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BARRIER VAPOR EXTRACTION SYSTEM
STARTUP TESTING
INDIAN BASIN REMEDIATION PROJECT
NEW MEXICO

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1.0 INTRODUCTION

Assessment at the Indian Basin Remediation Project identified dissolved hydrocarbons in Lower Queen groundwater at large distances downgradient of the known free-phase condensate plume. Since it's involvement in the project in 1994, Fluor Daniel GTI has worked to define the mechanism for these downgradient impacts to groundwater. It was postulated that migration of vapors from the free-phase condensate far exceeded the advancement of the free-phase itself. Theoretically, vapors could travel relatively large distances, condense and impact groundwater downgradient of the advancement of the free-phase. Pilot tests conducted in January 1995 to evaluate the effectiveness of vapor extraction for remediation of the vadose zone suggested effects of barometric pumping. This was an indication that vapor phase transport might be responsible for expansion of the dissolved contaminant plume.

Design of a Barrier Vapor Extraction System (BVES) was initiated in late 1995 to mitigate impacts to groundwater through the postulated vapor-transport mechanism. The system is intended to intercept, and remove from the subsurface, migrating vapors that could potentially condense and impact currently clean groundwater. The proposed system design includes several equipment compounds installed along the perimeter of the downgradient edge of the dissolved-phase plume (Figure 1).

In August 1996, Fluor Daniel GTI conducted a project summary to confirm that the regulatory and remediation strategy for the project remained appropriate. Existing data were reviewed, new information was collected, and the feasible regulatory exit strategies for the project were evaluated. The results of the project summary are documented in a report dated August 29, 1996.

Review of the vapor-transport mechanism and the BVES were components of the project summary. Several laboratory tests were conducted to test the ability of vapors to impact groundwater at the site. The tests showed that condensate in the more downgradient portion of the free-phase plume (MW-72) is orders of magnitude less volatile than more upgradient product (MW-86). This indicates a degraded, or weathered, product in areas distant from the source. As the condensate weathers, it is less able to impact groundwater because the more soluble components are lost. This suggested that vapor-phase migration may not be a major contributor to the spread of groundwater impacts at this site.

The BVES remained a recommended approach, but a phased installation with testing was proposed before full implementation of the system. This report documents construction of the first blower station, the startup testing and results.

2.0 SCOPE OF WORK

Marathon Oil Company (Marathon) completed installation of the northernmost blower station of the BVES. The layout of the system is shown on Figure 1.

The system consists of a Suterbilt 6L, 25 horsepower, 460 V blower with a 88-gallon moisture knockout, an outlet silencer, an inlet filter, and a vacuum relief valve. All vapor extraction components are trailer mounted. The system is designed to run continuously unless there is a power outage, or the high temperature sensor, high vacuum, or high level sensors in the knockout are triggered. The system is currently attached to five vapor extraction wells, VE-1 through VE-5, plus one monitor well, MW-61A. All vapor extraction piping is either 6" or 8" diameter. The vapor extraction wells are 7 7/8" diameter open-hole completions with an 8 5/8" conductor casing extending from depths ranging from 57.5 feet to 77.5 feet below ground surface (bgs) to just above ground surface. The total depths of the wells range from 168 feet to 214 feet bgs.

2.1 Construction Verification

Fluor Daniel GTI and a representative from Marathon verified construction of the system as described above on January 14, 1997. In addition, inspection of the system on January 20, 1997 prior to beginning the startup testing, revealed that a fresh air dilution valve had not been installed on the unit and the exhaust stack was shorter than air permit conditions allowed. Upon initiation of the startup testing on VE-1, a buried valve leading to a moisture pump-out line was identified to have not been closed during construction, allowing fresh air to enter the system. All other components of the vapor extraction system appeared to be operational.

On January 21, 1997, Marathon installed a fresh air dilution valve, closed and capped the pump-out line on the VE-1 pipe, lengthened the exhaust stack, and made various other minor system repairs.

2.2 Startup Testing

Testing of the system consisted of four distinct tests.

- Test 1: Short-term tests of individual extraction wells.
- Test 2: Long-term test on VE-1, including a step test.
- Test 3: Balancing the system flow rates.
- Test 4: Testing formation respiration.

Each test is described below.

Test 1: Short-term tests on extraction wells. Vacuum and contaminant concentrations at each extraction wellhead were taken prior to testing. The first short-term test was conducted on VE-1 on January 20, 1997. The valves to all wells except VE-1 were closed and the system was turned on. The

test was proposed to run until a steady state concentration of extracted vapors was reached. Steady state was reached almost immediately and the test was run for 90 minutes for confirmation. Start-up testing recommenced at 10:25 on January 21, 1997 with a short-term test on VE-3. Short-term tests on VE-2, VE-4, and VE-5 followed.

During the short-term testing, vacuum at the well head, influent flowrate and temperature, and effluent concentrations were all measured at 30-minute intervals. The concentration of oxygen, carbon dioxide, and methane were measured with a LandTech GA-90. Petroleum hydrocarbons, oxygen, and hydrogen sulfide were measured with a GasTech GT-302. The results of the short-term tests are given in Appendix A. An air sample was also collected at the conclusion of each short-term test and was sent to AEN Laboratories for analysis of TPH, BTEX by TO-14, and n-hexane by GC/FID. Analytical results are discussed in Section 3.0 and the lab reports are in Appendix B.

Test 2: Long-term test on VE-1. At 18:00 on January 21, 1997 the long-term test on VE-1 commenced. The test was conducted under full vacuum (dilution valve was 100% closed) and lasted 21.5 hours. Based on flow and photoionization detector (PID) concentration measurements, it appeared that the system reached steady state within the first three hours of operation. After 15 hours of operation, field monitoring detected methane in the effluent stream. Methane was present during the remainder of the test.

Pressure was measured at the wellhead of MW-66 and VE-2 during the test to determine if the vapor extraction system was causing influence. The vacuum reading upstream and downstream of the butterfly valve at the wellhead was reading approximately the same. It is likely that the valves on the VE-2 vapor extraction leg were leaking slightly. Therefore, the pressure measurements at VE-2 are not considered reliable.

After 21.5 hours, a step test was conducted by opening the fresh air dilution valve and reducing the vacuum at the blower to 2/3 of its full value. The flowrate stabilized almost immediately. The test was conducted for 45 minutes. An additional step test was then run by opening the knockout valve and reducing the blower vacuum to 1/3 of the maximum value. This test was also conducted for 45 minutes and the system appeared to stabilize almost immediately.

The results of the long-term test are shown in Appendix A. Figures 2-4 also contain pertinent information concerning the long-term test. The results presented in the figures are discussed in Section 4.0.

Test 3: Balance system flow rates. On January 23, 1997 all extraction wells were opened and the system was restarted. The intent was to balance the air flow evenly among all five wells. The flow from well VE-1, VE-2, and VE-3 was identical, but the flow from the combined VE-4,5 leg was lower. There was no way to increase the flow from the VE-4,5 leg without decreasing the flow from another leg so the system was left as it was. The steady state vacuum, flows, and concentrations were measured and are shown in Appendix A. An effluent air sample was collected after the balanced system was in operation for 45 minutes and was sent to AEN Laboratories for analysis of TPH, BTEX by TO-14, and n-hexane by GC/FID. The results of the effluent air sample are shown in Section 3.0 and in Appendix B.

