)	1.28	9.70	

C_{std} or $C_s = \dfrac{(Y - b)}{m}$ $\%D_{avg} = \left| \dfrac{A_1 - Y}{Y} \right| \times 100\%$ $\%D_{act} = \dfrac{C_{std} - C_{act}}{Y} \times 100\%$

ANALYSIS OF METHOD 18 FIELD SAMPLES

TOLUENE

Date: 12-4-93 Analyst: DS Plant: MACASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BETX
Number of Standards: 2 Date Prepared: ____ Prepared By: ____

GC Used: SRI Column Used: 5% SP 1200/1.75% BENTONE 34
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40 cc/min
Column Temperatures, Initial: 25C Program Rate: – Final: 25C
Sample Loop Volume: 1cc Loop Temperature: 25C Inject. Port Temp.: 25C
Detector Temp.: ___ Auxiliary Gases: ____

Calibration Data First analysis/second analysis	Standard 1	Standard 2	Standard 3
Standard concentration (C_{act})	1.18	11	
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	4.66/4.633	4.66/4.683	/
Peak retention time range (min)	4.633	4.66	
Peak area	13.74/14.18	103.28/107.58	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	13.96	105.43	
Percent deviation from average	< 5%	< 5%	
Calculated concentration (C_{std})	1.18	11	
% deviation from actual (%D_{act})	0	0	

Linear regression equation: slope (m): 9.32 y-intercept (b): 2.97

Sample Analysis Data First analysis/second analysis	Sample 1	Sample 2	Sample 3
Sample identification	1.18	11	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	4.66/4.63	4.66/4.68	/
Peak retention time range (min)	4.63	4.66	
Peak area	14.48/14.88	104.69/109.35	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	14.68	107.02	
% deviation from average (%D_{avg})	< 5%	< 5%	
Calculated concentration (C_s)	1.18	11	

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

ORTO-XYLENE

Date: 12-4-93 Analyst: O.S. Plant: MACASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: BETA
Number of Standards: 2 Date Prepared: ______ Prepared By: ______

GC Used: SRI Column Used: 5% SP1200/1.75%
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40cc/min
Column Temperatures, Initial: 75C Program Rate: – Final: 75C
Sample Loop Volume: 1cc Loop Temperature: 75C Inject. Port Temp.: 75C
Detector Temp.: ___ Auxiliary Gases: ______

Calibration Data First analysis/second analysis	Standard 1	Standard 2	Standard 3
Standard concentration (C_{act})	1.18	10.2	
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	6.4/6.4	6.416/6.466	/
Peak retention time range (min)	6.4	6.416	
Peak area	13.59/13.75	105.71/113.02	/
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	13.67	109.37	
Percent deviation from average	<5%	<5%	
Calculated concentration (C_{std})	1.18	10.2	
% deviation from actual ($\%D_{act}$)	0	0	

Linear regression equation: slope (m): 10.61 y-intercept (b): 1.150

Sample Analysis Data First analysis/second analysis	Sample 1	Sample 2	Sample 3
Sample identification	1.18	10.2	
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	/
Liquid injection volume (tubes)	NA/	NA/	/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	/
Detector attenuation	32/32	32/32	/
Peak retention time (min)	6.4/6.4	6.416/6.466	/
Peak retention time range (min)	6.4	6.416	
Peak area	14.63/13.75	107.72/115.11	/
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	14.19	111.42	
% deviation from average ($\%D_{avg}$)	<5%	<5%	
Calculated concentration (C_s)	1.18	10.2	

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

ANALYSIS OF METHOD 18 FIELD SAMPLES

METHANE

Date: 12-4-92 Analyst: O.S. Plant: MAC ASPHALT
Location: MELBOURNE FL Sample Type: GAS
Type of Calibration Standard: CYLINDER Target Compound: METHANE
Number of Standards: 3 Date Prepared: ______ Prepared By: ______

GC Used: SRI Column Used: 5% SP1200/1.75% BENTONE 34
Carrier Gas Used: N_2 Carrier Gas Flow Rate: 40 cc/min
Column Temperatures, Initial: 25C Program Rate: — Final: 25C
Sample Loop Volume: 1cc Loop Temperature: 25C Inject. Port Temp.: 25C
Detector Temp.: ___ Auxiliary Gases: ______

Calibration Data First analysis/second analysis	Standard 1	Standard 2	Standard 3
Standard concentration (C_{act})	11	310	495
Flow rate through loop (ml/min)	600/600	600/600	600/600
Liquid injection volume (tubes)	NA/	NA/	NA/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	NA/
Detector attenuation	32/32	32/32	32/32
Peak retention time (min)	.400/.416	.400/.416	.441/.400
Peak retention time range (min)	.400	.400	.400
Peak area	18.62/19.27	509.25/508.58	888.54/843.48
Peak area x attenuation factor	/	/	/
Average peak area value (Y)	18.95	508.92	866.01
Percent deviation from average	<5%	<5%	<5%
Calculated concentration (C_{std})	15.79	297.46	502.75
% deviation from actual (%D_{act})	25.3%	2.5%	.9%

Linear regression equation; slope (m): 1.74 y-intercept (b): -8.52

Sample Analysis Data First analysis/second analysis	Sample 1	Sample 2	Sample 3
Sample identification	11	310	495
Interface dilution factor			
Flow rate through loop (ml/min)	600/600	600/600	600/600
Liquid injection volume (tubes)	NA/	NA/	NA/
Injection time (24-hr clock)	/	/	/
Chart speed (cm/min)	NA/	NA/	NA/
Detector attenuation	32/32	32/32	32/32
Peak retention time (min)	.400/.416	.400/.416	.416/.400
Peak retention time range (min)	.400	.400	.400
Peak area	18.66/18.61	509.09/506.63	831.77/882.52
Peak area x atten. factor (A_1/A_2)	/	/	/
Average peak area value (Y)	18.64	507.84	857.15
% deviation from average (%D_{avg})	<5%	<5%	<5%
Calculated concentration (C_s)	15.61	294.85	492.65

$$C_{std} \text{ or } C_s = \frac{(Y - b)}{m} \qquad \%D_{avg} = \left| \frac{A_1 - Y}{Y} \right| \times 100\% \qquad \%D_{act} = \frac{C_{std} - C_{act}}{Y} \times 100\%$$

VIII. EQUIPMENT CALIBRATION DATA

B. CEMS CALIBRATION DATA

INSTRUMENTAL ANALYSIS CALIBRATION DATA

DILUENT O_2 AND CO_2 MONITORS

Plant NAPA- Mac Asphalt Location Cocoa Beach, FL

Date 12-2-92 Operator TM

Initial Calibration (Accuracy: ± 2% Span)

O_2			CO_2		
Gas Type	Actual Concentration	Analyzer Response	Gas Type	Actual Concentration	Analyzer Response
O_2-Zero	0.0	0.0	CO_2-Zero	0.0	0.0
O_2-High	20.9	21.1	CO_2-High	17.1	17.3
O_2-Mid	10.0	10.0	CO_2-Mid	10.0	10.0

System Bias Reponse: Analyzer Response-Initial Bias = ± 5% Span
Final Bias - Initial Bias = ± 3% Span

Run # 1 Time: 14:16 - 14:16

Gas Type	Initial Bias Response		Final Bias Response		Drift
Zero	0.0	0.0	0.0	0.1	
CO_2/O_2	10.0	10.0	10.0	10.0	

12-3-92 Run # 2 Time: 10:25 - 12:22

Gas Type	Initial Bias Response		Final Bias Response		Drift
Zero	0.1	0.1	-0.2	-0.3	
CO_2/O_2	10.1	10.1	9.3	9.9	

12-3-92 Run # 3 Time: 12:55 → 13:22 + 14:59 → 16:40

Gas Type	Initial Bias Response		Final Bias Response		Drift
Zero	0.1	0.1	-0.5	-0.5	
CO_2/O_2	10.0	10.1	9.5	9.7	

12-4-92 Run # 4 Time: 8:26 → 9:20 + 10:41 → 11:50

Gas Type	Initial Bias Response		Final Bias Response		Drift
Zero	0.1	0.1	0.3	-0.3	
CO_2/O_2	10.0	10.0	10.0	9.7	

INSTRUMENTAL ANALYSIS CALIBRATION DATA

DILUENT O_2 AND CO_2 MONITORS

Plant NAPA - MacAsphalt

Location Cocoa Beach, FL

Date 12-4-92

Operator TM

Initial Calibration (Accuracy: ± 2% Span)

O_2			CO_2		
Gas Type	Actual Concentration	Analyzer Response	Gas Type	Actual Concentration	Analyzer Response
O_2-Zero			CO_2-Zero		
O_2-High			CO_2-High		
O_2-Mid			CO_2-Mid		

System Bias Reponse: Analyzer Response-Initial Bias = ± 5% Span
Final Bias - Initial Bias = ± 3% Span

Run # 5 Time: 12:18 - 14:02

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	0.0 0.0	0.2 -0.1	
CO_2/O_2	10.0 10.0	9.7 9.9	

Run # 6 Time: 14:46-16:02

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	0.0 0.0	0.1 0.2	
CO_2/O_2	10.0 10.0	10.1 10.2	

Run # Time:

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero			
CO_2/O_2			

Run # Time:

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero			
CO_2/O_2			

INSTRUMENTAL ANALYSIS CALIBRATION DATA

TOTAL HYDROCARBONS

PLANT NAPA - MacAsphalt LOCATION Cocoa Beach, FL
DATE 12-2-92 OPERATOR TM
H C RANGE 0-1000 ppm Methane RESPONSE TIME

INITIAL CALIBRATION: (Accuracy ±5% of calibration gas value)

Gas Type	Actual Concentration	Analyzer	Gas Type	Actual Concentration	Analyzer
HC - Zero	0	0.4	HC - Mid	~~5~~495	493
HC - High	999	996	HC - Low	310	309.8

ZERO & SPAN DRIFT: (Accuracy ±3% of span)

Run # 1	Time: 14:16-16:16	
Gas Type	Initial Response	Final Response
HC - Zero	0.4	0.4
HC - 310	309.8	309.1

12-3-92

Run # 2	Time: 10:25-12:22	
Gas Type	Initial Response	Final Response
HC - Zero	-0.1	3.0
HC - 310	307.9	309.9

12-3-92

Run # 3	Time: 12:55→13:22 + 14:59→16:40	
Gas Type	Initial Response	Final Response
HC - Zero	0.4	0.7
HC - 310	307.1	312.8

12:4-92

Run # 4	Time: 8:26→9:20→10:41→11:5	
Gas Type	Initial Response	Final Response
HC- Zero	0.4	6.5
HC - 310	308.5	302.4

12-4-92

Run # 5	Time: 12:18-14:02	
Gas Type	Initial Response	Final Response
HC- Zero	1.0	0.3
HC - 310	308.3	306.9

Run # 6	Time: 14:46-16:02	
Gas Type	Initial Response	Final Response
HC- Zero	0.3	-1.1
HC -	306.9	300.6

INSTRUMENTAL ANALYSIS CALIBRATION DATA

CARBON MONOXIDE

Plant NAPA - Mac Asphalt

Location Cocoa Beach, FL

Date 12-2-92

Operator TM

CO Range 0-1000 ppm

Initial Calibration: (Accuracy: ± 5% Span)

Gas Type	Actual Concentration	Anayzer Response
CO-Zero	0	-0.1
CO-High	904	914
CO-Mid	536	528
CO-Low	290	295

Zero & Span Drift: (Accuracy ± 5% Span)

End Run # 1 Time: 14:16-15:16

Gas Type	Initial Response	Final Response	Drift
CO-Zero	-0.1	-3.1	
CO-904	914	907	

12-3-92 End Run # 2 Time: 10:25-12:22

Gas Type	Initial Response	Final Response	Drift
CO-Zero	0.3	-7.4	
CO-290	293	272	

12-3-92 End Run # 3 Time: 12:55 → 13:22 + 14:59 → 16:40

Gas Type	Initial Response	Final Response	Drift
CO-Zero	0.3	-5.6	
CO-290	291	291.6	

12-4-92 End Run # 4 Time: 8:26 → 9:20 + 10:41 → 11:50

Gas Type	Initial Response	Final Response	Drift
CO-Zero	0.9	-5.1	
CO-290	290	294.7	

INSTRUMENTAL ANALYSIS CALIBRATION DATA

CARBON MONOXIDE

Plant NAPA - MacAsphalt

Location Cocoa Beach, FL

Date 12-4-92

Operator TM

CO Range 0-1000 ppm

Initial Calibration: (Accuracy: ± 5% Span)

Gas Type	Actual Concentration	Anayzer Response
CO-Zero	0	
CO-High		
CO-Mid		
CO-Low		

Zero & Span Drift: (Accuracy ± 5% Span)

End Run #5 Time: 12:18 - 14:02

Gas Type	Initial Response	Final Response	Drift
CO-Zero	0.8	-1.1	
CO-290	294.7	292.7	

End Run #6 Time: 14:46 - 16:02

Gas Type	Initial Response	Final Response	Drift
CO-Zero	1.0	-1.1	
CO-	294.0	290.1	

End Run # Time:

Gas Type	Initial Response	Final Response	Drift
CO-Zero			
CO-			

End Run # Time:

Gas Type	Initial Response	Final Response	Drift
CO-Zero			
CO-			

INSTRUMENTAL ANALYSIS CALIBRATION DATA

NO_x MONITOR

Plant NAPA- Mac Asphalt

Location Cocoa Beach, FL

Date 12-2-92

Operator TM

Initial Calibration (Accuracy: ± 2% Span)

Gas Type	Actual Concentration	Analyzer Response
NO_x-Zero	0.0	0.1
NO_x-High	200	204
NO_x-Mid	143	144.8

System Bias Reponse: Analyzer Response-Initial Bias = ± 5% Span
Final Bias - Initial Bias = ± 3% Span

Run # 1 Time: 14:16-15:16

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	0.1	2.4	
NO_x	144.8	147.0	

12-3-92 Run # 2 Time: 10:25-12:22

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	0.8	3.5	
NO_x	143.9	148.1	

12-3-92 Run # 3 Time: 12:55 → 13:22 + 14:59 → 16:46

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	0.3	-1.0	
NO_x	144.7	139.0	

12-4-92 Run # 4 Time: 8:26 → 9:20 + 10:41 → 11:50

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	0.9	14.1	
NO_x	142.8	172.3	

INSTRUMENTAL ANALYSIS CALIBRATION DATA

NO_x MONITOR

Plant NAPA - Mac Asphalt

Location Cocoa Beach, FL

Date 12-4-92

Operator TM

Initial Calibration (Accuracy: ± 2% Span)

Gas Type	Actual Concentration	Analyzer Response
NO_x-Zero		
NO_x-High		
NO_x-Mid		

System Bias Reponse: Analyzer Response-Initial Bias = ± 5% Span
Final Bias - Initial Bias = ± 3% Span

Run # 5 Time: 12:18-14:02

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	1.0	15.1	
NO_x	141.9	165.3	

Run # 6 Time: 14:46-16:02

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	0.2	6.0	
NO_x	144.7	139.8	

Run # Time:

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero			
NO_x			

Run # Time:

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero			
NO_x			

INSTRUMENTAL ANALYSIS CALIBRATION DATA

SO_2 MONITORS

Plant NAPA- Mac Asphalt

Location Cocoa Beach, FL

Date 12-2-92

Operator TM

Initial Calibration (Accuracy: ± 2% Span)

Gas Type	Actual Concentration	Analyzer Response
SO_2-Zero	0.0	2.0
SO_2-High	828	836
SO_2-Mid	555	556

System Bias Reponse: Analyzer Response-Initial Bias = ± 5% Span
Final Bias - Initial Bias = ± 3% Span

Run # 1 Time: 14:16 - 15:16

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	2.0	3.0	
SO_2	556	555	

12-3-92 Run # 2 Time: 10:25-12:22

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	3.0	5.0	
SO_2	555	561	

12-3-92 Run # 3 Time: 12:55→13:22 + 14:59→16:40

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	3.0	7.0	
SO_2	548	559	

12-4-92 Run # 4 Time: 8:26→9:20 + 10:41→11:50

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	2.0	4.0	
SO_2	549	558	

INSTRUMENTAL ANALYSIS CALIBRATION DATA

SO_2 MONITORS

Plant NAPA-Mac Asphalt
Location Cocoa Beach, FL
Date 12-4-92
Operator TM

Initial Calibration (Accuracy: ± 2% Span)

Gas Type	Actual Concentration	Analyzer Response
SO_2-Zero		
SO_2-High		
SO_2-Mid		

System Bias Reponse: Analyzer Response-Initial Bias = ± 5% Span
Final Bias - Initial Bias = ± 3% Span

Run # 5 Time: 12:18 - 14:02

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	3.0	3.0	
SO_2	558	562	

Run # 6 Time: 14:46 - 16:02

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero	3.0	4.0	
SO_2	562	559	

Run # Time:

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero			
SO_2			

Run # Time:

Gas Type	Initial Bias Response	Final Bias Response	Drift
Zero			
SO_2			

VIII. EQUIPMENT CALIBRATION DATA

C. PARTICULATE CALIBRATION DATA

4A

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? ✓ yes ____ no

Pitot tube openings damaged? ____ yes (explain below) ✓ no

α_1 = 1.3 ° (<10°), α_2 = 0.8 ° (<10°), β_1 = 0.5 ° (<5°),
β_2 = 1.8 ° (<5°)

γ = 2.9 °, θ = 1.7 °, A = .97 cm (in.)

z = A sin γ = .05 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = .03 cm (in.); <.08 cm (<1/32 in.)