Hydrocarbon concentration measured with a PID from the combined system showed a concentration almost equaling the maximum concentration recorded from any of the individual well tests. Additionally, the methane and carbon dioxide concentrations were much higher than in previous tests

from individual well, and the oxygen concentration was lower, indicating increased biological activity in the subsurface.

Test 4: Test formation respiration. Concurrent to the startup testing, a Baro-ball™ was installed on MW-73. A Baro-ball™ is a check valve that allows subsurface gas to be expelled from a well, while preventing air from entering the well bore through the surface casing. A 30-gallon plastic bag was taped over the effluent port of the device. The well was visited periodically during the day on January 22 to observe whether the bag inflated. Initially the bag was sucked into the device, which indicates that the check valve did not function properly. As the day progressed, the bag did inflate. At the maximum observed rate of inflation, it appeared that the flowrate leaving the Baro-ball™ was approximately 1 standard cubic foot of air per hour (SCFH).

During the testing on the Baro-ball™, the barometric pressure was being recorded. A weather station was setup at the Indian Basin Gas Plant which is located nearby. The weather station records the barometric pressure automatically at ten minute intervals. The data could be retrieved and then printed to give a continuous readout of the ambient barometric pressure in the vicinity of the test. Barometric pressure data are required to confirm when the effects of atmospheric pumping should be the most pronounced. Data were also collected during the Baro-ball™ testing and pilot testing in order to correlate some of the results that were observed. A total of 51 continuous hours of barometric pressure data were collected. The barometric pressure is tabulated in Appendix C. Figure 5 shows a graphical plot of the barometric pressure versus time.

The maximum rate of inflation did not occur at the time the lowest barometric pressure was recorded. It appeared that the maximum subsurface exhalation trailed the minimum barometric pressure by approximately 6-9 hours based on the Baro-ball™ data and the pressure measurements in well MW-66. It is speculated that up to 12 SCF of air may be expelled from well MW-73 per day, based on data collected during the test.

3.0 LABORATORY RESULTS

A total of six air samples were collected for laboratory analysis, one after each short-term test and one effluent sample with all wells open to the system. All air samples were analyzed by EPA Method TO-14 for volatile organic compounds, including benzene, toluene, ethylbenzene, and xylenes, total petroleum hydrocarbons, and for n-hexane by GC/FID. The pertinent results of the laboratory analyses are shown in Table 1. The complete analytical results are attached as Appendix B.

The laboratory results indicate that benzene, ethylbenzene, and xylenes were not detected. Toluene was detected at an extremely low concentration from the VE-5 sample. N-hexane was detected in all samples, except VE-5. Total petroleum hydrocarbons in the C_4-C_{12} range, exclusive of n-hexane, were only detected in the VE-1 sample.

There is an incongruity between the n-hexane value established by Method 8015 and TO-14. While EPA Method 8015 used n-hexane for calculations, TO-14 is an estimated value based on the EPA TIC calculation method. In all cases the value for n-hexane is lower by TO-14.

AEN reviewed the chromatograms associated with each method and concluded that the lower n-hexane results indicated by TO-14 should be used for air emission calculations. The chromatography is more discriminating and, or course, the mass spectrometer is more selective. Furthermore, the mass spectrometer reconstructed ion chromatograms show that there are substantially more peaks than was indicated by the 8015 methodology.

In future analyses the n-hexane will be quantified by TO-14. Chromatograms and a discussion of the laboratory results are included in Appendix B.

4.0 DATA EVALUATION

The following calculations were made from the field data collected. All calculations are for the steady-state operation of the system with all wells open. A general air flowrate equation was used to calculate the air flow:

$$(\textit{air velocity [ft/min]}) \times (\textit{pipe area [ft}^2\textit{]}) \times \frac{(\textit{standard temperature [°R]})}{(\textit{air temperature [°R]})} \times$$

$$\frac{(\textit{local atmospheric pressure [inches Hg]})}{(\textit{standard atmospheric pressure [inches Hg]})} = \textit{air flowrate (scfm)}$$

The steady-state influent flowrate was calculated as the sum of the individual pipe flowrates:

For VE-1

$$450\ ft/\text{min} \times 0.2\ ft^2 \times \frac{528\ °R}{533\ °R} \times \frac{26.32\ inches\ Hg}{29.92\ inches\ Hg} = 77\ scfm$$

For VE-2

$$450\ ft/\text{min} \times 0.2\ ft^2 \times \frac{528\ °R}{533\ °R} \times \frac{26.32\ inches\ Hg}{29.92\ inches\ Hg} = 77\ scfm$$

For VE-3

$$450\ ft/\text{min} \times 0.2\ ft^2 \times \frac{528\ ^\circ R}{533\ ^\circ R} \times \frac{26.32\ inches\ Hg}{29.92\ inches\ Hg} = 77\ scfm$$

For VE-4 and VE-5

$$225\ ft/\text{min} \times 0.35\ ft^2 \times \frac{528\ ^\circ R}{533\ ^\circ R} \times \frac{26.32\ inches\ Hg}{29.92\ inches\ Hg} = 68\ scfm$$

The total influent flowrate is:

$$(77\ scfm + 77\ scfm + 77\ scfm + 68\ scfm) = 299\ scfm$$

Note: scfm = standard cubic feet per minute

The following general equation was used to calculate the mass emission rate based on field PID concentrations:

$$(vapor\ flowrate\ [\frac{ft^3}{\text{min}}]) \times \frac{1\ lb\ mol\ TPH}{379\ ft^3\ TPH} \times \frac{86\ lb\ TPH}{1\ lb\ mol\ TPH} \times (vapor\ concentration\ [\frac{ft^3\ TPH}{1{,}000{,}000\ ft^3}]) \times$$

$$\frac{60\ \text{min}}{1\ hr} = mass\ emission\ rate\ (\frac{lb\ TPH}{hr})$$

The steady state mass emission rate, based on a PID measurement of 40.5 ppmv, was calculated to be:

$$(299\ [\frac{ft^3}{\text{min}}]) \times \frac{1\ lb\ mol\ TPH}{379\ ft^3\ TPH} \times \frac{86\ lb\ TPH}{1\ lb\ mol\ TPH} \times (40.5\ [\frac{ft^3\ TPH}{1{,}000{,}000\ ft^3}]) \times \frac{60\ \text{min}}{1\ hr} = 0.165\ \frac{lb\ TPH}{hr}$$

Note: assumes a molecular weight for TPH of 86 lb/lb mol

The steady state mass emission rate can also be calculated using the concentration obtained from the laboratory analysis of the combined effluent stream (1,800 µg/L TPH). The general equation that is used is:

$$(\textit{air flowrate } [\frac{ft^3}{min}]) \times (\textit{influent concentration } [\frac{\mu g}{L}]) \times \frac{28.32\ L}{ft^3} \times \frac{1\ lb}{454 \times 10^6\ \mu g} \times \frac{60\ min}{hr} =$$

$$\textit{mass emission rate } (\frac{lbs}{hr})$$

The calculated mass emission rate is:

$$(299\ [\frac{ft^3}{min}]) \times (1{,}800\ [\frac{\mu g}{L}]) \times \frac{28.32\ L}{ft^3} \times \frac{1\ lb}{454 \times 10^6\ \mu g} \times \frac{60\ min}{hr} = 2.01\ \frac{lb\ TPH}{hr}$$

Induced vacuum was not measured in the nearest monitoring well to the BVES (402 ft), so a definitive radius of influence from the BVES was not calculated (Figure 3). The lack of induced vacuum does not mean, however, that there was no air flow, which is the key to vapor extraction. Previous pilot testing indicated measured vacuum 200 feet away.

The following observations were made and results obtained from the startup testing.

- Well VE-1 had the highest field-measured contaminant levels, up to 55.3 ppmv.
- The hydrocarbon concentrations that were measured by the PID during the long-term test on well VE-1 were low and steady (Figure 2) indicating that the mass removal of the system is limited by the time necessary for contaminants to diffuse into continuous fractures.
- The LEL values did not correlate with the PID values. PID levels were low and LEL levels got as high as 52%. There were no analytes detected in the laboratory analyses that would be measured by the LEL and not by the PID. It is likely that methane, which is not detected with a PID, was contributing to the high LEL values. The presence of methane was confirmed by field measurements.
- No H_2S was detected from any well during the test.
- The vapor extraction system was able to deliver high vacuum to each well head.
- Step testing indicated that above 8 inches of mercury vacuum, flowrate increases decline rapidly. In addition, the rated capacity of the blower is 600 cfm, therefore additional wells can be hooked up to the system. Results of the step test are shown in Figure 4.

- There was no detectable vacuum response at well MW-66 during the test. All pressure fluctuations at the well were likely due to barometric pressure changes and not influenced from VE-1.
- Due to valve leakage, the induced vacuum measurements at VE-2 were not considered reliable.
- There is a significant amount of methane coming from the subsurface, indicating the anaerobic decay of hydrocarbons.
- Vapor extraction appears to be stimulating aerobic biodegradation in the subsurface.
- The mass removal rate from the combined system measured with field instruments during the test was 0.165 lbs/hr and the New Mexico Environment Department (NMED) air permit allows up to 57 lbs/hr to be emitted without vapor controls. The mass emission rate based on the laboratory data was 2.01 lbs/hr.
- The steady state flowrate measured during the test was 299 scfm. The NMED air permit allows up to 600 scfm per blower station.
- The Baro-ball™ demonstrated the exhalation of air from well MW-73 at a maximum observed rate of 1 SCFH. The check valve did not function properly, however, so air was drawn into the well also.
- No moisture was collected in the knockout drum during the test.
- All equipment functioned properly. The vacuum relief valve is slightly open due to the flow limited, high vacuum, conditions.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The following recommendations are provided to improve the performance and safety of the installed system.

- A filter should be installed on the vacuum relief valve to prevent dirt from being sucked directly into the blower.
- A battery powered sample pump is necessary to overcome vacuum in the lines so vapor samples from each well during combined system operation can be obtained.
- The dilution valve size should be increased from a two-inch to a four-inch valve to allow greater addition of dilution air.
- A 110 V service utility outlet should be installed at the treatment compound. The 110 V service is necessary to operate hand tools and sampling equipment.
- The components on the vapor extraction trailer downstream of the blower should be labeled with warning stickers alerting of high temperature hazard.

- A 0-200 inch H_2O magnehelic gauge should be utilized to make wellhead vacuum measurements. This gauge will allow greater accuracy and consistency of readings than the gauges currently installed.
- Based on an average per well flowrate of 70 scfm, approximately 8 wells can be hooked up to each blower station.
- Future equipment installations should follow the piping and instrumentation diagram and schematics that were presented to Marathon in the Draft Barrier Vapor Extraction System Design.

5.1 System Analysis and Future Strategy

The purpose of the BVES is to remove hydrocarbon vapors from the unsaturated zone along the leading edge of the liquid condensate plume in order to mitigate the threat of vapor migration. The northernmost station of the BVES was installed to evaluate mass removal rates, radius of influence, and variability of flowrate and concentration from well to well. The startup test proved that, mechanically, the vapor extraction system is working properly.

Laboratory testing in August 1996 identified widely varying volatility of the condensate in the free-phase. Along the leading edge of the liquid plume the volatility was low. Startup testing of the BVES confirms this, with low hydrocarbon concentrations in the effluent stream. It is also apparent that the wells connected to the system have a very low overall permeability to air. Therefore, the flowrate of air through the system is limited.

Based on the low ambient and low steady-state concentrations observed during the startup testing, it is concluded that vapor phase transport is not a significant threat to groundwater at the location of the test. To maximize the amount of contaminant mass removed for each dollar spent, remedial efforts should be conducted in the area of highest contaminant concentrations, and most volatile product. Although air flowrate limitations exist at the site, vapor extraction appears to remain the most feasible remedial technology given the geology and nature and distribution of the contaminant. The focus of vapor extraction should shift to removing as much hydrocarbon mass as possible from the fractured bedrock. This, combined with the current groundwater pumping and condensate recovery efforts, is the most effective way to reduce the potential migration of condensate.

To continue to gather technical and economic data on the feasibility of vapor extraction, the next phase of vapor extraction implementation is proposed in an area of the condensate plume where fresh, less degraded product is present. Figure 6 shows the location of five proposed vapor extraction wells along Rocky Arroyo, in the vicinity of MW-65A. It is proposed that the vacuum blower be moved from the existing compound to the proposed testing area along Rocky Arroyo. The system along Rocky Arroyo

should be operated for a minimum of two months to evaluate mass removal rate over time. Operation of the system in this area will provide valuable information for determination of the feasibility of full-scale vapor extraction.

The existing air permit for the BVES can be used for the allocated blower station. A letter should be submitted to the NMED notifying them of the relocated station.