P_A .48 cm (in.) P_b .49 cm (in.)

D_t = .38 cm (in.)

Comments: ____

Calibration required? ____ yes ✓ no

4B

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? ✓ yes ______ no

Pitot tube openings damaged? ______ yes (explain below) ______ no

α_1 = 2.3 ° (<10°), α_2 = .5 ° (<10°), β_1 = 1.8 ° (<5°),
β_2 = 1.8 ° (<5°)

γ = 3.2 °, θ = 1.0 °, A = .98 cm (in.)

$z = A \sin \gamma$ = .05 cm (in.); <0.32 cm (<1/8 in.),
$w = A \sin \theta$ = .02 cm (in.); <.08 cm (<1/32 in.)

P_A .49 cm (in.) P_b .49 cm (in.)

D_t = .38 cm (in.)

Comments: ______

Calibration required? ______ yes ✓ no

RAMCON ENVIRONMENTAL CORPORATION

Lear Siegler Stack Sampler

Nozzle Diameter Calibration

Date ____________ Signature ____________

Nozzle No.	Average Diameter	Nozzle No.	Average Diameter
1		7	
2		8	
3		9	
4		10	
5		11	
6		12	

Pitot Tube Calibration (S Type)

Pitot Tube Identification No. 6-4 Date 6-9-91

Calibrated by: S Buck

"A" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp (s) cm H_2O (in. H_2O)	$C_p(s)$	DEVIATION $C_{p(s)}-\bar{C}_p(A)$
1	2.2	3.2	.829	.001
2	1.8	2.6	.832	.002
3	1.1	1.6	.829	.001
		$\bar{C}_p$ (SIDE A)	.830	

"B" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	$\Delta p(s)$ cm H_2O in. H_2O)	$C_p(s)$	DEVIATION $C_{p(s)}-\bar{C}_p(B)$
1	2.2	3.2	.829	.001
2	1.8	2.6	.832	.002
3	1.1	1.6	.829	.001
		$\bar{C}_p$ (SIDE B)	.830	

$$\text{AVERAGE DEVIATION} = \sigma(\text{A OR B}) = \frac{\sum_{1}^{3} |C_p(s) - \bar{C}_p(\text{A OR B})|}{3} \leftarrow \text{MUST BE} \leq 0.01$$

$$|\bar{C}_p(\text{SIDE A}) - \bar{C}_p(\text{SIDE B})| \leftarrow \text{MUST BE} \leq 0.01$$

$$C_{p(s)} = C_{p(std)}\sqrt{\frac{\Delta p\ std}{\Delta p_s}}$$

Form No. EED-17-1

RAMCON

Lear Siegler Stack Sampler

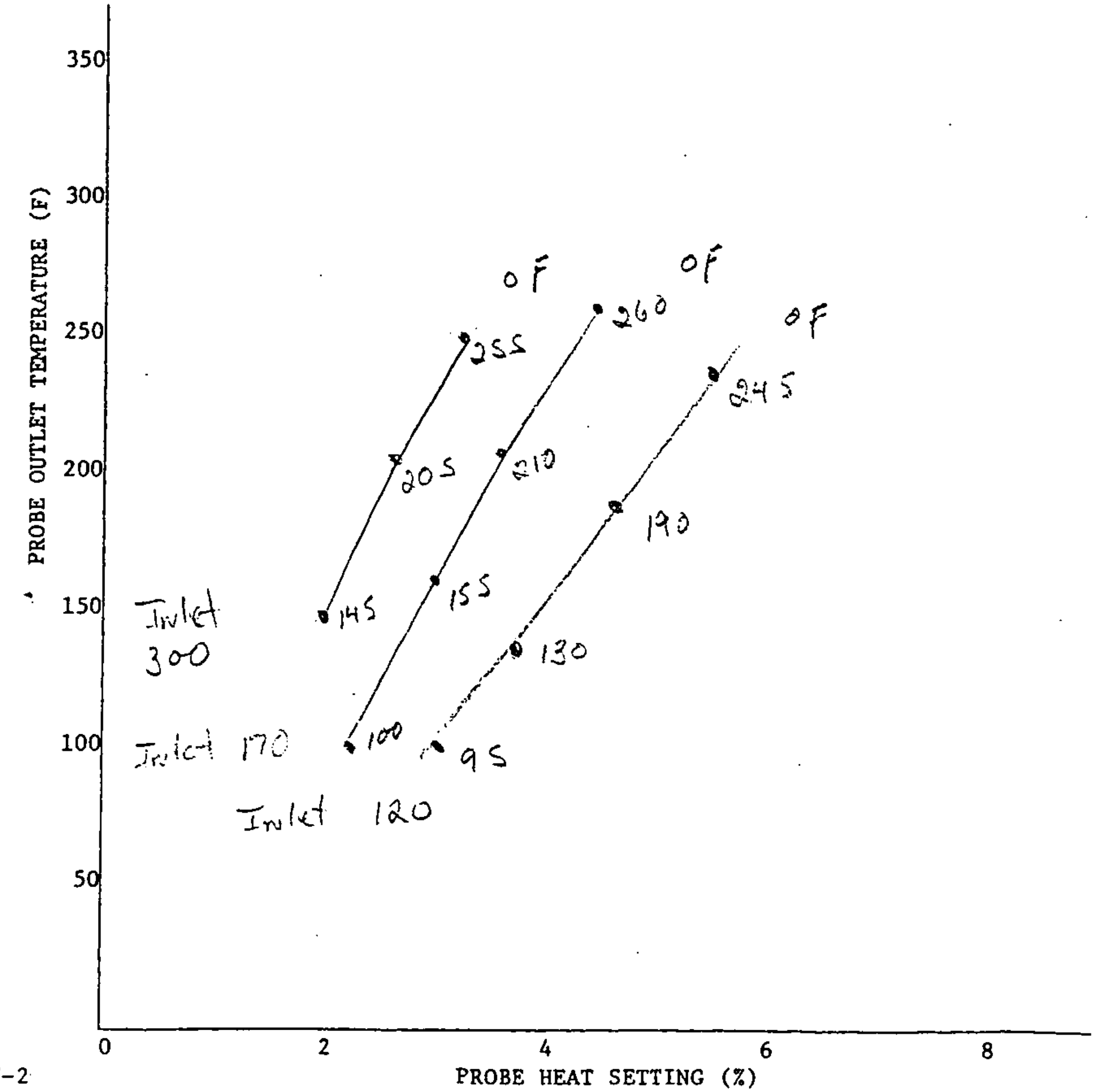
Heating Probe Calibration

Probe No. 64 Probe Length 6'

Date of Calibration 5-7-90 Signature Sam Turner

Name of Company to be tested

Note: 3 ft. probe - 5 min. warmup
6 ft. probe - 15 min. warmup
10 ft. probe - 30 min. warmup
Calibration flow rate = .75 CFM



Form No. EED-17-2

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-5-90 Thermocouple number 64

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator S Tume Reference: mercury-in-glass ✓

other

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
A	Ice Bath	32	32	0
B	Boiling water	212	211	.005
C	Boiling oil	381	378	.008
D	Ambient			

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ________ Date 1/2/93 Meter box number Anderson 90-800 Plant ________

Barometric pressure, P_b = 30.36 in. Hg Dry gas meter number 26940 Pretest Y ________

Orifice manometer setting, (ΔH), in. H_2O	Gas volume		Temperature				Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i
	Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter (t_w), °F	Dry gas meter						$\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
				Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average (t_d),[a] °F				
1.0	10	342.143 352.883	64°	104 118	85 88	98.75	19.2	6"	.99	1.89
2.0	10	330.616 341.298	640	105 120	79 85	97.25	13.73	5"	.99	1.94
3.0	10	317.841 328.402	64°	96 117	69 75	89.25	11.13	7"	.985	1.94
									Y =	

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ± 0.05Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ______ Date 11/28 Meter box number Anderson Plant Napa

Barometric pressure, P_b = 30.18 in. Hg Dry gas meter number ______ Pretest Y ______

Orifice manometer setting, (ΔH), in. H_2O	Gas volume		Temperature				Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i 517 553
	Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter (t_w), °F	Dry gas meter						$\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$ 583
				Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average[a] (t_d), °F				
10.917 3 0	10	940.565 951.782	63°	92° 110	85° 85	93	11.1	5	.979	1.920
5.324 .50	~~10~~ 5	951.663 956.582	63	85 94	84 82	87	13.1	2	.981	1.803
1.5	10	957.345 968.035	63	93 100	82 86	90.3	15.3	3	.971	1.833
									Y =	1.852

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm 0.05Y$.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

Quality Assurance Handbook M4-2.4A

Form #REC-01

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ________ Date 12-11-92 Meter box number C-185 Plant ________

Barometric pressure, P_b = 30.10 in. Hg Dry gas meter number 638809 Pretest Y ________

5.105
10.225

Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average (t_d),[a] °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i 543 541 511.5 $\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$ 526
.50	~~10~~ 5	862.314 867.419	66	90 93	70 71	81	11.98	1	1.006	1.546
1	10	868.162 878.387	66	93 96	72 72	83	16.9	3	1.007	1.532
3	10	852.036 862.022	66	90 98	68 90	81.5	9.65	6	1.023	1.503
									Y = 1.012	1.527

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm 0.05Y$.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

Form #REC-01

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ______ Date 11-23-92 Meter box number C-185 Plant ______

Barometric pressure, P_b = 29.90 in. Hg Dry gas meter number 658805 Pretest Y ______

	Orifice manometer setting, (ΔH), in. H_2O	Gas volume		Temperature				Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i 539
		Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter (t_w), °F	Dry gas meter						541 $\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$ 525
					Inlet (t_{d_i}), °F	Outlet (t_{d_o}), °F	Average[a] (t_d), °F				
5.159	.50	~~10~~ 5	514.442 519.601	65	92 92	70 70	81	12.0	2	.997	1.555
10.363	1.0	10	519.932 530.295	65	86 88	72 70	79	16.75	4	.988	1.515
10.27	3.0	10	530.728 540.998	65	88 98	70 70	81	9.7	7	.996	1.524
										Y = .994	1.531

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm 0.05Y$.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

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                              Macasphalt - NAPA

                            RUN # 1 DATA LISTING

NAME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS. TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME              HC      SO2       CO2       CO        O2       NOX
CHAN UNITS            PPM      PPM        %        PPM        %       PPM
FULL SCALE         1000.0   1000.0      20.0     500.0     25.0     250.0
ZERO OFFSET           0.0      0.0       0.0       0.0      0.0       0.0
START / CHANNEL        01       02        03        04       05        06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/02/92   14:18    54.0    151.5       5.2      52.0     14.2     141.4
12/02/92   14:19    69.0    158.5       5.3      52.0     14.2     137.5
12/02/92   14:20    77.5    150.0       5.0      48.5     14.5     128.9
12/02/92   14:21    77.5    141.5       4.9      48.0     14.8     125.3
12/02/92   14:22    78.5    139.5       5.1      54.0     14.6     130.5
12/02/92   14:23    79.5    145.5       5.3      56.0     14.3     136.9
12/02/92   14:24    85.0    146.5       5.5      62.0     14.2     138.4
12/02/92   14:25    78.5    144.5       5.7     118.5     14.0     136.3
12/02/92   14:26    97.0    141.5       5.4     140.0     14.3     126.6
12/02/92   14:27    91.5    135.0       5.1     140.0     14.7     118.0
12/02/92   14:28   102.5    130.0       5.0     147.5     14.9     114.8
12/02/92   14:29   119.5    126.5       5.0     153.0     15.0     113.3
12/02/92   14:30   121.5    120.5       5.0     166.0     15.0     112.4
12/02/92   14:31   126.0    124.5       5.0     184.5     15.0     113.0
 2/02/92   14:32   122.5    131.0       5.1     196.5     14.8     115.0
 2/02/92   14:33   102.5    129.0       5.1     170.0     14.9     115.0
12/02/92   14:34    94.5    125.5       5.0     131.0     15.0     116.3
12/02/92   14:35    95.0    125.5       4.9     100.5     15.2     115.5
12/02/92   14:36    89.0    129.0       4.9      79.5     15.2     120.3
12/02/92   14:37    86.5    141.5       5.3      71.5     14.5     131.5
12/02/92   14:38    82.0    151.5       5.7      68.5     14.1     137.9
12/02/92   14:39    71.0    142.5       5.6      57.5     14.2     136.3
12/02/92   14:40    70.0    145.5       5.4      48.0     14.4     129.5
12/02/92   14:41    72.5    146.0       5.8      48.5     14.1     140.9
12/02/92   14:42    75.5    156.0       6.1      52.5     13.7     145.4
12/02/92   14:43    76.0    161.5       6.1      54.5     13.7     143.4
12/02/92   14:44    75.5    168.5       6.1      53.5     13.7     145.3
12/02/92   14:45    74.5    170.0       6.2      55.0     13.6     145.8
12/02/92   14:46    76.5    171.0       6.1      57.5     13.7     144.8
12/02/92   14:47    79.0    163.5       6.0      62.5     13.9     142.0
12/02/92   14:48    78.0    162.5       6.0      66.5     13.9     143.1
12/02/92   14:49    76.0    161.5       6.1      70.0     13.9     143.8
12/02/92   14:50    76.0    162.0       6.1      70.5     13.9     144.4
12/02/92   14:51    75.5    163.0       6.1      68.0     13.8     146.4
12/02/92   14:52    76.5    164.0       6.2      62.0     13.8     148.3
12/02/92   14:53    74.0    165.0       6.2      59.0     13.8     147.3
12/02/92   14:54    70.5    163.5       6.1      55.0     13.9     146.0
12/02/92   14:55    66.5    153.5       5.6      53.5     14.4     134.8
12/02/92   14:56    66.0    151.5       5.5      51.0     14.5     133.9
12/02/92   14:57    62.5    151.5       5.5      50.5     14.4     134.6
 2/02/92   14:58    62.0    155.5       5.5      50.5     14.5     134.4
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                              Macasphalt - NAPA

                            RUN # 1 DATA LISTING

NAME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS. TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME                HC      SO2       CO2        CO        O2       NOX
CHAN UNITS              PPM      PPM        %        PPM         %       PPM
FULL SCALE           1000.0   1000.0      20.0     500.0      25.0     250.0
ZERO OFFSET             0.0      0.0       0.0       0.0       0.0       0.0
START / CHANNEL          01       02        03        04        05        06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/02/92  14:59        64.5    155.0       5.5      50.5      14.6     134.5
12/02/92  15:00        66.0    155.5       5.4      53.0      14.6     134.1
12/02/92  15:01        65.0    154.0       5.6      57.0      14.4     137.1
12/02/92  15:02        67.0    156.5       5.6      58.0      14.4     138.0
12/02/92  15:03        69.0    156.5       5.6      58.0      14.4     136.5
12/02/92  15:04        66.5    154.0       5.6      58.5      14.4     138.5
12/02/92  15:05        68.5    156.0       5.6      55.0      14.5     138.4
12/02/92  15:06        74.0    161.5       5.5      53.0      14.4     138.5
12/02/92  15:07        71.5    161.5       5.5      50.0      14.5     136.6
12/02/92  15:08        70.0    157.5       5.4      46.5      14.6     133.1
12/02/92  15:09        73.0    160.5       5.3      42.0      14.7     128.9
12/02/92  15:10        77.0    151.5       5.3      39.5      14.7     130.0
12/02/92  15:11        76.0    147.0       5.4      38.5      14.7     130.0
12/02/92  15:12        73.0    147.0       5.4      38.5      14.7     129.3
12/02/92  15:13        68.5    143.0       5.4      38.0      14.5     130.9
12/02/92  15:14        70.0    148.5       5.4      36.5      14.6     130.0
12/02/92  15:15        74.5    150.0       5.3      35.5      14.7     128.4
12/02/92  15:16        70.5    147.0       5.3      35.0      14.7     128.5
12/02/92  15:17        59.5    147.5       5.3      34.0      14.7     127.3
12/02/92  15:18        64.5    145.5       5.3      34.0      14.7     128.5
12/02/92  15:19        70.0    145.0       5.3      35.0      14.7     130.0
12/02/92  15:20        68.0    150.5       5.4      38.0      14.6     131.4
12/02/92  15:21        68.5    148.5       5.4      38.5      14.5     130.4

Averages:              77.8    149.5       5.5      68.9      14.4     132.9
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                           Macasphalt - NAPA

                         RUN # 2 DATA LISTING

NAME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME                HC      SO2       CO2        CO       O2      NOX
CHAN UNITS              PPM      PPM         %       PPM        %      PPM
FULL SCALE            100.0    400.0      20.0     500.0     25.0   9000.0
ZERO OFFSET             0.0      0.0       0.0       0.0      0.0      0.0
START / CHANNEL          01       02        03        04       05       06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/03/92   10:25     69.5    137.0       4.0      43.0     14.9    133.3
12/03/92   10:26     68.0    150.0       4.2      52.0     14.7    136.0
12/03/92   10:27     70.0    153.0       4.3      53.0     14.5    138.0
12/03/92   10:28     72.5    153.5       4.4      55.5     14.5    138.6
12/03/92   10:29     73.5    157.0       4.3      62.0     14.6    134.5
12/03/92   10:30     75.0    147.0       4.3      66.0     14.7    132.5
12/03/92   10:31     86.5    143.5       4.4      85.5     14.7    133.4
12/03/92   10:32     95.5    149.0       4.4      95.5     14.6    129.4
12/03/92   10:33     94.5    144.5       4.4      78.0     14.7    130.1
12/03/92   10:34     97.5    141.5       4.4      75.0     14.6    132.8
12/03/92   10:35    102.5    145.0       4.6      88.5     14.5    137.3
12/03/92   10:36    102.0    139.5       4.6      92.5     14.5    137.1
12/03/92   10:37    105.0    139.0       4.6      89.5     14.4    138.6
12/03/92   10:38     96.5    138.0       4.7      77.0     14.4    139.5
12/03/92   10:39     85.0    141.5       4.7      70.0     14.4    141.0
12/03/92   10:40     74.5    142.5       4.7      65.0     14.4    142.1
12/03/92   10:41     96.0    142.5       4.7      59.0     14.3    143.0
12/03/92   10:42     95.0    153.5       4.8      55.0     14.3    143.3
12/03/92   10:43     92.5    154.0       4.7      52.0     14.4    139.6
12/03/92   10:44     85.0    151.5       4.6      51.5     14.5    137.5
12/03/92   10:45     89.5    159.0       4.8      49.5     14.3    143.3
12/03/92   10:46     91.0    161.0       4.9      48.5     14.3    146.3
12/03/92   10:47     93.0    163.5       4.9      53.0     14.2    145.6
12/03/92   10:48     89.0    159.5       4.9      58.0     14.2    145.8
12/03/92   10:49     93.5    164.0       4.9      57.5     14.2    145.4
12/03/92   10:50     95.5    159.5       4.9      60.5     14.3    143.9
12/03/92   10:51    102.0    158.0       4.8      74.5     14.2    142.4
12/03/92   10:52    104.0    158.5       4.8      79.0     14.3    141.1
12/03/92   10:53     96.0    156.5       4.8      74.0     14.3    141.3
12/03/92   10:54     91.0    153.0       4.8      58.5     14.4    141.8
12/03/92   10:55     98.5    155.0       4.8      53.0     14.3    142.8
12/03/92   10:56    101.5    154.5       4.8      55.0     14.3    142.9
12/03/92   10:57     97.5    156.0       4.9      58.5     14.2    145.3
12/03/92   10:58     94.0    155.5       4.9      59.5     14.2    143.3
12/03/92   10:59     90.0    154.5       4.8      58.0     14.4    141.1
12/03/92   11:00     92.5    155.5       4.7      52.5     14.4    138.5
12/03/92   11:01     93.0    152.5       4.7      51.0     14.5    136.6
12/03/92   11:02     93.0    153.5       4.7      55.5     14.5    137.1
12/03/92   11:03     93.5    153.0       4.7      62.5     14.5    136.6
12/03/92   11:04     96.0    153.5       4.7      64.5     14.5    138.3
12/03/92   11:05     91.5    149.0       4.7      53.5     14.5    138.3
```

RUN # 2 DATA LISTING

```
ME:  RAMCON ENVIRONMENTAL    LOCATION:  MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME              HC      SO2      CO2       CO      O2      NOX
CHAN UNITS            PPM      PPM        %      PPM       %      PPM
FULL SCALE          100.0    400.0     20.0    500.0    25.0   9000.0
ZERO OFFSET           0.0      0.0      0.0      0.0     0.0      0.0
START / CHANNEL        01       02       03       04      05       06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/03/92  11:06    84.5    149.5      4.7     42.0    14.4    141.1
12/03/92  11:07    84.5    156.0      4.7     36.0    14.4    141.5
12/03/92  11:08    84.0    152.0      4.7     35.5    14.4    141.9
12/03/92  11:09    81.5    152.5      4.7     37.0    14.4    143.0
12/03/92  11:10    85.0    154.0      4.7     34.5    14.5    139.5
12/03/92  11:11    78.5    150.5      4.6     31.0    14.6    141.1
12/03/92  11:12    77.0    152.0      4.7     30.0    14.5    142.1
12/03/92  11:13    73.5    152.0      4.7     30.0    14.4    143.1
12/03/92  11:14    78.5    159.0      4.7     31.0    14.3    143.0
12/03/92  11:15    80.5    161.5      4.7     29.0    14.4    139.4
12/03/92  11:16    72.0    154.0      4.7     27.5    14.5    140.9
12/03/92  11:17    76.5    157.5      4.8     31.5    14.3    146.6
12/03/92  11:18    80.5    164.0      4.9     36.5    14.1    149.8
12/03/92  11:19    75.5    157.5      4.9     38.5    14.1    149.3
12/03/92  11:20    76.5    160.5      4.9     35.0    14.2    147.1
12/03/92  11:21    74.5    158.5      4.8     32.5    14.2    146.6
12/03/92  11:22    72.5    158.0      4.8     30.5    14.3    146.0
 2/03/92  11:23    77.5    159.5      4.8     29.5    14.3    146.6
12/03/92  11:24    83.5    160.0      4.8     30.5    14.2    148.3
12/03/92  11:25    90.0    161.0      4.8     37.5    14.3    148.3
12/03/92  11:26    86.0    159.0      4.8     42.0    14.2    149.6
12/03/92  11:27    78.0    150.5      4.8     37.5    14.2    149.6
12/03/92  11:28    80.5    156.5      4.8     33.0    14.2    150.9
12/03/92  11:29    84.5    161.5      4.9     32.5    14.2    150.9
12/03/92  11:30    83.5    162.0      4.9     31.5    14.2    151.3
12/03/92  11:31    83.0    163.0      4.9     31.5    14.1    152.9
12/03/92  11:32    78.0    161.0      5.0     31.5    14.0    152.9
12/03/92  11:33    80.5    166.0      5.0     31.5    14.0    154.3
12/03/92  11:34    82.5    166.5      5.0     30.0    14.0    154.1
12/03/92  11:35    82.5    164.5      4.9     27.0    14.0    153.1
12/03/92  11:36    79.5    162.5      4.9     25.0    14.0    151.5
12/03/92  11:37    75.0    160.5      4.9     26.0    14.1    150.6
12/03/92  11:38    73.5    157.5      4.9     27.0    14.1    150.9
12/03/92  11:39    79.0    161.0      4.9     29.0    14.1    150.5
12/03/92  11:40    84.5    158.0      4.8     30.5    14.1    149.5
12/03/92  11:41    85.5    155.0      4.7     31.5    14.4    144.4
12/03/92  11:42    96.0    151.5      4.6     37.5    14.5    135.9
12/03/92  11:43   104.0    132.0      4.4     88.0    14.8    125.5
12/03/92  11:44   108.5    132.0      4.6    110.0    14.4    136.9
12/03/92  11:45   103.5    135.0      4.7    103.5    14.3    143.6
12/03/92  11:46    92.5    141.0      4.8     83.0    14.2    146.4
12/03/92  11:47    85.0    145.5      4.8     69.0    14.1    149.9
12/03/92  11:48    79.0    149.5      4.8     61.0    14.1    151.1
 2/03/92  11:49    70.0    150.5      4.8     43.5    14.1    151.1
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Macasphalt - NAPA

RUN # 2 DATA LISTING

```
AME:   RAMCON ENVIRONMENTAL    LOCATION:   MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME              HC      SO2       CO2       CO        O2      NOX
CHAN UNITS            PPM      PPM        %       PPM         %      PPM
FULL SCALE          100.0    400.0      20.0    500.0      25.0   9000.0
ZERO OFFSET           0.0      0.0       0.0      0.0       0.0      0.0
START / CHANNEL        01       02        03       04        05       06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/03/92   11:50     71.5    153.5       4.8     28.5      14.1    152.0
12/03/92   11:51     72.0    156.0       4.8     24.0      14.1    154.0
12/03/92   11:52     73.0    160.0       4.8     23.0      14.1    153.0
12/03/92   11:53     71.0    162.5       4.8     23.0      14.1    152.4
12/03/92   11:54     69.0    159.5       4.7     21.0      14.2    151.8
12/03/92   11:55     72.0    161.5       4.7     19.5      14.3    151.4
12/03/92   11:56     76.5    162.5       4.7     16.5      14.2    151.5
12/03/92   11:57     73.0    160.5       4.7     16.0      14.2    151.9
12/03/92   11:58     71.0    162.0       4.6     17.5      14.3    151.8
12/03/92   11:59     70.5    158.0       4.6     17.5      14.4    150.5
12/03/92   12:00     73.0    159.0       4.5     18.0      14.4    149.5
12/03/92   12:01     72.0    159.5       4.6     17.5      14.4    151.3
12/03/92   12:02     70.0    160.0       4.6     17.0      14.3    152.1
12/03/92   12:03     68.5    163.5       4.6     16.5      14.3    151.6
12/03/92   12:04     67.0    161.0       4.6     15.0      14.3    151.5
12/03/92   12:05     67.0    161.5       4.6     13.5      14.2    152.4
12/03/92   12:06     71.5    162.5       4.6     12.5      14.2    152.3
12/03/92   12:07     68.0    156.5       4.6     13.0      14.3    151.0
 2/03/92   12:08     49.5    149.5       4.6     12.5      14.2    150.8
12/03/92   12:09     38.5    147.5       4.6     12.5      14.3    152.4
12/03/92   12:10     51.5    143.0       4.6     14.0      14.2    146.5
12/03/92   12:11     63.0    115.5       3.5     24.0      15.8    103.1
12/03/92   12:12     66.0     86.5       3.2     70.5      16.2    118.9
12/03/92   12:13     68.5    109.0       4.4     42.0      14.6    141.0
12/03/92   12:14     69.0    122.5       4.4     47.0      14.4    145.1
12/03/92   12:15     65.5    121.5       4.5     46.5      14.3    147.3
12/03/92   12:16     62.5    115.5       4.5     38.0      14.4    145.6
12/03/92   12:17     62.0    113.5       4.4     29.0      14.5    145.8
12/03/92   12:18     66.5    116.0       4.4     29.0      14.4    144.5
12/03/92   12:19     69.5    118.5       4.4     40.0      14.5    140.3
12/03/92   12:20     68.5    120.0       4.3     43.5      14.7    132.0
12/03/92   12:21     67.5    101.5       3.0     50.5      16.2     98.3
12/03/92   12:22     71.5     97.5       4.0     44.5      15.1    137.9

Averages:            81.0    150.0       4.6     44.3      14.4    143.6
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                              Macasphalt - NAPA

                            RUN # 3A DATA LISTING

NAME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS, TENNESSEE
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME                HC      SO2      CO2       CO       O2      NOX
CHAN UNITS              PPM      PPM        %      PPM        %      PPM
FULL SCALE            100.0    400.0     20.0    500.0     25.0   9000.0
ZERO OFFSET             0.0      0.0      0.0      0.0      0.0      0.0
START / CHANNEL          01       02       03       04       05       06
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/03/92   13:03       65.5    234.5      4.3     43.0     14.5    132.0
12/03/92   13:04       63.5    173.5      4.4     39.0     14.7    131.5
12/03/92   13:05       62.0    153.5      4.4     35.0     14.8    131.5
12/03/92   13:06       62.5    148.5      4.4     33.0     14.9    132.1
12/03/92   13:07       64.5    146.5      4.6     34.0     14.8    135.5
12/03/92   13:08       64.0    145.5      4.7     36.0     14.6    137.1
12/03/92   13:09       63.0    142.0      4.8     36.5     14.6    139.0
12/03/92   13:10       63.5    139.5      4.8     39.0     14.6    137.5
12/03/92   13:11       64.5    138.0      4.9     48.5     14.6    134.1
12/03/92   13:12       60.5    133.0      4.8     58.5     14.6    132.3
12/03/92   13:13       60.0    129.0      4.8     54.0     14.7    132.3
12/03/92   13:14       62.0    131.5      4.8     47.0     14.6    133.6
12/03/92   13:15       62.5    130.0      4.8     45.5     14.8    133.1
12/03/92   13:16       60.0    130.0      4.8     45.5     14.7    133.0
 2/03/92   13:17       63.5    132.5      4.8     45.5     14.8    133.1
 2/03/92   13:18       67.0    128.5      4.8     50.0     14.8    132.3
12/03/92   13:19       64.0    122.0      4.8     57.0     14.8    133.4
12/03/92   13:20       66.0    126.5      4.8     60.5     14.8    133.8
12/03/92   13:21       64.5    121.5      4.8     62.0     14.7    135.1
12/03/92   13:22       66.0    123.0      4.9     65.5     14.7    135.1
12/03/92   13:23       65.0    119.0      4.9     60.0     14.7    135.1
12/03/92   13:24       67.0    120.0      4.9     51.5     14.8    133.1

Averages:              63.7    139.5      4.7     47.6     14.7    133.9
```

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                               Macasphalt - NAPA

                            RUN # 3B DATA LISTING

NAME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME                HC       SO2       CO2        CO        O2       NOX
CHAN UNITS              PPM       PPM         %       PPM         %       PPM
FULL SCALE            100.0     400.0      20.0     500.0      25.0    9000.0
ZERO OFFSET             0.0       0.0       0.0       0.0       0.0       0.0
START / CHANNEL          01        02        03        04        05        06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/03/92  14:59    34.5     147.0       3.9      67.0      15.1     130.5
12/03/92  15:00    44.0     146.0       3.9      65.5      15.3     126.4
12/03/92  15:01    59.5     145.5       3.9      70.5      15.3     128.0
12/03/92  15:02    61.0     145.5       4.0      75.0      15.1     129.3
12/03/92  15:03    63.0     144.5       4.1      81.5      15.0     130.0
12/03/92  15:04    62.0     145.0       4.2      84.0      15.0     133.3
12/03/92  15:05    61.0     142.5       4.3      83.5      14.9     135.9
12/03/92  15:06    60.0     138.5       4.4      76.0      14.8     139.3
12/03/92  15:07    63.0     134.5       4.4      66.0      14.7     139.1
12/03/92  15:08    58.5     127.5       4.4      59.0      14.8     138.9
12/03/92  15:09    52.5     128.0       4.3      50.5      14.9     133.6
12/03/92  15:10    49.0     131.0       4.2      40.0      15.0     131.9
12/03/92  15:11    48.0     130.0       4.2      36.5      15.1     134.9
12/03/92  15:12    49.0     121.5       4.3      36.5      14.9     137.0
12/03/92  15:13    45.5     118.0       4.4      37.0      14.8     138.9
 2/03/92  15:14    46.5     112.0       4.4      36.5      14.8     141.9
 2/03/92  15:15    42.5     120.5       4.5      38.0      14.7     144.3
12/03/92  15:16    46.0     119.0       4.5      38.0      14.9     141.8
12/03/92  15:17    43.0     122.5       4.4      39.5      15.0     139.4
12/03/92  15:18    49.0     134.5       4.3      41.0      15.0     135.8
12/03/92  15:19    46.5     125.5       4.1      38.0      15.2     129.0
12/03/92  15:20    47.5     121.5       4.1      37.5      15.3     127.8
12/03/92  15:21    52.0     122.0       4.1      38.0      15.3     127.8
12/03/92  15:22    59.0     126.0       4.3      39.0      15.0     136.0
12/03/92  15:23    58.0     129.0       4.4      40.0      15.0     135.0
12/03/92  15:24    55.5     125.5       4.2      40.0      15.2     127.6
12/03/92  15:25    68.0     123.5       4.1      43.0      15.2     124.9
12/03/92  15:26    69.0     122.0       4.0      42.0      15.3     124.8
12/03/92  15:27    52.0     127.0       4.2      39.0      15.2     130.3
12/03/92  15:28    43.5     128.0       4.3      43.5      15.0     130.3
12/03/92  15:29    62.5     134.5       4.3      48.0      15.0     131.1
12/03/92  15:30    74.0     134.5       4.1      47.0      15.3     123.3
12/03/92  15:31    80.5     125.0       3.9      45.0      15.6     120.3
12/03/92  15:32    75.5     128.0       3.8      43.5      15.6     119.5
12/03/92  15:33    73.5     123.5       3.6      43.0      15.8     113.5
12/03/92  15:34    68.5     123.0       3.7      42.0      15.6     122.3
12/03/92  15:35    65.5     135.0       4.1      40.0      15.1     131.5
12/03/92  15:36    64.5     143.5       4.4      43.5      14.9     137.4
12/03/92  15:37    65.5     147.0       4.4      44.5      14.8     135.4
12/03/92  15:38    60.5     143.5       4.4      43.5      14.9     134.0
12/03/92  15:39    54.5     144.5       4.2      33.0      15.0     125.9
```

Macasphalt - NAPA

RUN # 3B DATA LISTING