Figure 2: Effluent concentration versus time for the long term test on VE-1

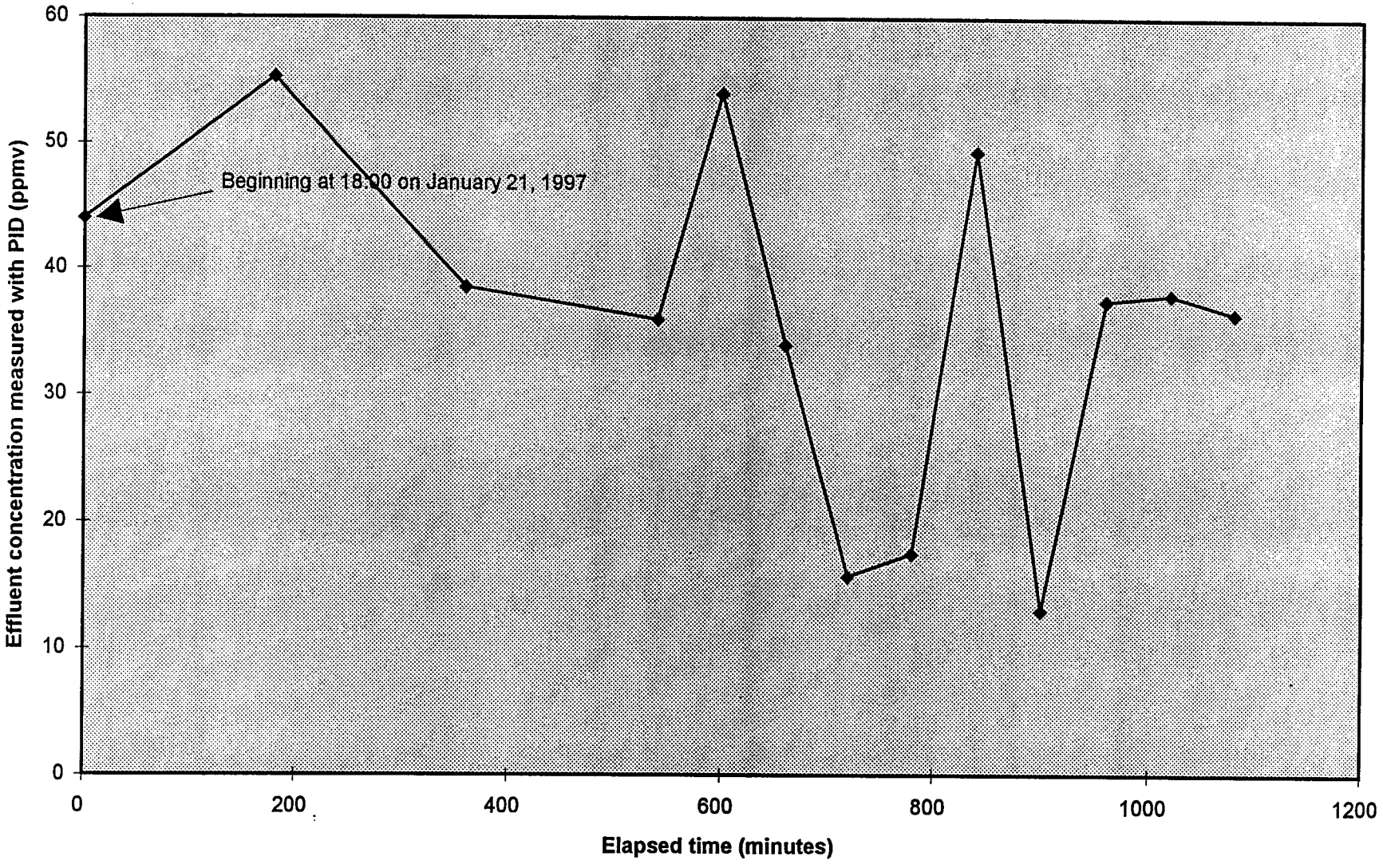


Figure 3: Induced vacuum in MW-66 for the long term test on VE-1

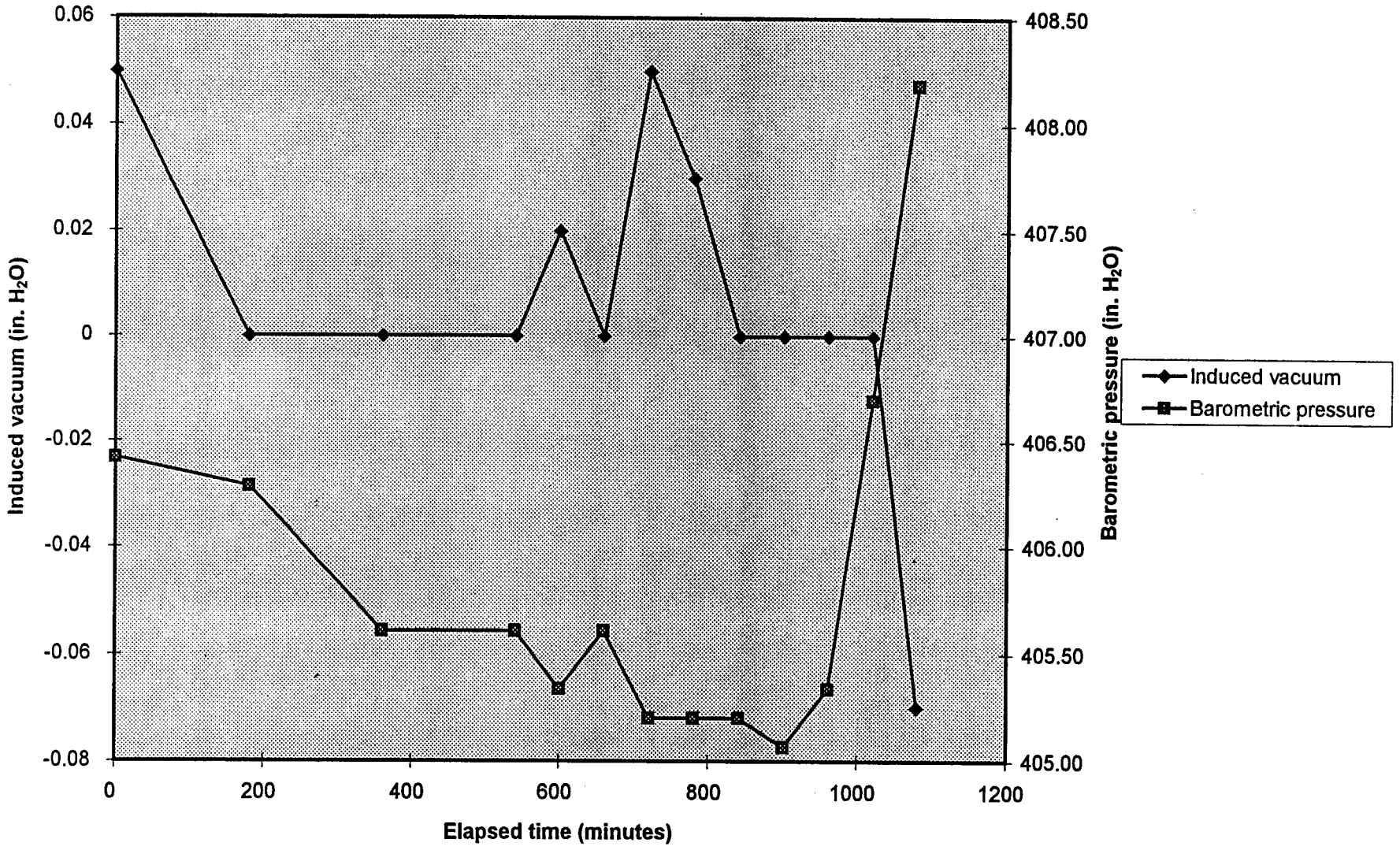


Figure 4: Step test results for VE-1

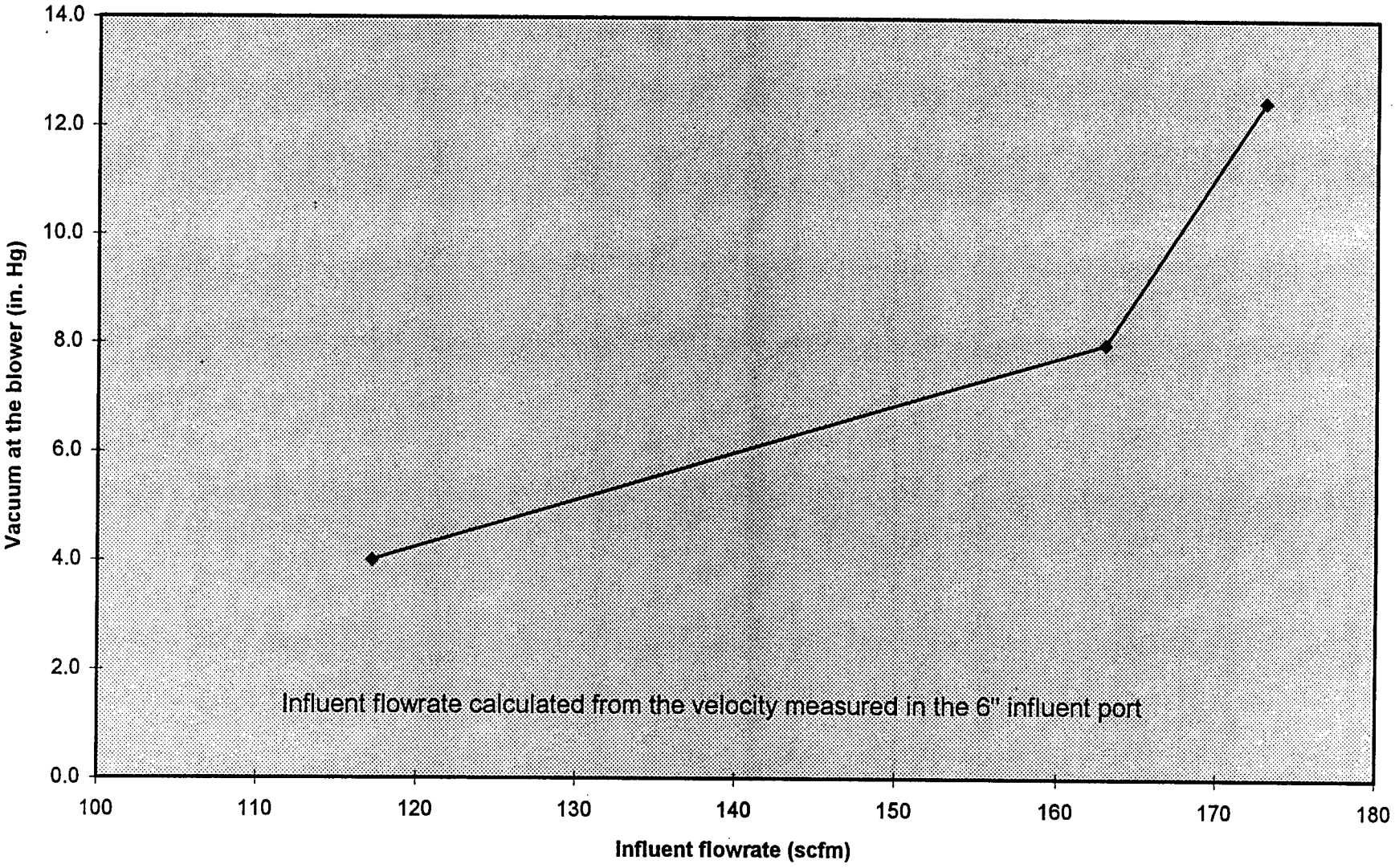


Figure 5: Barometric pressure at Indian Basin during start-up testing

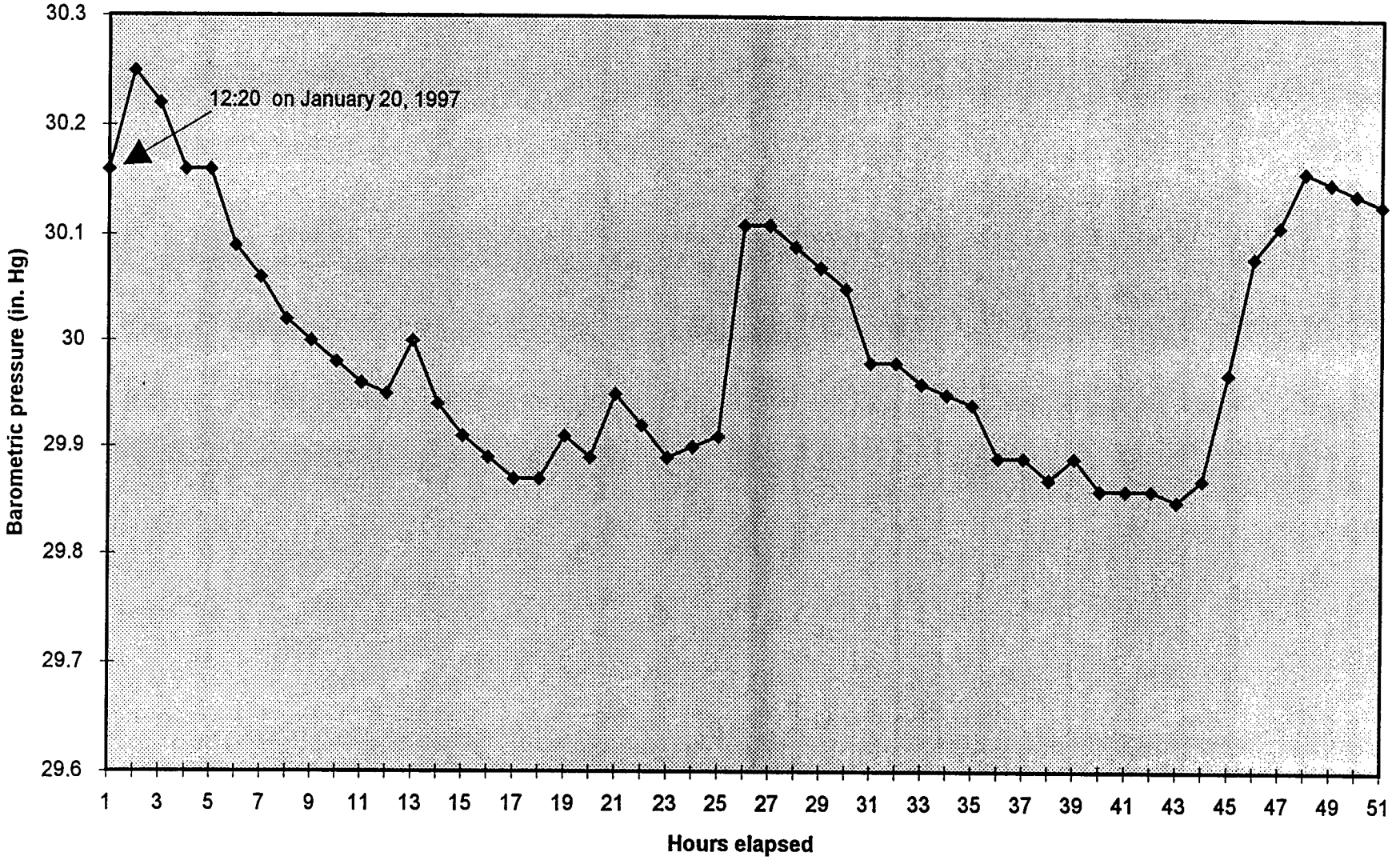


Table 1
Analytical results of air samples collected during start-up testing

	VE-1	VE-2	VE-3	VE-4	VE-5	Combined Effluent
Benzene	<1.7	<0.07	<0.07	<0.1	<0.07	<0.03
Toluene	<1.7	<0.07	<0.07	<0.1	0.1	<0.03
Ethylbenzene	<1.7	<0.07	<0.07	<0.1	<0.07	<0.03
Xylenes	<1.7	<0.07	<0.07	<0.1	<0.07	<0.03
TPH	1,590	960	680	390	<50	1,800
n-hexane	900	960	680	390	<50	1,800

All concentrations are in µg/L
Samples collected on January 20-23, 1997
Analyses conducted by American Environmental Network. See Appendix B for reports.