```
AME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME                 HC       SO2       CO2        CO        O2       NOX
CHAN UNITS               PPM       PPM         %       PPM         %       PPM
FULL SCALE             100.0     400.0      20.0     500.0      25.0    9000.0
ZERO OFFSET              0.0       0.0       0.0       0.0       0.0       0.0
START / CHANNEL           01        02        03        04        05        06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/03/92   15:40       63.0     114.0       3.0      57.0      16.7      77.4
12/03/92   15:41       51.0      74.5       2.3     231.5      17.5      89.4
12/03/92   15:42       59.5     106.0       3.9      44.5      15.5     128.1
12/03/92   15:43       53.0     126.5       4.2      39.0      15.1     131.9
12/03/92   15:44       45.0     130.0       4.2      38.0      15.0     133.0
12/03/92   15:45       47.5     133.5       4.3      40.5      15.0     133.1
12/03/92   15:46       52.5     135.5       4.3      46.5      15.0     133.5
12/03/92   15:47       39.5     140.5       4.3      48.0      14.9     133.9
12/03/92   15:48       66.5     141.5       4.4      46.5      14.7     139.1
12/03/92   15:49       64.0     156.0       4.5      42.0      14.7     133.6
12/03/92   15:50       68.5     135.0       3.5      42.5      15.9     105.5
12/03/92   15:51       77.5     136.5       4.0      50.0      15.3     129.9
12/03/92   15:52       76.0     156.0       4.4      42.0      14.8     137.5
12/03/92   15:53       83.5     160.5       4.3      44.0      15.0     126.3
12/03/92   15:54       76.5     143.5       3.8      41.0      15.6     111.5
12/03/92   15:55       74.0     129.0       3.6      53.0      15.8     121.9
12/03/92   15:56       73.5     156.0       4.4      54.5      14.8     136.0
12/03/92   15:57       79.0     164.5       4.4      53.5      14.9     132.4
12/03/92   15:58       63.0     127.0       3.0      79.0      16.6      88.6
12/03/92   15:59       66.0     129.0       3.8      80.0      15.5     129.1
12/03/92   16:00       65.5     144.0       4.3      38.0      15.0     131.3
12/03/92   16:01       61.5     142.0       4.2      32.5      15.1     129.0
12/03/92   16:02       60.0     143.0       4.3      33.5      14.9     133.1
12/03/92   16:03       57.0     137.5       4.2      37.5      15.0     132.3
12/03/92   16:04       57.5     138.5       4.3      37.5      15.0     133.8
12/03/92   16:05       60.5     141.5       4.4      37.0      14.9     134.0
12/03/92   16:06       58.0     135.5       4.3      38.5      15.0     131.1
12/03/92   16:07       54.0     143.0       4.4      37.5      14.9     131.4
12/03/92   16:08       56.0     147.0       4.3      34.0      15.0     127.1
12/03/92   16:09       66.0     140.5       4.2      31.5      15.1     122.8
12/03/92   16:10       68.5     117.5       3.2      54.5      16.3      87.0
12/03/92   16:11       66.0     104.5       3.6     119.0      15.9     121.5
12/03/92   16:12       71.5     139.5       4.4      35.5      14.8     133.8
12/03/92   16:13       72.5     146.0       4.4      35.0      14.7     132.5
12/03/92   16:14       68.0     141.5       4.2      32.5      15.1     123.4
12/03/92   16:15       79.0     140.0       4.2      39.5      15.2     123.0
12/03/92   16:16       92.5     139.5       4.4      76.5      14.9     122.3
12/03/92   16:17       95.0     133.0       4.3     105.0      15.0     117.5
12/03/92   16:18       92.0     133.0       4.2      99.0      15.1     115.9
12/03/92   16:19       85.0     128.5       4.1      89.0      15.2     113.1
12/03/92   16:20       79.0     124.5       4.0      78.0      15.4     110.1
12/03/92   16:21       79.0     119.0       3.5      65.5      15.9     103.3
12/03/92   16:22       74.0     117.5       4.1      61.5      15.3     118.4
 2/03/92   16:23       77.0     139.0       4.4      54.5      14.8     125.4
```

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                         Macasphalt - NAPA

                        RUN # 3B DATA LISTING

 AME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME               HC      SO2      CO2       CO       O2      NOX
CHAN UNITS             PPM      PPM        %      PPM        %      PPM
FULL SCALE           100.0    400.0     20.0    500.0     25.0   9000.0
ZERO OFFSET            0.0      0.0      0.0      0.0      0.0      0.0
START / CHANNEL         01       02       03       04       05       06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/03/92  16:24       78.5    133.5      4.5     51.0     14.8    127.0
12/03/92  16:25       72.0    132.0      4.4     54.0     15.0    125.4
12/03/92  16:26       68.0    127.5      4.4     51.0     15.0    126.6
12/03/92  16:27       65.0    127.5      4.4     48.5     15.0    126.4
12/03/92  16:28       60.5    124.0      4.4     48.0     15.0    125.1
12/03/92  16:29       61.0    128.0      4.5     44.5     14.8    130.1
12/03/92  16:30       59.0    128.0      4.5     47.0     14.8    130.3
12/03/92  16:31       63.5    133.5      4.5     50.0     14.8    129.5
12/03/92  16:32       64.5    132.0      4.5     53.0     14.8    128.9
12/03/92  16:33       66.0    134.5      4.5     54.0     14.7    129.6
12/03/92  16:34       64.0    134.5      4.6     53.5     14.7    130.4
12/03/92  16:35       61.5    132.0      4.6     52.5     14.6    130.9
12/03/92  16:36       63.5    134.0      4.7     55.0     14.6    130.6
12/03/92  16:37       66.0    135.5      4.7     60.0     14.6    130.4
12/03/92  16:38       63.0    131.0      4.7     61.5     14.6    130.6

Averages:             62.8    132.8      4.2     52.5     15.1    127.3
```

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                              Macasphalt - NAPA

                            RUN # 4A DATA LISTING

NAME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME               HC      SO2      CO2       CO       O2      NOX
CHAN UNITS             PPM      PPM       %       PPM       %       PPM
FULL SCALE           100.0    400.0     20.0    500.0     25.0   9000.0
ZERO OFFSET            0.0      0.0      0.0      0.0      0.0      0.0
START / CHANNEL         01       02       03       04       05       06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/04/92   08:11     92.0     68.5      4.7    132.5     15.9    105.6
12/04/92   08:12     92.5     70.0      4.7    154.0     15.8    106.0
12/04/92   08:13     85.0     71.0      4.9    157.5     15.6    112.4
12/04/92   08:14     78.5     75.5      5.0    139.5     15.5    117.9
12/04/92   08:15     81.0     86.0      5.0    125.5     15.5    118.4
12/04/92   08:16     87.0     96.0      5.0    128.0     15.6    115.0
12/04/92   08:17     92.0    102.0      5.1    142.5     15.4    113.3
12/04/92   08:18     96.0     94.0      5.1    153.0     15.4    109.0
12/04/92   08:19    101.0     89.0      5.0    146.5     15.6    110.6
12/04/92   08:20    105.0     85.0      5.0    138.0     15.6    115.0
12/04/92   08:21    102.0     83.5      5.1    131.5     15.4    119.0
12/04/92   08:22    108.5     85.0      5.1    118.0     15.4    123.6
12/04/92   08:23    105.0     85.5      5.2    104.0     15.3    128.9
12/04/92   08:24     94.5     86.5      5.3     88.5     15.2    132.8
12/04/92   08:25     90.5     88.0      5.2     73.5     15.3    134.9
12/04/92   08:26     80.5     88.5      5.2     63.0     15.3    135.8
12/04/92   08:27     74.0     88.5      5.2     58.5     15.3    133.6
12/04/92   08:28     72.0     86.5      5.1     58.0     15.5    129.0
12/04/92   08:29     71.0     86.5      5.1     56.0     15.5    129.8
12/04/92   08:30     71.5     88.5      5.1     53.0     15.5    130.1
12/04/92   08:31     71.5     91.5      5.1     52.5     15.5    130.9
12/04/92   08:32     69.5     92.5      5.1     53.5     15.4    130.9
12/04/92   08:33     69.5     93.5      5.3     50.0     15.2    137.6
12/04/92   08:34     70.0     96.0      5.4     46.5     15.0    138.6
12/04/92   08:35     73.0     95.0      5.3     47.5     15.1    138.8
12/04/92   08:36     73.5     94.5      5.3     46.5     15.1    138.5
12/04/92   08:37     73.5     94.5      5.3     45.5     15.2    137.6
12/04/92   08:38     74.5     92.0      5.3     44.5     15.2    138.0
12/04/92   08:39     74.0     93.5      5.3     45.0     15.2    138.0
12/04/92   08:40     71.5     93.5      5.3     44.5     15.2    138.4
12/04/92   08:41     68.5     91.5      5.3     43.5     15.2    139.0
12/04/92   08:42     67.5     91.5      5.2     44.5     15.2    138.5
12/04/92   08:43     67.5     92.0      5.3     44.5     15.1    140.0
12/04/92   08:44     68.5     91.5      5.3     43.0     15.1    140.3
12/04/92   08:45     72.5     89.0      5.3     42.5     15.1    141.6
12/04/92   08:46     72.0     90.5      5.3     41.0     15.1    141.6
12/04/92   08:47     73.5     91.5      5.3     43.0     15.1    140.5
12/04/92   08:48     74.5     90.0      5.3     48.5     15.1    139.3
12/04/92   08:49     73.0     85.5      5.3     55.5     15.0    140.0
12/04/92   08:50     66.0     85.5      5.3     55.0     15.1    141.3
12/04/92   08:51     51.0     84.5      5.3     51.0     15.1    140.6
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                              Macasphalt - NAPA

                             RUN # 4A DATA LISTING

NAME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME               HC       SO2       CO2        CO       O2       NOX
CHAN UNITS             PPM       PPM        %        PPM        %       PPM
FULL SCALE           100.0     400.0      20.0     500.0     25.0    9000.0
ZERO OFFSET            0.0       0.0       0.0       0.0      0.0       0.0
START / CHANNEL         01        02        03        04       05        06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/04/92   08:52      66.0      82.5       5.2      48.0     15.2     141.1
12/04/92   08:53      69.5      85.0       5.2      45.5     15.1     142.5
12/04/92   08:54      65.0      93.0       5.2      44.0     15.2     143.5
12/04/92   08:55      64.0      97.0       5.2      41.0     15.2     145.6
12/04/92   08:56      66.0      95.5       5.2      40.0     15.2     145.3
12/04/92   08:57      68.5      94.0       5.2      42.5     15.2     143.5
12/04/92   08:58      69.0      97.0       5.3      46.5     15.1     145.8
12/04/92   08:59      70.5     109.0       5.3      45.0     15.1     151.1
12/04/92   09:00      72.0     106.5       5.3      41.0     15.1     150.0
12/04/92   09:01      72.0     104.5       5.3      40.5     15.1     149.6
12/04/92   09:02      72.5     169.0       5.3      40.5     15.1     154.6
12/04/92   09:03      71.0     199.0       5.2      41.0     15.1     152.1
12/04/92   09:04      66.5     193.0       5.2      42.0     15.1     150.4
12/04/92   09:05      66.5     187.5       5.2      40.0     15.1     152.4
12/04/92   09:06      66.5     167.5       5.2      39.5     15.2     151.9
12/04/92   09:07      66.0     160.5       5.2      39.0     15.2     151.9
12/04/92   09:08      65.0     150.5       5.2      38.5     15.2     152.3
12/04/92   09:09      64.0     146.5       5.2      38.5     15.2     151.8
12/04/92   09:10      62.0     140.5       5.2      41.5     15.1     152.1
12/04/92   09:11      59.0     136.0       5.2      41.0     15.1     153.6
12/04/92   09:12      60.0     141.0       5.2      39.0     15.0     155.5
12/04/92   09:13      63.0     140.0       5.2      40.0     15.0     153.9
12/04/92   09:14      63.0     143.5       5.2      40.0     15.1     153.3
12/04/92   09:15      60.5     146.0       5.2      38.0     15.1     152.8
12/04/92   09:16      59.0     148.0       5.2      36.0     15.1     150.8
12/04/92   09:17      67.0     145.5       5.1      35.5     15.2     148.6
12/04/92   09:18      69.5     143.5       5.0      37.0     15.3     147.8
12/04/92   09:19      70.5     140.5       5.1      36.5     15.2     148.1
12/04/92   09:20      77.5     140.0       5.0      35.5     15.3     147.0

Averages:             74.1     107.5       5.2      62.6     15.2     138.1
```

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                              Macasphalt - NAPA

                            RUN # 4B  DATA LISTING

NAME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME                HC       SO2       CO2        CO        O2       NOX
CHAN UNITS              PPM       PPM        %        PPM         %       PPM
FULL SCALE            100.0     400.0      20.0     500.0      25.0    9000.0
ZERO OFFSET             0.0       0.0       0.0       0.0       0.0       0.0
START / CHANNEL          01        02        03        04        05        06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/04/92   10:36       29.5     115.0       3.5     104.0      15.9     142.6
12/04/92   10:37       28.0     162.5       3.8      45.5      15.4     147.6
12/04/92   10:38       30.5     157.0       3.6      39.0      15.8     130.3
12/04/92   10:39       49.5     125.5       3.0      55.5      16.6     126.9
12/04/92   10:40       63.0     149.5       4.1      37.0      15.3     155.8
12/04/92   10:41       70.5     166.5       4.4      39.0      14.9     161.9
12/04/92   10:42       63.0     171.0       4.5      36.5      14.8     162.5
12/04/92   10:43       64.5     170.0       4.5      31.0      14.9     160.6
12/04/92   10:44       65.5     167.5       4.5      29.0      14.8     161.4
12/04/92   10:45       69.0     162.0       4.6      28.5      14.8     164.0
12/04/92   10:46       94.5     146.0       4.6      34.0      14.8     156.5
12/04/92   10:47      130.0     127.0       4.6      98.0      14.9     144.0
12/04/92   10:48      131.5     119.5       4.6     181.0      14.9     137.0
12/04/92   10:49      115.5     122.5       4.5     197.0      15.1     134.4
12/04/92   10:50      103.0     122.0       4.4     153.5      15.2     137.9
 2/04/92   10:51      106.5     124.0       4.7     122.5      14.8     150.8
12/04/92   10:52      130.0     128.0       4.7     120.5      14.8     146.3
12/04/92   10:53      144.0     131.5       4.7     180.0      14.8     137.1
12/04/92   10:54      141.0     130.5       4.6     233.0      14.9     130.9
12/04/92   10:55      133.0     120.0       4.4     211.5      15.3     126.0
12/04/92   10:56      127.0     115.0       4.2     170.0      15.5     127.4
12/04/92   10:57      118.0     118.0       4.3     150.0      15.4     130.6
12/04/92   10:58      111.0     123.5       4.3     129.0      15.4     134.6
12/04/92   10:59      108.0     128.0       4.4     105.5      15.3     140.0
12/04/92   11:00       99.0     132.5       4.5      83.5      15.1     145.4
12/04/92   11:01      103.0     140.0       4.6      74.5      15.0     148.3
12/04/92   11:02      113.0     140.5       4.7      91.0      14.9     147.3
12/04/92   11:03      118.5     141.5       4.8     113.5      14.7     148.6
12/04/92   11:04      111.5     141.5       4.9     116.0      14.6     150.4
12/04/92   11:05      111.0     142.0       4.9     107.0      14.6     150.6
12/04/92   11:06      112.5     138.0       4.9     112.0      14.5     150.5
12/04/92   11:07      112.5     135.5       5.0     117.0      14.5     151.3
12/04/92   11:08      106.5     138.5       5.0     112.0      14.5     151.9
12/04/92   11:09      103.0F    142.5F      5.0F    107.0F     14.5F    150.8F        F
12/04/92   11:10      101.0     144.5       4.9     101.5      14.6     150.4
12/04/92   11:11       99.0     142.5       4.7      86.0      14.8     145.5
12/04/92   11:12       91.5     140.0       4.4      66.5      15.2     140.3
12/04/92   11:13       88.0     142.0       4.4      56.5      15.3     140.9
12/04/92   11:14       94.0     145.0       4.6      60.5      15.0     146.6
12/04/92   11:15       95.0     148.5       4.8      67.5      14.8     152.9
 2/04/92   11:16       86.0     148.0       4.7      61.5      14.8     154.8
```

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                                    Macasphalt - NAPA

                                    RUN # 4B   DATA LISTING

NAME:   RAMCON ENVIRONMENTAL    LOCATION:   MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME              HC       SO2       CO2        CO        O2       NOX
CHAN UNITS            PPM       PPM        %        PPM        %        PPM
FULL SCALE          100.0     400.0      20.0     500.0      25.0    9000.0
ZERO OFFSET           0.0       0.0       0.0       0.0       0.0       0.0
START / CHANNEL        01        02        03        04        05        06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/04/92  11:17      79.5     148.5       4.8      54.0      14.7     155.4
12/04/92  11:18      76.0     149.0       4.8      53.5      14.6     156.9
12/04/92  11:19      77.5     148.5       4.8      52.5      14.7     156.1
12/04/92  11:20      77.5     145.5       4.8      51.5      14.6     156.9
12/04/92  11:21      78.0     144.5       4.8      52.0      14.6     156.6
12/04/92  11:22      76.0     142.5       4.8      51.0      14.6     156.8
12/04/92  11:23      73.5     143.0       4.8      49.0      14.7     157.4
12/04/92  11:24      73.0     143.0       4.8      45.0      14.7     155.5
12/04/92  11:25      69.5     141.0       4.8      43.5      14.8     154.0
12/04/92  11:26      69.5     144.0       4.7      42.5      14.8     153.9
12/04/92  11:27      71.0     142.5       4.7      42.0      14.8     154.5
12/04/92  11:28      69.0     142.0       4.8      43.5      14.7     155.4
12/04/92  11:29      68.0     142.5       4.8      40.0      14.7     156.3
12/04/92  11:30      66.0     144.5       4.8      36.5      14.7     156.8
12/04/92  11:31      65.0     146.0       4.8      35.0      14.7     156.3
12/04/92  11:32      54.5     154.5       4.8      34.0      14.7     153.5
 2/04/92  11:33      37.0     102.0       2.5      19.5      18.0      62.6
 2/04/92  11:34      36.0      49.0       1.6       7.0      19.3      56.1
12/04/92  11:35      35.5      36.0       1.6      10.0      19.3      56.0
12/04/92  11:36      36.0      29.5       1.6      14.5      19.3      54.4
12/04/92  11:37      72.0      49.5       2.7      27.5      17.4     116.3
12/04/92  11:38      71.0     107.0       4.4      63.5      15.0     146.4
12/04/92  11:39      68.5     124.0       4.5      57.0      14.8     150.9
12/04/92  11:40      66.5     130.5       4.5      50.0      14.8     152.5
12/04/92  11:41      66.5     133.5       4.6      46.5      14.8     153.0
12/04/92  11:42      64.5     133.5       4.6      47.5      14.7     153.5
12/04/92  11:43      65.0     134.5       4.7      47.0      14.7     154.3
12/04/92  11:44      66.5     137.0       4.7      44.5      14.7     155.3
12/04/92  11:45      67.5     136.0       4.7      45.5      14.7     154.6
12/04/92  11:46      78.5     127.0       4.7      60.5      14.7     150.5
12/04/92  11:47      88.0     118.0       4.7      94.0      14.7     145.8
12/04/92  11:48      95.5     113.5       4.7     123.0      14.7     143.8
12/04/92  11:49      96.5     115.5       4.7     141.0      14.7     144.6
12/04/92  11:50      93.0     118.0       4.7     135.0      14.7     147.1

Averages:            84.2     130.4       4.3      76.2      15.0     141.5
```

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                                  Macasphalt - NAPA

                                RUN # 5 DATA LISTING

NAME:  RAMCON ENVIRONMENTAL    LOCATION:  MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME                HC       SO2       CO2        CO        O2       NOX
CHAN UNITS              PPM       PPM        %        PPM         %       PPM
FULL SCALE            100.0     400.0      20.0     500.0      25.0    9000.0
ZERO OFFSET             0.0       0.0       0.0       0.0       0.0       0.0
START / CHANNEL          01        02        03        04        05        06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/04/92   12:20     25.5     150.0       3.8      34.5      16.0     113.5
12/04/92   12:21     30.5     182.5       4.4      31.5      15.2     123.6
12/04/92   12:22     34.0     181.0       4.2      36.5      15.5     113.1
12/04/92   12:23     34.0     147.0       3.3      41.5      16.7      93.4
12/04/92   12:24     36.5     165.5       4.2      38.0      15.7     115.4
12/04/92   12:25     42.0     165.5       4.4      38.0      15.4     118.8
12/04/92   12:26     57.5     156.5       4.5      41.0      15.2     123.8
12/04/92   12:27     62.5     153.5       4.7      44.5      15.1     125.5
12/04/92   12:28     65.0     152.0       4.7      45.5      15.2     125.0
12/04/92   12:29     70.5     149.0       4.7      45.5      15.2     125.6
12/04/92   12:30     75.0     144.0       4.8      47.0      15.1     126.6
12/04/92   12:31     63.5     136.0       4.9      48.0      15.0     127.9
12/04/92   12:32     78.5     135.0       4.9      47.0      14.9     129.8
12/04/92   12:33     76.5     133.5       5.0      44.5      14.9     130.5
12/04/92   12:34     77.5     135.5       4.9      41.5      14.9     130.4
12/04/92   12:35     79.0     138.0       4.9      39.0      14.9     130.5
12/04/92   12:36     74.5     140.0       4.9      38.5      15.0     130.1
12/04/92   12:37     76.5     140.5       4.9      45.0      15.0     128.9
12/04/92   12:38     78.5     139.0       4.9      50.5      14.9     129.5
12/04/92   12:39     79.0     133.5       4.9      47.5      15.0     129.6
12/04/92   12:40     79.0     136.0       4.9      44.5      15.0     130.1
12/04/92   12:41     73.5     138.5       5.0      41.5      15.0     131.0
12/04/92   12:42     69.0     140.0       5.0      39.0      14.9     132.0
12/04/92   12:43     68.5     141.0       5.0      38.5      14.9     132.0
12/04/92   12:44     70.0     141.0       5.0      40.0      14.8     130.9
12/04/92   12:45     74.5     142.5       5.0      42.0      14.9     131.1
12/04/92   12:46     77.0     140.0       5.0      44.5      14.8     131.1
12/04/92   12:47     78.5     143.0       5.0      48.5      14.9     129.9
12/04/92   12:48     78.5     144.0       5.0      54.5      14.9     129.0
12/04/92   12:49     77.5     144.5       5.0      58.0      14.9     128.9
12/04/92   12:50     76.5     140.5       5.0      61.0      14.9     129.4
12/04/92   12:51     76.0     142.5       5.0      61.5      14.9     130.1
12/04/92   12:52     78.5     141.5       5.0      60.0      14.9     130.6
12/04/92   12:53     79.5     143.5       5.0      59.0      14.9     131.8
12/04/92   12:54     78.5     146.0       5.0      57.5      14.8     133.4
12/04/92   12:55     77.0     148.5       5.0      56.0      14.9     134.0
12/04/92   12:56     76.0     152.0       5.1      52.5      14.8     134.6
12/04/92   12:57     74.0     151.5       5.1      49.5      14.8     135.3
12/04/92   12:58     73.5     150.5       5.1      46.5      14.7     136.1
12/04/92   12:59     75.5     153.5       5.1      44.5      14.7     136.6
12/04/92   13:00     75.0     149.5       4.9      42.0      15.0     133.1
```

Macasphalt - NAPA

RUN # 5 DATA LISTING

AME: RAMCON ENVIRONMENTAL LOCATION: MEMPHIS, TENNESSEE

CHAN NAME		HC	SO2	CO2	CO	O2	NOX
CHAN UNITS		PPM	PPM	%	PPM	%	PPM
FULL SCALE		100.0	400.0	20.0	500.0	25.0	9000.0
ZERO OFFSET		0.0	0.0	0.0	0.0	0.0	0.0
START / CHANNEL		01	02	03	04	05	06
12/04/92	13:01	69.5	148.5	4.8	40.0	15.1	131.8
12/04/92	13:02	66.0	147.0	4.8	36.5	15.1	131.8
12/04/92	13:03	65.0	149.5	4.8	34.0	15.1	131.6
12/04/92	13:04	68.0	149.5	4.8	33.5	15.2	131.1
12/04/92	13:05	68.0	151.5	4.7	33.5	15.2	131.1
12/04/92	13:06	67.5	153.0	4.8	33.0	15.2	131.3
12/04/92	13:07	67.5	155.5	4.8	33.0	15.1	131.9
12/04/92	13:08	64.5	154.0	4.8	33.0	15.1	132.1
12/04/92	13:09	61.0	158.0	4.8	33.0	15.1	132.0
12/04/92	13:10	57.5	157.0	4.8	33.0	15.0	132.8
12/04/92	13:11	57.0	155.0	4.8	33.0	15.1	133.1
12/04/92	13:12	58.5	152.5	4.8	33.0	15.1	132.8
12/04/92	13:13	57.5	153.5	4.8	34.5	15.1	132.1
12/04/92	13:14	59.5	152.0	4.7	38.5	15.2	131.1
12/04/92	13:15	58.0	150.0	4.7	41.0	15.1	131.6
12/04/92	13:16	58.0	151.0	4.8	42.0	15.1	132.4
12/04/92	13:17	60.0	150.5	4.8	41.5	15.1	132.5
12/04/92	13:18	63.0	155.0	4.8	41.0	15.1	132.5
12/04/92	13:19	64.0	155.5	4.8	40.5	15.1	133.0
12/04/92	13:20	63.5	153.5	4.8	38.5	15.1	134.0
12/04/92	13:21	67.0	152.0	4.8	41.0	15.0	133.8
12/04/92	13:22	72.5	151.0	4.8	48.0	15.0	132.9
12/04/92	13:23	75.5	149.5	4.8	57.5	15.0	132.6
12/04/92	13:24	77.5	149.5	4.8	57.5	15.0	133.4
12/04/92	13:25	76.5	147.0	4.8	53.0	15.1	134.0
12/04/92	13:26	73.5	149.5	4.8	47.0	15.1	134.5
12/04/92	13:27	74.5	153.5	4.8	44.0	15.1	135.1
12/04/92	13:28	105.0	147.0	4.8	54.5	15.0	130.3
12/04/92	13:29	168.5	142.5	4.8	182.5	15.0	116.0
12/04/92	13:30	210.0	147.5	4.9	434.0	14.9	109.4
12/04/92	13:31	202.0	152.0	5.0	536.0	14.8	112.6
12/04/92	13:32	176.0	149.5	5.0	474.5	14.7	120.8
12/04/92	13:33	162.5	143.5	5.1	356.0	14.7	129.0
12/04/92	13:34	235.0	145.0	5.0	352.5	14.7	118.4
12/04/92	13:35	297.0	155.5	5.0	646.5	14.7	108.4
12/04/92	13:36	277.0	161.0	5.1	793.5	14.6	111.5
12/04/92	13:37	222.5	159.0	5.0	647.5	14.7	118.6
12/04/92	13:38	180.0	147.0	5.0	452.0	14.8	123.9
12/04/92	13:39	168.5	137.5	4.8	313.0	15.0	123.9
12/04/92	13:40	191.0	138.0	4.9	312.5	14.9	123.9
12/04/92	13:41	171.0	142.5	5.0	411.5	14.7	124.9

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                              RUN # 5 DATA LISTING

NAME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME             HC       SO2       CO2       CO        O2       NOX
CHAN UNITS           PPM       PPM        %        PPM        %       PPM
FULL SCALE         100.0     400.0     20.0     500.0     25.0    9000.0
ZERO OFFSET          0.0       0.0      0.0       0.0      0.0       0.0
START / CHANNEL       01        02       03        04       05        06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/04/92  13:42    143.0     141.5      5.0     397.5     14.7     128.5
12/04/92  13:43    123.0     139.0      5.1     311.0     14.7     134.6
12/04/92  13:44    101.0     140.5      5.1     209.0     14.7     137.4
12/04/92  13:45    107.5     145.0      5.0     192.0     14.7     134.1
12/04/92  13:46    111.0     145.5      5.0     222.5     14.7     132.6
12/04/92  13:47    109.0     143.5      4.9     192.0     14.9     133.5
12/04/92  13:48    109.5     145.5      4.9     153.0     14.8     135.0
12/04/92  13:49     81.0     143.5      4.9     139.0     14.8     135.5
12/04/92  13:50     84.0     139.0      4.9     130.0     14.9     136.1
12/04/92  13:51    127.5     137.0      4.9     164.5     14.8     131.0
12/04/92  13:52    126.5     125.5      4.3     262.0     15.6     110.4
12/04/92  13:53    148.0     135.5      4.8     310.5     14.9     124.9
12/04/92  13:54    118.0     137.0      4.8     263.5     15.0     125.8
12/04/92  13:55     96.0     132.0      4.6     202.0     15.2     122.1
12/04/92  13:56    100.5     128.0      4.7     167.0     15.1     127.9
12/04/92  13:57     93.5     131.5      4.9     160.5     14.9     132.3
12/04/92  13:58     97.0     133.0      5.0     180.0     14.7     134.8
12/04/92  13:59    130.0     128.5      5.0     191.0     14.7     131.3
12/04/92  14:00    190.0     130.0      5.0     349.0     14.7     118.6
12/04/92  14:01    210.0     133.0      5.0     563.5     14.6     114.8
12/04/92  14:02    193.0     131.0      5.0     567.5     14.7     117.8

Averages:           96.5     146.1      4.8     138.4     15.0     128.1
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                         Macasphalt - NAPA

                       RUN # 6 DATA LISTING

NAME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS, TENNESSEE
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME              HC      SO2       CO2       CO       O2      NOX
CHAN UNITS            PPM      PPM        %       PPM        %      PPM
FULL SCALE          100.0    400.0     20.0    500.0     25.0   9000.0
ZERO OFFSET           0.0      0.0      0.0      0.0      0.0      0.0
START / CHANNEL        01       02       03       04       05       06
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/04/92  14:50  147.5    130.5      3.6    231.5     16.2     93.1
12/04/92  14:51  146.0    150.0      4.2    222.5     15.4    104.5
12/04/92  14:52  145.5    145.5      4.2    160.0     15.5    105.4
12/04/92  14:53  138.0    143.5      4.4    183.5     15.3    106.8
12/04/92  14:54  127.0    144.5      4.5    212.0     15.3    109.5
12/04/92  14:55  113.5    145.0      4.6    185.5     15.2    113.5
12/04/92  14:56  100.0    144.0      4.7    158.5     15.1    117.3
12/04/92  14:57   89.5    143.5      4.6    129.5     15.1    115.9
12/04/92  14:58   91.0    142.5      4.5    112.0     15.4    112.0
12/04/92  14:59   93.5    145.0      4.5    124.0     15.4    111.0
12/04/92  15:00   93.0    143.0      4.6    135.0     15.4    111.8
12/04/92  15:01   95.0    146.0      4.6    136.0     15.3    111.9
12/04/92  15:02   99.0    146.5      4.7    136.5     15.3    112.4
12/04/92  15:03  105.5    144.5      4.7    145.0     15.3    111.3
 2/04/92  15:04  109.5    141.5      4.7    157.5     15.3    110.4
 2/04/92  15:05  116.5    140.5      4.7    176.0     15.2    108.9
12/04/92  15:06  123.0    140.5      4.8    199.0     15.2    108.4
12/04/92  15:07  136.0    140.5      4.8    211.5     15.2    107.1
12/04/92  15:08  165.5    140.5      4.8    277.0     15.1     99.8
12/04/92  15:09  178.5    139.5      4.9    378.0     15.0    101.9
12/04/92  15:10  196.0    141.0      5.0    419.0     15.0    100.3
12/04/92  15:11  190.0    138.5      4.9    455.5     15.1    101.1
12/04/92  15:12  169.5    133.5      4.9    405.0     15.2     99.8
12/04/92  15:13  148.5    127.0      4.7    324.5     15.3    100.8
12/04/92  15:14  130.0    121.0      4.7    257.0     15.4    102.4
12/04/92  15:15  120.5    121.5      4.6    194.5     15.5    104.6
12/04/92  15:16  118.5    122.0      4.6    161.0     15.5    106.1
12/04/92  15:17  128.5    121.0      4.6    157.0     15.5    106.1
12/04/92  15:18  144.5    125.0      4.7    212.0     15.2    104.0
12/04/92  15:19  143.5    128.5      4.9    268.0     15.1    106.3
12/04/92  15:20  137.5    129.0      4.9    254.5     15.1    108.4
12/04/92  15:21  138.0    124.5      4.9    232.5     15.1    107.5
12/04/92  15:22  139.5    121.0      4.9    242.5     15.1    104.4
12/04/92  15:23  138.5    119.5      4.9    255.5     15.2    104.1
12/04/92  15:24  132.0    124.0      4.9    246.5     15.2    105.4
12/04/92  15:25  124.0    122.5      4.8    223.0     15.2    106.3
12/04/92  15:26  119.5    123.5      4.8    202.5     15.3    107.8
12/04/92  15:27  117.0    123.0      4.8    185.5     15.2    108.8
12/04/92  15:28  115.0    120.0      4.8    176.0     15.2    110.8
12/04/92  15:29  108.5    116.5      4.8    160.5     15.2    113.3
 2/04/92  15:30  100.0    123.0      4.8    138.5     15.2    115.6
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                              Macasphalt - NAPA

                           RUN # 6 DATA LISTING

NAME:  RAMCON ENVIRONMENTAL   LOCATION:  MEMPHIS, TENNESSEE
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
CHAN NAME            HC      SO2       CO2       CO        O2      NOX
CHAN UNITS          PPM      PPM        %       PPM         %      PPM
FULL SCALE        100.0    400.0      20.0    500.0      25.0   9000.0
ZERO OFFSET         0.0      0.0       0.0      0.0       0.0      0.0
START / CHANNEL      01       02        03       04        05       06
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
12/04/92  15:31    94.5    126.0       4.9    122.0      15.2    117.1
12/04/92  15:32    90.5    124.0       4.9    112.5      15.2    117.8
12/04/92  15:33    92.5    123.0       4.9    110.0      15.1    118.8
12/04/92  15:34    96.0    125.0       5.0    116.5      15.0    119.0
12/04/92  15:35    96.0    123.5       5.0    127.5      15.0    119.3
12/04/92  15:36    93.0    120.0       4.9    126.5      15.2    114.9
12/04/92  15:37    90.5    122.5       4.8    119.5      15.3    115.0
12/04/92  15:38    89.0    120.5       4.8    115.0      15.3    115.6
12/04/92  15:39    88.5    120.5       4.8    113.5      15.3    116.4
12/04/92  15:40    95.5    120.0       4.8    113.5      15.3    115.1
12/04/92  15:41   103.5    120.5       4.8    134.5      15.3    112.3
12/04/92  15:42   100.5    127.5       4.7    147.0      15.4    108.0
12/04/92  15:43    97.5    124.0       4.5    135.5      15.6    101.4
12/04/92  15:44    95.0     95.5       3.5    143.5      16.8     82.1
12/04/92  15:45   113.0    120.5       4.7    168.0      15.4    107.6
12/04/92  15:46   109.5    127.0       4.7    166.0      15.4    108.5
12/04/92  15:47    95.5    124.5       4.6    132.0      15.5    109.9
12/04/92  15:48    84.0    122.5       4.8    113.0      15.2    115.5
12/04/92  15:49    79.5    122.0       4.8     99.5      15.2    118.8
12/04/92  15:50    80.0    124.5       4.9     89.5      15.1    122.9
12/04/92  15:51    79.0    125.5       4.8     84.5      15.2    121.5
12/04/92  15:52    78.5    125.5       4.8     82.0      15.2    120.8
12/04/92  15:53    75.0    130.0       4.8     83.5      15.2    122.3
12/04/92  15:54    69.5    137.0       4.8     78.0      15.2    132.4
12/04/92  15:55    68.0    134.0       4.9     72.5      15.1    134.0
12/04/92  15:56    68.0    132.5       4.9     66.5      15.1    133.3
12/04/92  15:57    67.0    131.0       4.9     59.0      15.1    130.3
12/04/92  15:58    70.5    132.0       4.9     55.5      15.1    125.4