APPENDIX A

FIELD DATA

TEST WELL: VE-1 Lower Queen Bedrock

Measured by:	C. Briscoe, K. Rutherford

Distance from test well to monitoring point (Ft.)	
MW-66	VE-2
402'	758'

Date	Well	Time	Vacuum at Test Well (in. Hg)	Vacuum at Blower (in. Hg)	Flow from Test Well 6" pipe (in. FPM)	Influent Temp (oF)	Effluent PID (ppmv)	Effluent LEL (%)	Effluent CO_2 (%)	Effluent O_2 (%)	Effluent H_2S (%)	Effluent CH_4 (%)	Effluent Temp (oF)	Vacuum at Monitoring Points (in H_2O)	
														MW-66	VE-2
														15	15
1/20/97	VE-1	03:35		8.25	650	64		16	0	21.7	0	0			
		04:05		8.0	600	61		19	0	21.7	0	0			
		04:35	8	8.25	650	59		16	0	21.7	0	0			
	VE-3	10:55	14	13.7	600	60	1.1	0	0		0	0			
		11:25	14.5	13.75	600	61	2.3	0	0		0	0			
		11:55	14	13.5	600	64	0.9	0	0		0	0			
1/21/97	VE-1	21:00	12.0	12.0	650	49	44	28	0	21.7	0	0		0.05	0.65
1/22/97		00:00	11.5	10.4	750	40	55.3	30	0.3	21.7	0	0		0	0.65
		03:00	11.5	10.5	750	38	38.5	30	0.0	21.7	meter malf.	0		0	0.45
		06:00	11.5	9.5	750	32	36.0	30	0.1	21.0	meter malf.	0		0	0.85
		07:00	15	9.6	750	28	54.0	52	0.1	21.2	meter malf.	0		0.02	1.0
		08:00	12.5	10.0	750	41	34.0	24	0.1	20.5	meter malf.	0		0	1.0
		09:00	13.7	11.7	750	49	15.7	17	0.2	20.5	0	0.7		0.05	1.2
		10:00	12.25	12.0	750	58	17.5	19	0.2	20.6	0	1.0		0.03	1.2
		11:00	12.5	12.8	750	65	49.4	19	0.1	20.5	0	1.2		0	0.85
		12:00	12.5	13.3	750	68	13.0	22	0	20.5	0	0.8		0	0.35
		13:00	12.25	13.3	750	70	37.5	21	0	20.5	0	0.7		0	0.00
		14:00	12.2	13.4	750	70	38.0	22	0	20.5	0	0.8		0	-0.20
		15:00	12.0	13.5	750	67	36.5	22	0	20.5	0	1.0		-0.07	-0.15
		15:25	N/A	13.0	750	63	33.1	23	0	20.5	0	0.9		N/A	N/A
		15:45	N/A	8.0	700	62	31.0	12	0	20.8	0	0.3		N/A	N/A
		16:00	N/A	8.0	700	62	28.0	13	0	20.5	0	0.5		N/A	N/A
		16:15	N/A	7.7	700	60	33.3	14	0	20.5	0	0.7		N/A	N/A
		16:30	N/A	4.0	500	59	32.4	6	0	20.5	0	0.2		N/A	N/A
		16:45	N/A	4.0	500	59	40.0	5	0	20.5	0	0.2		N/A	N/A
		17:00	N/A	3.9	500	57	44.0	5	0	20.5	0	0.3		N/A	N/A
	VE-2	12:50	12.5	13.5	650	67	0.8	0	0		0	0			
		13:20	12.5	13.75	650	70	0.7	0	0		0	0			
		13:50	NA	13.5	650	68	1.2	0	0		0	0			
	VE-4	14:50	11.5	13.5	650	74	3.1	5.0	0		0	0			
		15:20	11.5	13.3	650	73	3.8	10.0	0		0	0			
		15:50	11.5	13.5	650	70	4.1	10.0	0		0	0			
	VE-5	16:30	12.5	13.0	650	64	2.3	0	0		0	0			
		17:00	12.5	13.0	650	60	2.3	10.0	0		0	0			
		17:30	12.5	13.0	650	57	4.1	10.0	0		0	0			

10:15 Started balancing system.

	VE-1	VE-2	VE-3	VE-4,5
Anometer Reading	450 fpm	450 fpm	450 fpm	225 fpm

Time	Vac. @ Blower	Influent Velocity	% LEL	% CO2	% CH4	% H2S	PID	Influent Temp	Effluent Discharge	O2%
10:50	13 in Hg	800 fpm	40	2	2.6	0	40.5	73oF	135oF	15

Sampled VES EFF taken @ 11:00

Vacuum at wells - Vacuum in In. Hg

VE-1	VE-2	VE-3	VE-4	VE-6
12.0	11.5	12.2	12.5	12.75

Notes:

1. There was water and/or sediment at the Tee where flow splits from VE-4 to VE-5
2. There was no good way to increase flow from VE-4 to VE-5 without restricting flow from other wells.
3. We did not have any instruments that would overcome the vacuum so we couldn't get individual leg concentrations.