Averages:         112.1    129.9       4.7    172.9      15.3    111.2
```

IX. FIELD DATA

B. GAS CHROMATOGRAPHY

FIELD ANALYSIS DATA SHEETS

Plant MACASPHALT Date 12-2-92

Location MELBOURNE FL.

1. General Information:

Source temp. (°C) ____
Probe temp. (°C) ____
Ambient temp. (°C) ____
Atmospheric press. (in. Hg) ____
Source press. (in. Hg) ____
Absolute source press. (mm) ____
Sampling rate (liter/min) .600 l/m
Sample loop volume (ml) 1 mL
Sample loop temp. (°C) 75C
Dilution gas flow rate (ml/min) —

Columnar temperature:
Initial (°C)/time (min) 75C
Program rate (°C/min) —
Final (°C)/time (min) 75C
Carrier gas flow rate (ml/min) 40 ml/min
Detector temperature (°C) ____
Injection time (24-hr basis) ____
Chart speed (mm/min) NA
Dilution ratio NA
Dilution gas used (symbol) NA

2. Field Analysis Data:

Run # 1 Time ____ 1st CONDENSABLES

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
INT 1	METHANE	26.01	32	—	17,027
2	METHANE	19.89	32	—	13,022
3	METHANE	6.39	32	—	4,187
4	METHANE	7.18	32	—	4,704
5	METHANE	6.46	32	—	4,233

Run # 1 Time ____

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
6	METHANE	4.85	32	—	3,180

Run # ____ Time ____

Components	Area	Attenuation	A x A Factor	Concentration (ppm)

FIELD ANALYSIS DATA SHEETS

Plant MACASPHALT Date 12-3-92

Location MELBOURNE FL

1. General Information:

Source temp. (°C)		Columnar temperature:	
Probe temp. (°C)		Initial (°C)/time (min)	75C
Ambient temp. (°C)		Program rate (°C/min)	–
Atmospheric press. (in. Hg)		Final (°C)/time (min)	75C
Source press. (in. Hg)		Carrier gas flow rate (ml/min)	40 ml/min
Absolute source press. (mm)		Detector temperature (°C)	
Sampling rate (liter/min)	.600 l/m	Injection time (24-hr basis)	
Sample loop volume (ml)	1 mL	Chart speed (mm/min)	NA
Sample loop temp. (°C)	75C	Dilution ratio	NA
Dilution gas flow rate (ml/min)	–	Dilution gas used (symbol)	NA

2. Field Analysis Data: 1st PAH

Run # 1 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
INJ 1	METHANE	7.61	32	–	BTDL
2	METHANE	17.29	32	–	BTDL
3	METHANE	8.74	32	–	BTDL
4	METHANE	14.33	32	–	BTDL
5	METHANE	10.34	32	–	BTDL

Run # 1 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
6	METHANE	7.68	32	–	BTDL
7	METHANE	7.51	32	–	BTDL
8	METHANE	5.72	32	–	BTDL
9	METHANE	0.00	32	–	BTDL
10	METHANE	8.78	32	–	BTDL

Run # 1 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
11	METHANE	6.84	32	–	BTDL
12	METHANE	0.00	32	–	BTDL
13	METHANE	0.00	32	–	BTDL
14	METHANE	7.76	32	–	BTDL
15	METHANE	0.00	32	–	BTDL

FIELD ANALYSIS DATA SHEETS

Plant MAC ASPHALT Date 12-3-92

Location MELBOURNE FL

1. General Information:

Source temp. (°C)		Columnar temperature:	
Probe temp. (°C)		Initial (°C)/time (min)	75 C
Ambient temp. (°C)		Program rate (°C/min)	—
Atmospheric press. (in. Hg)		Final (°C)/time (min)	75 C
Source press. (in. Hg)		Carrier gas flow rate (ml/min)	40 cc/min
Absolute source press. (mm)		Detector temperature (°C)	
Sampling rate (liter/min)	.600 L/m	Injection time (24-hr basis)	
Sample loop volume (ml)	1 mL	Chart speed (mm/min)	NA
Sample loop temp. (°C)	75 C	Dilution ratio	NA
Dilution gas flow rate (ml/min)	—	Dilution gas used (symbol)	NA

2. Field Analysis Data: 2nd Condensables + PAH

Run # 2 Time

Components	Area	Attenuation	A x A Factor	Concentration (ppm)
INJ 1 MATHANE	8.25	32	—	BTDL 1.65
2 METHANE	0.00	32	—	BTDL
3 METHANE	6.18	32	—	BTDL 1.24
4 METHANE	6.27	32	—	BTDL 1.26
5 METHANE	30.50	32	—	6.135

Run # Time

Components	Area	Attenuation	A x A Factor	Concentration (ppm)
6 METHANE	0.00	32	—	BTDL
7 METHANE	0.00	32	—	BTDL
8 METHANE	0.00	32	—	BTDL
9 METHANE	0.00	32	—	BTDL
10 METHANE	0.00	32	—	BTDL

Run # Time

Components	Area	Attenuation	A x A Factor	Concentration (ppm)
11 METHANE	0.00	32	—	BTDL
12 METHANE	12.78	32	—	BTDL 2.57
13 METHANE	5.23	32	—	BTDL 1.05

FIELD ANALYSIS DATA SHEETS

Plant MACASPHALT

Date 12-4-92

Location MELBOURNE FL.

1. General Information:

Source temp. (°C)		Columnar temperature:	
Probe temp. (°C)		Initial (°C)/time (min)	75 C
Ambient temp. (°C)		Program rate (°C/min)	—
Atmospheric press. (in. Hg)		Final (°C)/time (min)	25 C
Source press. (in. Hg)		Carrier gas flow rate (ml/min)	40 ml/min
Absolute source press. (mm)		Detector temperature (°C)	
Sampling rate (liter/min)	.600 ml/min	Injection time (24-hr basis)	
Sample loop volume (ml)	1 ml	Chart speed (mm/min)	NA
Sample loop temp. (°C)	75 C	Dilution ratio	NA
Dilution gas flow rate (ml/min)	—	Dilution gas used (symbol)	NA

2. Field Analysis Data: 3rd CONDENSABLES + PAH

Run # 3 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
INJ 1	METHANE	16.68	32	—	14.487
2	METHANE	12.26	32	—	14.820
3	METHANE	0.00	32	—	BTDL
4	METHANE	0.00	32	—	BTDL
5	METHANE	0.00	32	—	BTDL

Run # 3 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
6	METHANE	0.00	32	—	BTDL
7	METHANE	0.00	32	—	BTDL
8	METHANE	0.00	32	—	BTDL
9	METHANE	14.24	32	—	13.084
10	METHANE	21.41	32	—	17.206

Run # 3 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
11	METHANE	17.41	32	—	14.907
12	METHANE	19.64	32	—	16.189
13	METHANE	9.03	32	—	10.089
14	METHANE	0.00	32	—	BTDL
15	METHANE	8.90	32	—	10.015

FIELD ANALYSIS DATA SHEETS

Plant MACASPHALT Date 12-4-92

Location MELBOURNE FL.

1. General Information:

Source temp. (°C)		Columnar temperature:	
Probe temp. (°C)		Initial (°C)/time (min)	75C
Ambient temp. (°C)		Program rate (°C/min)	–
Atmospheric press. (in. Hg)		Final (°C)/time (min)	75C
Source press. (in. Hg)		Carrier gas flow rate (ml/min)	40 ml/min
Absolute source press. (mm)		Detector temperature (°C)	
Sampling rate (liter/min)	.600 ml/min	Injection time (24-hr basis)	
Sample loop volume (ml)	1 ml	Chart speed (mm/min)	NA
Sample loop temp. (°C)	75C	Dilution ratio	NA
Dilution gas flow rate (ml/min)	–	Dilution gas used (symbol)	NA

2. Field Analysis Data: 1st FORMALDEHYDE

Run # 1 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
INJ 1.	METHANE	8.75	32	–	10.043
2	METHANE	8.90	32	–	10.051
3	METHANE	0.00	32	–	BTOL
4	METHANE	9.46	32	–	10.336
5	METHANE	0.00	32	–	BTOL

Run # 1 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
6	METHANE	0.00	32	–	BTOL

Run # Time

Components	Area	Attenuation	A x A Factor	Concentration (ppm)

FIELD ANALYSIS DATA SHEETS

Plant MACASPHALT Date 12-4-92

Location MELBOURNE FL

1. General Information:

Source temp. (°C)		Columnar temperature:	
Probe temp. (°C)		Initial (°C)/time (min)	75C
Ambient temp. (°C)		Program rate (°C/min)	—
Atmospheric press. (in. Hg)		Final (°C)/time (min)	75C
Source press. (in. Hg)		Carrier gas flow rate (ml/min)	40 ml/min
Absolute source press. (mm)		Detector temperature (°C)	
Sampling rate (liter/min)	.600 ml/min	Injection time (24-hr basis)	
Sample loop volume (ml)	1 ml	Chart speed (mm/min)	NA
Sample loop temp. (°C)	75C	Dilution ratio	NA
Dilution gas flow rate (ml/min)	—	Dilution gas used (symbol)	NA

2. Field Analysis Data: 2nd FORMALDEHYDE

Run # 2 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
INJ 1	METHANE	7.38	32	—	9.141
2	METHANE	0.00	32	—	BTDL
3	METHANE	0.00	32	—	BTDL
4	METHANE	7.18	32	—	9.026
5	METHANE	21.36	32	—	17.177

Run # 2 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
4	METHANE	105.38	32	—	65.478

Run # Time

Components	Area	Attenuation	A x A Factor	Concentration (ppm)

FIELD ANALYSIS DATA SHEETS

Plant MACASPHALT Date 12-4-92

Location MELBOURNE FL

1. General Information:

Source temp. (°C)		Columnar temperature:	
Probe temp. (°C)		Initial (°C)/time (min)	75C
Ambient temp. (°C)		Program rate (°C/min)	–
Atmospheric press. (in. Hg)		Final (°C)/time (min)	75C
Source press. (in. Hg)		Carrier gas flow rate (ml/min)	40 ml/min
Absolute source press. (mm)		Detector temperature (°C)	
Sampling rate (liter/min)	.600 ml/min	Injection time (24-hr basis)	
Sample loop volume (ml)	1 ml	Chart speed (mm/min)	NA
Sample loop temp. (°C)	75C	Dilution ratio	NA
Dilution gas flow rate (ml/min)	–	Dilution gas used (symbol)	NA

2. Field Analysis Data: 3rd FORMALDEHYDE

Run # 3 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
INJ 1	METHANE	19.12	32	–	15.89
2	METHANE	19.21	32	–	15.94
3	METHANE	64.91	32	–	43.363
4	METHANE	0.00	32	–	BTDL
5	METHANE	17.68	32	–	15.062

Run # 3 Time

	Components	Area	Attenuation	A x A Factor	Concentration (ppm)
6	METHANE	18.26	32	–	15.395

Run # Time

Components	Area	Attenuation	A x A Factor	Concentration (ppm)

IX. FIELD DATA

C. PAH

RAMCON ENVIRONMENTAL CORPORATION

Plant MacAsphalt (Pah)

Location Melbourne
Operator mw
Date 12/4
Run No. ~~12/4~~ 3
Sample Box No.
Meter Box No. Andersen
Meter H @ 1.852
C Factor .980
Pitot Tube Coefficient Cp .87

Ambient Temperature 58
Barometric Pressure 30.00
Assumed Moisture, % .18
Probe Length, m(ft) 6

	IMPG VOL. ml	SILICA GEL WEIGHT, g
FINAL	553	418.6
INITIAL	200	412.8
DIFFERENCE	353	5.8

Nozzle Identification No. .000576
Avg. Calibrated Nozzle Dia., (in.) .325/.325/.325
Probe Heater Setting 4
Leak Rate, m^3/min. (cfm) ~~.08~~ .018 @ 25"
Probe Liner Material ~~Pyrex~~ Quartz
Static Pressure, mm Hg (in. Hg)
Filter No. TS S00026

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1-1	8:11.30 8:15.15	20	237°	.66	4.97	181.804 184.5	72°	66°	237°	65°
2	8:19	20	241°	.65	4.4	188.1	78°	65°	237°	59°
3	8:22.45	15	253°	.45	3.05	191.3	85°	65°	242°	59°
4	8:26.30	16	255°	.47	3.18	194.5	94°	66°	250°	56°
5	8:30.15	16	262°	.47	3.18	197.7	101°	69°	252°	57°
6	8:34	15	266°	.46	3.12	200.9	106°	71°	251°	57°
7	8:37.45	12	269°	.35 ~~.44~~	2.37 ~~2.64~~	204.0	110°	74°	253°	58°
8	8:41.30	12	271°	.35	2.37	207.2	117°	76°	256°	57°
9	8:45.15	13	271°	.40	2.71	210.6	122°	79°	260°	58°
10	8:49	13	272°	.40	2.71	214.1	123°	82°	261°	59°
11	8:52.45	13	272°	.40	2.71	217.4	124°	85°	260°	61°
12	8:56.30	13	270°	.35	2.37	220.649	127°	87°	258°	61

6.75
Form #REC-05

MACASFT2

220

Form #REC-06

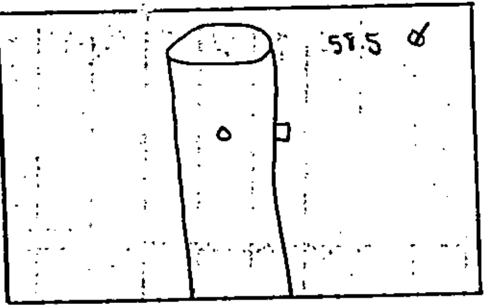
RAMCON emissions test log sheet, cont. DATE 12/4 LOCATION Macasphalt TEST NO. 3

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in H_2O)	ORFICE DIFF. PRESSURE ΔH (in H_2O)	222.302 GAS VOLUME Vm (ft³)	GAS SAMPLE TEMP. (°F)		SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
							in	out		
B2-1	10:41.30 / 10:45.15	15	250°	.45	3.05	~~222.086~~ / 225.7	79°	75°	252°	65°
2	10:49	15	255°	.45	3.05	229.1	85°	75°	243°	65°
3	10:52.45	15	259°	.45	3.05	232.5	98°	76°	230°	64°
4	10:56.30	14	264°	.41	2.78	236.1	107°	77°	229°	65°
5	11:00.15	14	269°	.37	2.5	239.2	119°	81°	242°	65°
6	11:04	13	271°	.35	2.37	242.3	124°	83°	253°	64°
7	11:07.45	12	273°	.27	1.83	245.2	129°	86°	259°	65°
8	11:11.30	12	278°	.24	1.62	247.7	130°	89°	265°	65°
9	11:15.15	12	279°	.21	1.42	250.2	131°	91°	270°	66°
10	11:19	11	280°	.20	1.35	252.6	131°	94°	268°	62°
11	11:22.45	12	282°	.23	1.56	255.1	132°	96°	263°	57°
12	11:26.30	12	284°	.23	1.56	257.761	139°	98°	259°	58°

RAMCON ENVIRONMENTAL CORPORATION

Plant Mac Asphalt (Pah)

Location Melbourne, Fla
Operator mw
Date 12/3
Run No. 1
Sample Box No.
Meter Box No. Andersen
Meter H @ 1.852
C Factor .980
Pitot Tube Coefficient Cp .84



Schematic of Stack Cross Section

Ambient Temperature 66
Barometric Pressure 30.02
Assumed Moisture, % 21
Probe Length, m(ft) 6
Nozzle Identification No. .000576
Avg. Calibrated Nozzle Dia., (in.) .325/.325/.325
Probe Heater Setting 4
Leak Rate, m³/min. (cfm)
Probe Liner Material ~~Pyrex~~ Quartz
Static Pressure, mm Hg (in. Hg)
Filter No. TS 6332

	IMPINGER VOL. ml	SILICA GEL WEIGHT, g
FINAL	570	302
INITIAL	200	293.7
DIFFERENCE	370	8.3

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in. H2O	PRESSURE DIFF. ORF. MTR in. H2O	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1-1	10:25 10:28.45	17	243°	.32	2.04	26.858 24.6	91°	71°	224°	65°
2	10:32.30	23	254°	.41	2.61	32.8	100°	72°	226°	55°
3	10:36.15	22	259°	.39	2.48	35.7	106°	74°	228°	58°
4	10:40	21	262°	.35	2.23	38.8	110°	78°	232°	59°
5	10:43.45	19	270°	.34	2.16	41.8	117°	82°	237°	61°
6	10:47.30	20	272°	.37	2.36	44.992	124°	84°	244°	62°
7	10:57 11:00.45	14	283°	.27	1.72	45.490 48.3	105°	88°	234°	63°
8	11:04.30	13	287°	.25	1.59	50.8	114°	88°	236°	61°
9	11:08.15	12	286°	.21	1.34	53.3	119°	89°	237°	61°
10	11:12	10	285°	.20	1.27	55.7	120°	90°	237°	64°
11	11:15.45	11	286°	.22	1.90	58.1	121°	92°	237°	64°
12	11:19.30	13	285°	.25	1.59	60.740	123°	94°	237°	64°

MACASFT2

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 12/3 LOCATION Macasphalt TEST NO. 1

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in H$_2$O)	ORFICE DIFF. PRESSURE ΔH (in H$_2$O)	GAS VOLUME Vm (ft.^{3})	GAS SAMPLE TEMP. (°F)		SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
							In	Out		
B 2-1	11:38 / 11:41.45	14	281°	.45	2.87	61.250 / 64.5	103°	92°	225°	65°
2	11:45.30	24	290°	.52	3.31	68.1	119°	92°	226°	61°
3	11:49.15	23	287°	.51	3.25	71.8	125°	93°	236°	60°
4	11:52.30	24	290°	.60	3.83	75.8	129°	94°	236°	62°
5	11:56.15	24	291°	.61	3.89	79.8	133°	96°	237°	63°
6	12:00	24	292°	.63	4.02	83.9	135°	97°	236°	64°
7	12:03.45	24	290°	.68	4.33	88.0	137°	99°	236°	64°
8	12:07.30	24	289°	.61	3.89	92.0	138°	100°	237°	64°
9	12:11.15	24	288°	.57	3.64	96.0	139°	101°	244°	63°
10	12:15	24	277°	.53	3.38	99.7	139°	102°	247°	62°
11	12:18.45	24	280°	.50	3.19	103.6	138°	102°	257°	63°
12	12:22.30	20	283°	.38	2.42	106.679	137°	102°	247°	64°
										15.25
										18.13
										45.93
										78.81

RAMCON ENVIRONMENTAL CORPORATION

Plant Macasphalt (Pat)

Location Melbourne, Fla
Operator mw
Date 12/3
Run No. 2 0
Sample Box No.
Meter Box No. Anderson
Meter H @ 1.852
C Factor .980
Pitot Tube Coefficient Cp .84

Schematic of Stack Cross Section

Ambient Temperature 66
Barometric Pressure 30.02
Assumed Moisture, %
Probe Length, m(ft) 6

	IMPINGER VOL. ml	SILICA GEL WEIGHT, g
FINAL	525	318.2
INITIAL	200	311.8
DIFFERENCE	325	6.4

Nozzle Identification No. .0005241
Avg. Calibrated Nozzle Dia., (in.) .310/.310/.310
Probe Heater Setting 4
Leak Rate, m^3/min. (cfm) .017 @ 15"
Probe Liner Material Pyrex Quartz
Static Pressure, mm Hg (in. Hg)
Filter No. TS 60 6333

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1-1	12:55 / 12:58.45	6	259°	.25	1.32	107.575 / 109.5	95°	88°	226°	65°
2	13:02.30	9	259°	.40	2.12	112.7	110°	88°	246°	62°
3	13:06.15	12	260°	.53	2.82	116.1	116°	89°	254°	60°
4	13:10	13	260°	.61	3.29	119.9	125°	91°	260°	62°
5	13:13.45	10°	261°	.49	2.33	123.0	129°	94°	256°	69°
6	13:17.30	9	262°	.41	2.18	126.2	129°	96°	253°	65°
7	13:21.15	8	263°	.32	1.70	128.933	130°	97°	250°	60°
8	15:04 / 15:07.45	6	255°	.20	1.06	131.1	80°	80°	260°	65°
9	15:21.00 / 15:24.95	9	264°	.38	2.02	134.0	95°	79°	225°	63°
10	15:28.30	9	265°	.36	1.91	136.9	107°	80°	239°	62°
11	15:32.15	9	264°	.36	1.91	139.7	111°	81°	251°	63°
12	15:36	10	269°	.38	2.02	142.681	108°	84°	258°	64°

28.5
32.2
36

MACASFT2

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 12/3 LOCATION Macasphalt TEST NO. 2

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in H_2O)	ORFICE DIFF. PRESSURE ΔH (in H_2O)	GAS VOLUME V_m (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
B 2-1	15:54.30 / 15:58.15	7	260°	.25	1.39	142.841 / 145.2	96°	89°	263°	65°
2	16:02	9	267°	.36	1.91	148.1	104°	89°	264°	64°
3	16:05.45	8	271°	.30	1.59	150.7	115°	89°	262°	62°
4	16:09.30	9	271°	.37	1.96	153.6	120°	91°	259°	60°
5	16:13.15	9	272°	.35	1.86	156.5	122°	92°	256°	60°
6	16:17	9	270°	.35	1.86	159.34	124°	94°	253°	61°
7	16:20.45	9	271°	.38	2.02	162.3	125°	95°	251°	61°
8	16:24.30	10	269°	.41	2.17	165.3	127°	96°	247°	61°
9	16:28.15	10	268°	.38	2.02	168.2	128°	97°	248°	62°
10	16:32	13	271°	.60	3.19	171.9	128°	98°	250°	62°
11	16:35.45	13	272°	.60	3.19	175.5	134°	99°	251°	62°
12	16:39.5	14	274°	.60	3.19	179.121	136°	100°	258°	63°

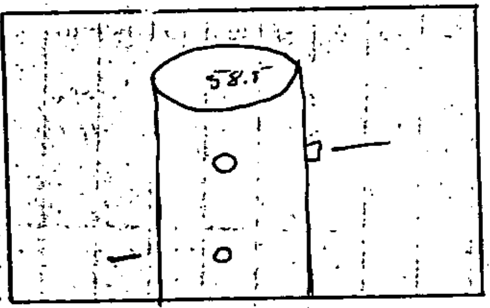
IX. FIELD DATA

D. PARTICULATE

RAMCON ENVIRONMENTAL CORPORATION

Plant MACASPhALT

Location Melbourne, FLA
Operator T.CRook
Date 12-2-92
Run No. 1
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.531
C Factor .987
Pitot Tube Coefficient Cp .84



Schematic of Stack Cross Section

Ambient Temperature 70
Barometric Pressure 30.01
Assumed Moisture, % .18
Probe Length, m(ft) 6Ft
Nozzle Identification No. .0004908
Avg. Calibrated Nozzle Dia., (in.) .30/.30/.30
Probe Heater Setting 4
Leak Rate, m3/min.(cfm) .009 AT 8"
Probe Liner Material PYRex
Static Pressure, mm Hg(in.Hg) ±.05
Filter No. T.S. 00018

	IMPING VOLU ml	SILICA GEL WEIGHT, g
FINAL	532	335.8
INITIAL	300	328.7
DIFFERENCE	232	7.1

2.5 MIN'S POINT CONDENSABLES

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
1	14:15 14:20.30	2	230	.35	1.4	531.198 532.9	80	74	259	67
2	14:23	3	231	.40	1.6	534.8	82	74	263	65
3	14:25.30	3	245	.36	1.4	536.6	86	74	268	62
4	14:28	2	253	.30	1.2	538.2	90	74	271	61
5	14:30.30	2	258	.26	1.0	539.8	92	74	266	62
6	14:33	2	262	.23	.93	541.2	94	76	259	62
7	14:35.30	2	261	.27	1.0	542.7	96	76	252	62
8	14:38	2	264	.28	1.1	544.3	98	76	246	61
9	14:40.30	3	265	.30	1.2	545.9	98	76	242	61
10	14:43	3	271	.30	1.2	547.6	100	78	240	61
11	14:45.30	2	274	.27	1.0	549.1	100	78	247	61
12	14:48	2	279	.27	1.0	550.6	100	78	254	62

Form #REC-05

MACASF1

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 12-2-92 LOCATION MACASPHALT TEST NO. 1

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in H_2O)	ORFICE DIFF. PRESSURE ΔH (in H_2O)	GAS VOLUME V_m (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
1	14:51 14:53.30	2	262	.23	.93	252.0	100	80	268	65
2	14:56	2	274	.27	1.0	553.5	100	80	272	60
3	14:58.30	3	288	.36	1.4	556.3	102	80	269	58
4	15:01	3	290	.37	1.5	557.2	102	80	265	58
5	15:03.30	3	291	.35	1.4	558.8	102	80	257	57
6	15:06	3	291	.30	1.2	560.6	102	80	251	56
7	15:08.30	3	291	.32	1.2	562.3	102	80	246	56
8	15:11	4	292	.45	1.8	564.3	102	80	244	56
9	15:13.30	4	291	.50	2.0	566.4	102	80	252	56
10	15:16	5	290	.60	2.4	568.8	102	80	258	56
11	15:18.30	5	289	.55	2.2	571.0	104	80	266	56
12	15:21	4	289	.50	2.0	573.234	104	80	270	57

RAMCON ENVIRONMENTAL CORPORATION

Plant MACASPLANT

Location Melbourne, FLA
Operator T. Crook
Date 12-3-92
Run No. 2
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.531
C Factor .987
Pitot Tube Coefficient Cp .84

Ambient Temperature 70
Barometric Pressure 30.02
Assumed Moisture, % 2
Probe Length, m(ft) 6 FT
Nozzle Identification No. .0004908
Avg. Calibrated Nozzle Dia., (in.) .30/.30/.30
Probe Heater Setting 4
Leak Rate, m³/min.(cfm) .015 AT 14"
Probe Liner Material PYREX
Static Pressure, mm Hg(in.Hg) +.05
Filter No. T.S.6575

	VOLUME ml	SILICA GEL WEIGHT, g
FINAL	460	427.4
INITIAL	300	422.5
DIFFERENCE	160	4.9

Schematic of Stack Cross Section

CONDENSABLES

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
1	14:59 / 15:01.30	4	230	.35	1.3	576.585 / 578.1	80	74	217	67
2	15:04	5	247	.40	1.5	580.0	82	74	224	66
3	15:06.30	6	251	.38	1.5	581.8	88	74	230	65
4 LOST POWER	15:10 / ~~15:10~~ 15:12.30	6	254	.38	1.5	582.7	90	74	232	65
5 LOST POWER	15:20 / 15:22.30	3	236	.30	1.1	584.9	82	74	204	67
6	15:25	4	265	.30	1.1	586.6	90	74	214	62
7	15:27.30	4	266	.30	1.1	588.1	92	74	227	61
8	15:30	4	265	.33	1.2	589.8	92	74	227	61
9	15:32.30	4	269	.27	1.0	591.3	94	74	231	62
10	15:35	4	270	.31	1.1	592.8	96	76	231	63
11	15:37.30	3	269	.26	9.7	594.3	96	76	237	65
12	15:40	8	273	.55	2.0	596.4	98	76	243	63

Form #REC-05

MACASFT1

228

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 12-3-92 LOCATION Melbourne, FLA TEST NO. 2

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP t_s (°F)	VELOCITY HEAD ΔP_s (in H_2O)	ORFICE DIFF. PRESSURE ΔH (in H_2O)	GAS VOLUME V_m (ft³)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
1	15:48 15:50.50	3	266	.22	.82	597.8	98	76	249	67
2	15:53	3	272	.25	.93	599.2	98	76	251	63
3	15:55.30	4	272	.30	1.1	600.7	98	76	249	60
4	15:58	4	271	.33	1.2	602.3	98	76	248	59
5	16:00.30	3	276	.23	.86	603.8	98	76	245	55
6	16:03	3	271	.25	.93	605.2	98	76	246	55
7	16:05.50	4	271	.33	1.2	606.7	98	76	246	54
8	16:08	6	271	.40	1.5	608.6	100	78	245	53
9	16:10.30	6	270	.45	1.7	610.5	100	78	244	53
10	16:13	6	268	.40	1.5	612.4	100	78	247	54
11	16:15.30	6	264	.45	1.7	614.5	100	78	248	55
12	16:18	6	255	.40	1.5	616.151	100	78	248	57

RAMCON ENVIRONMENTAL CORPORATION

Plant MACASPHALT
Location Melbourne, FLA
Operator T.C'Rook
Date 12-4-92
Run No. 3
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.531
C Factor .987
Pitot Tube Coefficient Cp .84

Ambient Temperature 50
Barometric Pressure 30.00
Assumed Moisture, % .20
Probe Length, m(ft)
Nozzle Identification No. .0004908
Avg. Calibrated Nozzle Dia., (in.) .30/.30/.30
Probe Heater Setting 4
Leak Rate, m^3/min. (cfm) .019 AT 9"
Probe Liner Material PYREX
Static Pressure, mm Hg (in. Hg) +.05
Filter No. TS.00025

	[illegible] VOLUME, ml	SILICA GEL WEIGHT, g
FINAL	482	400.1
INITIAL	300	392.4
DIFFERENCE	182	7.7

Schematic of Stack Cross Section

CONDENSABLES

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H_2O	PRESSURE DIFF. ORF. MTR in H_2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
1	8:26 8:28.30	4	254	.38	1.5	618.419 620.0	66	60	262	60
2	8:31	7	261	.50	2.1	622.2	72	60	265	55
3	8:33.30	6	264	.47	1.9	624.3	74	60	268	54
4	8:36	5	264	.35	1.4	626.2	78	62	270	58
5	8:38.30	5	266	.35	1.4	627.9	80	62	262	60
6	8:41	5	268	.34	1.4	629.7	82	62	250	59
7	8:43.30	3	266	.23	.94	631.1	84	64	247	57
8	8:46	3	269	.20	.84	632.5	86	64	242	56
9	8:48.30	3	269	.17	.71	633.8	86	64	252	56
10	8:51	3	271	.18	.75	635.1	88	66	257	56
11	8:53.30	3	271	.20	.84	636.5	88	66	261	57
12	8:56	3	272	.22	.92	638.0	90	68	261	57

Form #REC-05

MACASFT1

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 12-4-92 LOCATION MALASPHALT TEST NO. 3

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP Ts (°F)	VELOCITY HEAD ΔPs (in H2O)	ORFICE DIFF. PRESSURE ΔH (in H2O)	GAS VOLUME Vm (ft.3)	GAS SAMPLE TEMP. (°F)		SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
							in	out		
1	9:08 9:10.30	4	264	.35	1.4	639.7	88	70	250	58
2	9:13	4	270	.35	1.4	641.5	90	70	243	56
3	9:15.30	4	271	.34	1.4	643.3	92	70	230	52
4	9:18	4	272	.31	1.3	645.0	92	70	232	53
5	9:20.30	4	274	.30	1.3	646.7	94	70	227	54
6	10:41 10:43.30	3	241	.20	.84	648.2	82	~~64~~ 74	270	67
7	10:46	4	248	.30	1.3	649.8	88	74	267	66
8	10:48.30	4	255	.35	1.5	651.6	90	74	266	63
9	10:51	6	258	.45	1.9	653.7	94	74	260	61
10	10:53.30	6	257	.50	2.1	655.9	94	74	257	60
11	10:56	6	262	.50	2.1	658.0	98	76	253	61
12	10:58.30	6	265	.50	2.1	660.240	98	76	250	61

IX. FIELD DATA

E. FORMALDEHYDE

RAMCON ENVIRONMENTAL CORPORATION

Plant MACASPAACT
Location Melbourne, FLA
Operator T-CRook
Date 12-4-92
Run No. 1
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.531
C Factor .587
Pitot Tube Coefficient Cp .84

Ambient Temperature 70
Barometric Pressure 30.00
Assumed Moisture, % .20
Probe Length, m(ft) 6FT
Nozzle Identification No. .0004908
Avg. Calibrated Nozzle Dia., (in.) .30/.30/.30
Probe Heater Setting 4
Leak Rate, m3/min.(cfm) .007 @ 9"
Probe Liner Material PYREX
Static Pressure, mm Hg(in.Hg) +.05
Filter No. NA

	VOLUME ml	SILICA GEL WEIGHT, g
FINAL	430	360.6
INITIAL	200	353.7
DIFFERENCE	230	6.9

Schematic of Stack Cross Section

FORMALDEHYDE

3 MW POINTS TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	10:49 10:52	3	251	.34	1.4	662.55 664.4	90	80	N/A	68
2	10:55	4	270	.35	1.5	666.6	98	82	N/A	65
3	10:58	4	276	.33	1.4	668.8	102	82	N/A	62
4	11:01	3	279	.30	1.2	670.7	102	82	N/A	61
5	12:04	2	279	.22	.92	672.5	104	82	N/A	62
6	12:07	2	273	.22	.92	674.3	104	84	N/A	61
7	12:10	3	257	.28	1.2	676.3	106	84	N/A	60
8	12:13	3	259	.28	1.2	678.3	108	84	N/A	59
9	12:16	4	252	.42	1.7	680.7	108	86	N/A	59
10	12:19	4	247	.35	1.5	683.0	110	86	N/A	59
11	12:22	3	247	.30	1.2	685.0	110	86	N/A	60
12	12:25	6	253	.50	2.1	687.6	110	86	N/A	60

MACASFT3

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 12-4-92 LOCATION [illegible] TEST NO. 1

FORMALDEHYDE

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP Ts (°F)	VELOCITY HEAD ΔPs (in H2O)	ORFICE DIFF. PRESSURE ΔH (in H2O)	GAS VOLUME Vm (ft.3)	GAS SAMPLE TEMP.(°F)		SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
							in	out		
B 1	12:28 12:31	4	259	.40	1.7	689.9	104	88	N/A	64
2	12:34	4	266	.42	1.7	692.4	108	88	N/A	62
3	12:37	4	271	.35	1.5	694.5	110	88	N/A	62
4	12:40	4	273	.37	1.5	696.8	110	88	N/A	62
5	12:43	4	275	.38	1.6	699.1	112	88	N/A	62
6	12:46	4	275	.35	1.5	701.4	112	88	N/A	61
7	12:49	3	276	.25	1.0	703.3	112	88	N/A	62
8	12:52	2	275	.22	.92	705.0	112	90	N/A	64
9	12:55	2	277	.17	.71	706.5	112	90	N/A	64
10	12:58	2	278	.20	.84	708.2	112	90	N/A	64
11	13:01	2	280	.20	.84	709.9	112	90	N/A	65
12	13:04	3	281	.23	.97	711.770	112	90	N/A	66

RAMCON ENVIRONMENTAL CORPORATION

Plant Macasphalt (DNPH)

Location Melbourne
Operator MW
Date 12/9
Run No. 2 ~~3~~
Sample Box No. 1
Meter Box No. Andersen
Meter H @ 1.852
C Factor .980
Pitot Tube Coefficient Cp .84

Schematic of Stack Cross Section

Ambient Temperature 70
Barometric Pressure 30.00
Assumed Moisture, % .18
Probe Length, m(ft) 6
Nozzle Identification No. .000576
Avg. Calibrated Nozzle Dia., (in.) .325/.325/.325
Probe Heater Setting 4
Leak Rate, m3/min. (cfm) .002 @ 15"
Probe Liner Material Quartz
Static Pressure, mm Hg (in.Hg)
Filter No. N/A

	IMPINGER VOL. ml	SILICA GEL WEIGHT, g
FINAL	440	436.1
INITIAL	200	429.8
DIFFERENCE	240	6.3

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (ΔPs) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft3	GAS SAMPLE TEMP. AT DRY GAS METER °F		FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
							Inlet	Outlet		
A 1-1	13:03 / 13:05.30	4	275°	.35	2.37	258.274 / 260.4	92°	82°	N/A	52°
2	13:08	5	281°	.38	2.57	262.55	99°	83°	/	49°
3	13:10.30	5	281°	.40	2.71	264.79	102°	82°	/	50°
4	13:13	5	282°	.38	2.57	266.92	109°	83°	/	63°
6	13:15.30	5	283°	.42	2.85	269.16	114°	85°	/	67°
7	13:18	5	285°	.40	2.71	271.4	117°	86°	/	67°