APPENDIX B

LAB DATA

Figure 3: Induced vacuum in MW-66 for the long term test on VE-1

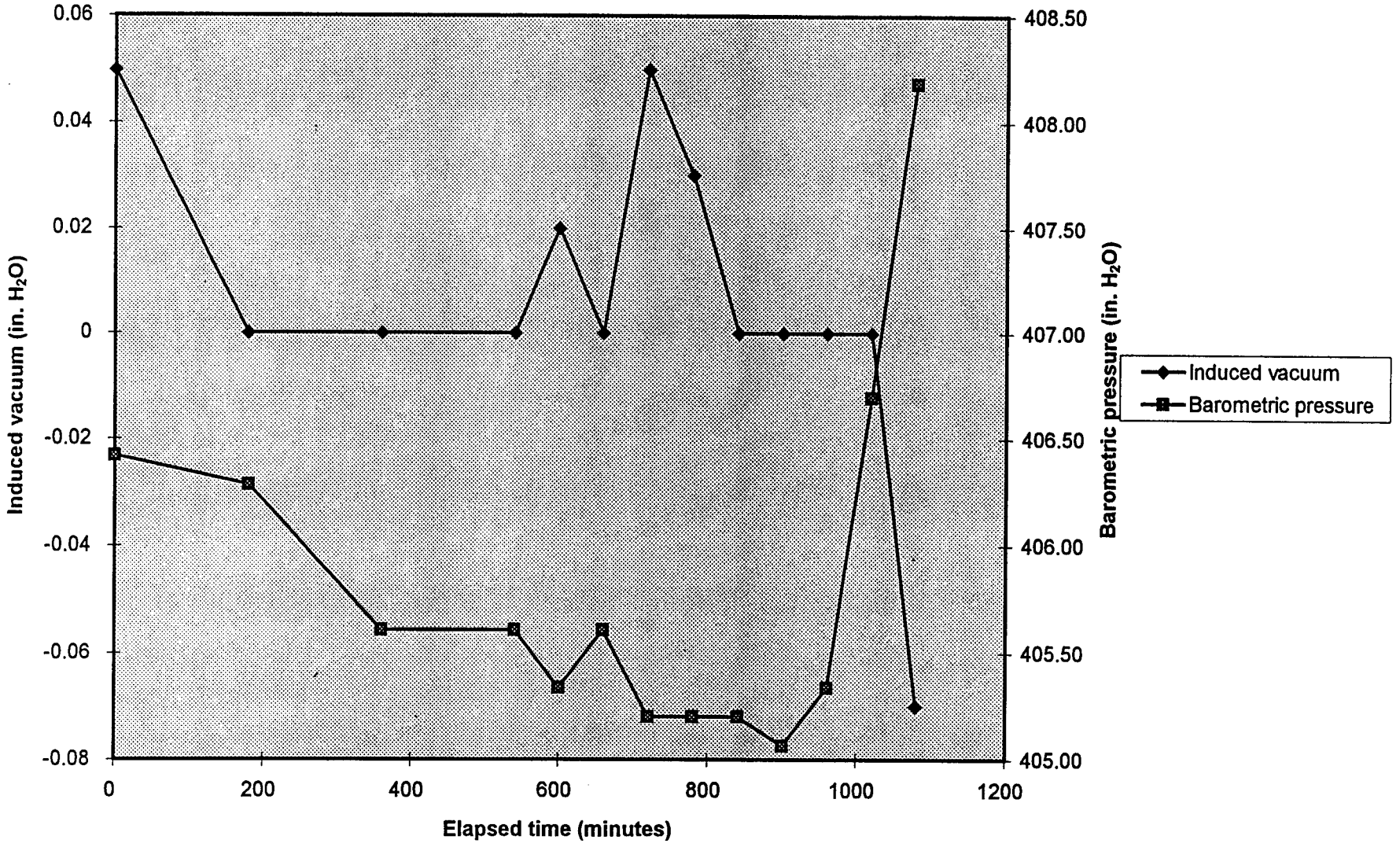


Figure 4: Step test results for VE-1

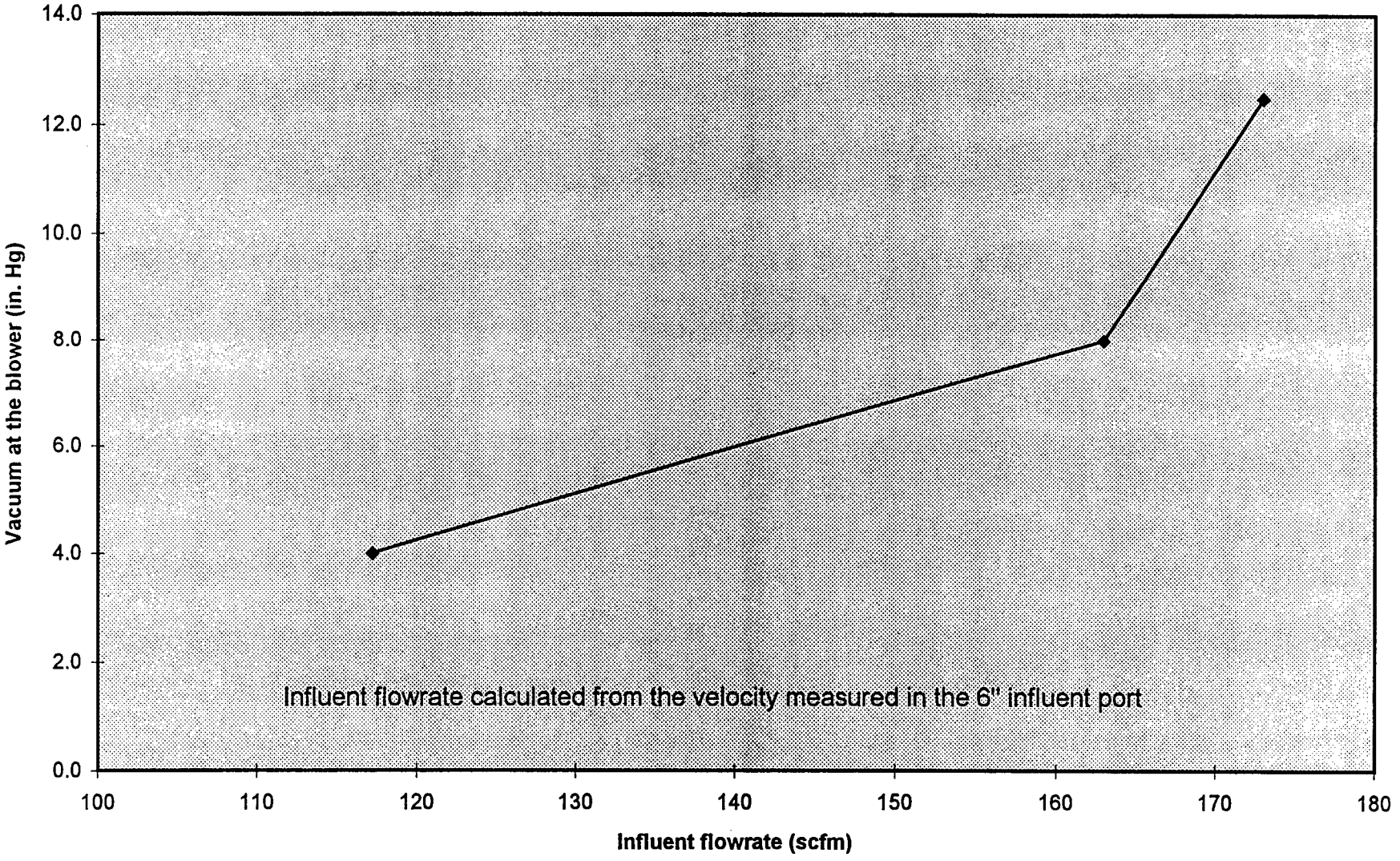


Figure 5: Barometric pressure at Indian Basin during start-up testing

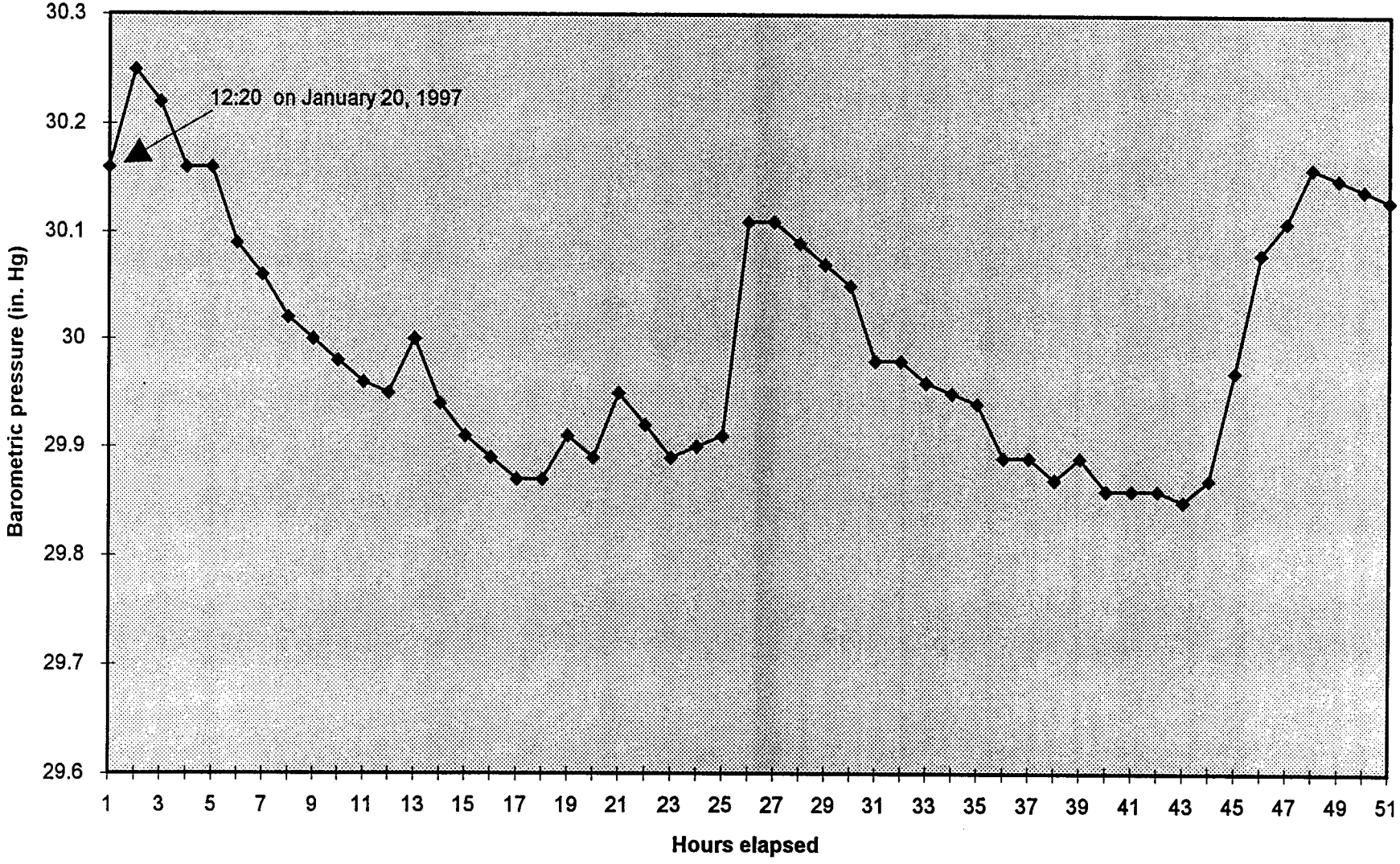


Table 1
Analytical results of air samples collected during start-up testing

	VE-1	VE-2	VE-3	VE-4	VE-5	Combined Effluent
Benzene	<1.7	<0.07	<0.07	<0.1	<0.07	<0.03
Toluene	<1.7	<0.07	<0.07	<0.1	0.1	<0.03
Ethylbenzene	<1.7	<0.07	<0.07	<0.1	<0.07	<0.03
Xylenes	<1.7	<0.07	<0.07	<0.1	<0.07	<0.03
TPH	1,590	960	680	390	<50	1,800
n-hexane	900	960	680	390	<50	1,800

All concentrations are in µg/L
Samples collected on January 20-23, 1997
Analyses conducted by American Environmental Network. See Appendix B for reports.

APPENDIX A

FIELD DATA

TEST WELL: VE-1 Lower Queen Bedrock

Measured by:	C. Briscoe, K. Rutherford

Distance from test well to monitoring point (Ft.)	
MW-66	VE-2
402'	758'

Date	Well	Time	Vacuum at Test Well (in. Hg)	Vacuum at Blower (in. Hg)	Flow from Test Well 6" pipe (in. FPM)	Influent Temp (oF)	Effluent PID (ppmv)	Effluent LEL (%)	Effluent CO2 (%)	Effluent O2 (%)	Effluent H_2S (%)	Effluent CH_4 (%)	Effluent Temp (oF)	Vacuum at Monitoring Points (in H_2O)	
														MW-66	VE-2
														15	15
1/20/97	VE-1	03:35		8.25	650	64		16	0	21.7	0	0			
		04:05		8.0	600	61		19	0	21.7	0	0			
		04:35	8	8.25	650	59		16	0	21.7	0	0			
	VE-3	10:55	14	13.7	600	60	1.1	0	0		0	0			
		11:25	14.5	13.75	600	61	2.3	0	0		0	0			
		11:55	14	13.5	600	64	0.9	0	0		0	0			
1/21/97	VE-1	21:00	12.0	12.0	650	49	44	28	0	21.7	0	0		0.05	0.65
1/22/97		00:00	11.5	10.4	750	40	55.3	30	0.3	21.7	0	0		0	0.65
		03:00	11.5	10.5	750	38	38.5	30	0.0	21.7	meter malf.	0		0	0.45
		06:00	11.5	9.5	750	32	36.0	30	0.1	21.0	meter malf.	0		0	0.85
		07:00	15	9.6	750	28	54.0	52	0.1	21.2	meter malf.	0		0.02	1.0
		08:00	12.5	10.0	750	41	34.0	24	0.1	20.5	meter malf.	0		0	1.0
		09:00	13.7	11.7	750	49	15.7	17	0.2	20.5	0	0.7		0.05	1.2