8	13:20.30	5	285°	.44	2.98	273.74	119°	87°	/	67°
9	13:23	6	285°	.50	3.39	276.25	120°	88°	/	69°
10	13:25.30	6	287°	.50	3.39	278.715	123°	90°	/	68°
11	13:28	8	287°	.65	4.40	281.55	127°	93°	/	61°
12	13:36.30	8	287°	.65	4.40	284.495	130°	94°	/	62°

MACASFT3

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 12/4 LOCATION Macasphalt TEST NO. 3

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft.^{3})	GAS SAMPLE TEMP. (°F)		SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
							in	out		
B 2-1	13:34 / 13:36:30	6	279°	.50	3.39	287.599	117°	97°	N/A	67
2	13:39	6	286°	.53	3.59	289.47	124°	97°		67°
3	13:41.30	6	287°	.53	3.59	292.0	126°	98°		67°
4	13:44	5	286°	.46	3.12	294.4	129°	99°		67°
5	13:46.30	5	287°	.42	2.84	296.8	130°	100°		67°
6	13:49	4	287°	.30	2.03	298.7	129°	100°		65°
7	13:51.20	4	287	.30	2.03	300.69	129°	101°		69°
8	13:54	3	287°	.22	1.49	302.368	129°	101°		64°
9	13:56.30	3	285°	.22	1.49	304.0	127°	101°		64°
10	13:59	3	284°	.20	1.35	305.69	127°	101°		64°
11	14:01.30	3	283°	.20	1.35	307.3	126°	101°		65°
12	14:04	3	284°	.20	1.35	308.929	126°	101°		65°

RAMCON ENVIRONMENTAL CORPORATION

Plant MACASPLANT,
Location Melbourne, FLA
Operator T. CROSS
Date 12-4-92
Run No. 3
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.531
C Factor .587
Pitot Tube Coefficient Cp .84

Ambient Temperature 70
Barometric Pressure 30.00
Assumed Moisture, % .20
Probe Length, m(ft) 6 FT

	VOLUME ml	SILICA GEL WEIGHT, g
FINAL	480	425.2
INITIAL	200	419.8
DIFFERENCE	280	5.4

Nozzle Identification No. .0004/908
Avg. Calibrated Nozzle Dia., (in.) .30/.50/.50
Probe Heater Setting 4
Leak Rate, m^3/min. (cfm) .003 AT 23"
Probe Liner Material PYROX
Static Pressure, mm Hg (in. Hg) .05
Filter No. N/A

Schematic of Stack Cross Section

FORMALDEHYDE

TRAV. PT NO.	3 MIN POINTS SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (ΔPs) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft³	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	14:48 / 14:51	2	250	.25	1.0	712.028 / 713.8	102	94	NA	61
2	14:54	8	251	.53	2.2	716.3	104	92	NA	55
3	14:57	8	253	.50	2.1	718.9	104	92	NA	55
4	15:00	8	255	.50	2.1	721.6	102	90	NA	57
5	15:03	7	262	.47	1.9	724.1	102	90	NA	58
6	15:06	7	265	.45	1.9	726.7	104	90	NA	58
7	15:09	4	267	.32	1.3	728.8	108	90	NA	57
8	15:12	4	267	.28	1.1	730.9	110	92	NA	58
9	15:15	3	268	.25	1.0	732.6	112	92	NA	59
10	15:18	3	270	.25	1.0	734.5	114	92	NA	59
11	15:21	4	268	.27	1.1	736.4	114	92	NA	59
12	15:24	4	258	.32	1.3	738.4	116	92	NA	59

MACASFT3

Form #REC-06

RAMCON emissions test log sheet, cont. DATE 12-4-92 LOCATION MACASPHALT TEST NO. 3

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM ~~mm~~ Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in H_2O)	ORFICE DIFF. PRESSURE ΔH (in H_2O)	GAS VOLUME V_m (ft^3)	GAS SAMPLE TEMP. (°F)		SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
							in	out		
B1	15:26/15:29	3	251	.25	1.0	740.2	110	94	NA	61
2	15:32	3	267	.25	1.0	742.0	114	94	NA	53
3	15:35	3	266	.20	.84	743.7	114	94	NA	53
4	15:38	3	268	.20	.84	7454	114	94	NA	54
5	15:41	3	270	.25	1.0	747.2	114	94	NA	55
6	15:44	3	271	.25	1.0	749.0	114	94	NA	55
7	15:47	5	271	.38	1.6	751.3	116	94	NA	55
8	15:50	7	268	.45	1.9	753.8	116	92	NA	54
9	15:53	7	268	.42	1.7	756.3	116	92	NA	55
10	15:56	8	269	.50	2.1	758.8	116	92	NA	55
11	15:59	8	267	.50	2.1	761.5	116	92	NA	57
12	16:02	7	263	.46	1.9	764.113	116	92	NA	59

Form REC#03

DATA ON FACILITY BEING STACK TESTED

TODAY'S DATE: 12/2/92

COMPANY NAME MacAsphalt - 0408 COMPANY REP. Eddie Cota PHONE (407) 242-1732
LOCATION OF FACILITY Melbourne ORIGINAL START-UP DATE 72 Std Stee DESIGNED CAPACITY 6000# batch
OEM MODEL NO. TYPE AC TYPE

1 Time (24 HR) NOTE: check small box in column when moisture sample is taken	2 Fuel Use #6 ☒ Fuel Oil ☐ Nat. Gas ☐ Propane ☐ Coal __ other	3 Burner Setting %	4 Blower Pressure	5 Production Rate __ Mix Aggregate TPH	 __ RAP TPH	6 Asphalt Cement %	7 Mix Temp. °F	8 Baghouse ~~Exhaust~~ Gas Temp. °F	9 __ Venturi Scrubber X Baghouse Pressure Drop in w.g.	 Water Pressure psi	10 Ambient Temp. °F	11 Relative Humidity %	12 Exhaust Damper Position Draft
1420		60%		145	Type III	4.6	325°	315°	3				.09
1435		60%		145	Dist #MAC	4.6	320°	340°	3.5				.08
1455		95%		164	#4152	4.6	310°	350°	4				.162
1505		90%		164		4.6	340°	350°	4				.14
1520		65%		151		4.6	325°	345°	3.5				.12
12/3/92		~~65~~		~~127~~	Type III	~~4.6~~	~~340~~	~~315~~	~~4~~				~~.14~~
10:30		65		127		4.6	340	315	4		55		.14
10:45		80		137		4.6	340	330	4				.10
11:00		78		144		4.6	350	340	4.2				.13
11:15		82		148		4.6	325	350°	4				.10
11:30		95		150		4.6	320	340	4				.11
11:45		95		154		4.6	350	340	4				.13
12:00		95		150		4.6	340	320	4				.13
12:15		95		129	S-1	4.4	320	310	3.5				.13
12:30		80		150		4.4	335	305	3.5				.13
12:45		70		150		4.4	330	305	3.5				.12
1100		65		154		4.4	330	305	3.5				.10

Form REC#04

PAGE ___ OF ___

1	2	3	4	5		6	7	8	9		10	11	12
Time (24 HR) NOTE: check small box in column when moisture sample is taken	Fuel Use __#Fuel Oil__ __Nat. Gas___ Propane ___ Coal ___ other	Burner Setting	Blower Pressure	Production Rate __Mix __Aggregate TPH	__RAP TPH	Asphalt Cement %	Mix Temp. °F	Exhaust Gas Temp. °F	__Venturi Scrubber __Baghouse Pressure Drop in w.g.	Water Pressure psi	Ambient Temp. ___ ___ ___ °F	Relative Humidity ___ ___ ___ %	Exhaust Damper Position
1:15		65		150	S-1	4.4	335	305	3.5				.10
1:23 1:30	Shut-Down	60		154		4.4	330	310	3.5				.12
1:45	Plant Re-Started												
2:55 3:00		87		166	Type III	4.6	315	305	4				.13
3:15		60		154	S-1	4.4	320	315	3.5				.13
3:30		85		144	Type III	4.6	330	320	3.5				.12
3:45		90		154	S-1	4.4	325	320	3.5				.13
4:00		95		146			320	320	3.5				.13
4:15		95		154				320	3.5				.12
4:30		95		159				320	4				.12
4:40	Shut-Down	90		144				310	4				.13

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Form REC#03

DATA ON FACILITY BEING STACK TESTED

TODAY'S DATE: 12/4/92

COMPANY NAME______ COMPANY REP.______ PHONE (___)______
LOCATION OF FACILITY______ ORIGINAL START-UP DATE______ DESIGNED CAPACITY______
OEM______ MODEL NO.______ TYPE______ AC TYPE______

1	2	3	4	5		6	7	8	9		10	11	12
Time (24 HR) NOTE: check small box in column when moisture sample is taken	Fuel Use 6 #Fuel Oil ✓ Nat. Gas ___ Propane ___ Coal ___ ___ other	Burner Setting	Blower Pressure	Production Rate ___ Mix ___ Aggregate [✓ TPH]	___ RAP TPH	Asphalt Cement %	Mix Temp. °F	Baghouse Exhaust Gas Temp. °F	___ Venturi Scrubber ___ Baghouse Pressure Drop in w.g.	Water Pressure psi	Ambient Temp. °F	Relative Humidity %	Exhaust Damper Position
Plant Started 8:10 am													
8:15		95		159	5-1	4.4	325	240	4.5				0.12
8:30		95		152	51		335	320	4.5				0.14
8:45		95		150	51		310	320	4				0.12
9:00		95		150	5-1		325	320	3.5				.12
9:15	Plant Shut	88		150				325	3.5				.13
10:30	Restarted 10:35	~~65~~		—			—		—				—
10:45		65		140			295	310	4				.15
11:00		70		135			350	330	4				.11
11:15		95		152			325	330	4.5				.13
11:30		95		152			325	330	4.5				.13
11:45		95		152			320	315	4.5				.13
12:00		10		100	Lean mix		320	290	3				.13
12:15		20		100	"		320	290	3				.13
12:30		95		150	5-1		335	320	4				.12
12:45		90		150	5-1		325	325	4				.12
13:00		95		152	"		335	320	4				.14
13:15		95		152	"		325	320	4				.12

Form REC#04

12/4/92

PAGE ___ OF ___

1 Time (24 HR) NOTE: check small box in column when moisture sample is taken	2 Fuel Use __#Fuel Oil__ Nat. Gas___ Propane___ Coal ___ ______ other	3 Burner Setting	4 Blower Pressure	5 Production Rate __Mix __Aggregate TPH	5 Production Rate __RAP TPH	6 Asphalt Cement %	7 Mix Temp. °F	8 Exhaust Gas Temp. °F	9 __Venturi Scrubber __Baghouse Pressure Drop in w.g.	9 Water Pressure psi	10 Ambient Temp. °F	11 Relative Humidity %	12 Exhaust Damper Position
13 30		95		150	5.1	4.4	360	330	4				.13
13:45		20		152			335	330	5				.13
14:00		80		150			330	310	5				.13
~~1415~~	Shut-Down		14:06										
	Re Started		14:47										
1500		90		150			320	310	6				.12
1515		90		150			320	320	6				.11
1530		90		150			320	310	6				.10
1545		80		150			310	310	6				.15
16:00		90		150			315	320	5.5				.14

DATA SUMMARY ON STACK BEING TESTED

AGGREGATE

1. Name/type of mix ____________________
2. Name/type of 2nd mix (if used) ____________________
3. Type/temperature of Liquid Asphalt ____________________ / _____ °F
4. Sieve/Screening analysis: _______ % Passing; __________ Moisture on Aggregate

	1st mix / 2nd mix		1st mix / 2nd mix		1st mix / 2nd mix
1"	____/____	3/8"	____/____	#____	____/____
3/4"	____/____	#200	____/____	#____	____/____
1/2"	____/____	#____	____/____	#____	____/____

CONTROL SYSTEM

Manufacturer: Estee Model 10-612

@168 tph w/upto 50% RAP   Heat Input 59.9 (10⁶) Btu/hr   Nº6 Max 1.9%

A. **Baghouse**:

1. Type of bags: Nomex # of bags 528 Sq. ft. of bags __________
2. Air to cloth ratio: 4.07 to 1 Designed ACFM 65,000   35,000 DSCF:
3. Type of cleaning - pulse jet X reverse air _____ plenum pulse _____ other _____
4. Cleaning cycle time: 13 sec Interval between cleaning cycle: __________
5. Pulse pressure on cleaning cycle: 100 psi

B. **Scrubber**:

1. Type - Venturi: __________ Wet Washer: __________
   Spray Booth: __________ Other: __________
2. Gallons per minute through system: __________
3. Water source: __________ (i.e., pond, lagoon, etc.)
4. Number of spray nozzles: __________

Company Name: ____________________ Date: __________

Company Representative: ____________________

Name: Mr. Sumner Buck
Title: President

Qualifications: Mr. Buck is a graduate of the University of Mississippi with graduate studies at Memphis State University and State Technical Institute of Memphis. He is a graduate of the EPA 450 "Source Sampling for Particulate Pollutant's" course and the 474 "Continuous Emissions Monitoring" courses outlined by EPA at Research Triangle Park, N.C. He has been directly involved in conducting and supervising air emission testing for over 15 years. He has personally conducted over 400 air emission tests. He currently sponsors and directs visual emission certification schools for US EPA Method 9.

Project Duties: Mr. Buck is responsible for the overall supervision of each testing project. This includes the correspondence to the State Regulatory Agency and the plant personnel regarding scheduling, testing requirements, etc. He will assist in supervision of the project preparation for each team involved and the overall organization between the testing crew(s) and facility.

Name: Mr. Joe Sewell
Title: Vice President

Qualifications: Mr. Sewell is currently serving as the Vice President of RAMCON Environmental Corporation. Mr. Sewell is a graduate of Christian Brothers University in Memphis, Tennessee where he obtained a Bachelor of Science degree in Chemical Engineering. He has conducted and supervised air emissions testing projects ranging a broad spectrum of facility process categories. His accomplishments include the development of the instrumental branch of emissions testing utilizing continuous emission monitors and gas chromatography. Mr. Sewell performs a major role in the upgrading of testing capabilities and professional quality that RAMCON Environmental Corporation offers.

Project Duties: Mr. Sewell provides staff engineering and project administration to ensure the integrity of the requested services. He serves as the primary contact person for RAMCON Environmental Corporation handling all correspondence between the facility personnel involved in the project and respective state agency representative(s). He provides project leadership to RAMCON Environmental Corporation field supervisors and managers involved in the testing project.

Name: Mr. Ray Jenkins
Title: Source Sampling Director

Qualifications: Mr. Jenkins is serving as the Source Sampling Director for RAMCON Environmental Corporation. He was promoted to this leadership position after gaining a significant amount of experience in conducting and providing field supervision of a variety of air testing projects. Mr. Jenkins has personally conducted and/or supervised all of the prevalent EPA approved procedures with expertise in the instrumental analyzer procedures. He graduated from Memphis State University obtaining a Bachelor of Science degree in Biology. He is also currently certified to conduct US EPA Reference Method 9 for the visual determination of emission opacity.

Project Duties: Mr. Jenkins provides project leadership to the Team Leaders and Field Technicians. He ensures the test crew(s) involved in the test project will be properly informed to his respective duties and responsibilities during the testing process. Mr. Jenkins also serves as the Quality Assurance/Quality Control Coordinator and provides guidance in QA/QC to each Team Leader with regard to sample integrity.