		10:00	12.25	12.0	750	58	17.5	19	0.2	20.6	0	1.0		0.03	1.2
		11:00	12.5	12.8	750	65	49.4	19	0.1	20.5	0	1.2		0	0.85
		12:00	12.5	13.3	750	68	13.0	22	0	20.5	0	0.8		0	0.35
		13:00	12.25	13.3	750	70	37.5	21	0	20.5	0	0.7		0	0.00
		14:00	12.2	13.4	750	70	38.0	22	0	20.5	0	0.8		0	-0.20
		15:00	12.0	13.5	750	67	36.5	22	0	20.5	0	1.0		-0.07	-0.15
		15:25	N/A	13.0	750	63	33.1	23	0	20.5	0	0.9		N/A	N/A
		15:45	N/A	8.0	700	62	31.0	12	0	20.8	0	0.3		N/A	N/A
		16:00	N/A	8.0	700	62	28.0	13	0	20.5	0	0.5		N/A	N/A
		16:15	N/A	7.7	700	60	33.3	14	0	20.5	0	0.7		N/A	N/A
		16:30	N/A	4.0	500	59	32.4	6	0	20.5	0	0.2		N/A	N/A
		16:45	N/A	4.0	500	59	40.0	5	0	20.5	0	0.2		N/A	N/A
		17:00	N/A	3.9	500	57	44.0	5	0	20.5	0	0.3		N/A	N/A
	VE-2	12:50	12.5	13.5	650	67	0.8	0	0		0	0			
		13:20	12.5	13.75	650	70	0.7	0	0		0	0			
		13:50	NA	13.5	650	68	1.2	0	0		0	0			
	VE-4	14:50	11.5	13.5	650	74	3.1	5.0	0		0	0			
		15:20	11.5	13.3	650	73	3.8	10.0	0		0	0			
		15:50	11.5	13.5	650	70	4.1	10.0	0		0	0			
	VE-5	16:30	12.5	13.0	650	64	2.3	0	0		0	0			
		17:00	12.5	13.0	650	60	2.3	10.0	0		0	0			
		17:30	12.5	13.0	650	57	4.1	10.0	0		0	0			

10:15 Started balancing system.

	VE-1	VE-2	VE-3	VE-4,5
Anometer Reading	450 fpm	450 fpm	450 fpm	225 fpm

Time	Vac. @ Blower	Influent Velocity	% LEL	% CO2	% CH4	% H2S	PID	Influent Temp	Effluent Discharge	O2%
10:50	13 in Hg	800 fpm	40	2	2.6	0	40.5	73oF	135oF	15

Sampled VES EFF taken @ 11:00

Vacuum at wells - Vacuum in In. Hg

VE-1	VE-2	VE-3	VE-4	VE-5
12.0	11.5	12.2	12.5	12.75

Notes:

1. There was water and/or sediment at the Tee where flow splits from VE-4 to VE-5
2. There was no good way to increase flow from VE-4 to VE-5 without restricting flow from other wells.
3. We did not have any instruments that would overcome the vacuum so we couldn't get individual leg concentrations.

APPENDIX B

LAB DATA

American Environmental Network, Inc.

March 20, 1997

To: Bob Menzie/Kyle Rutherford
From: Mitch Rubenstein

Subject: Review of TO-14 Data Vs. Mod. 8015 Data for Hexane

Bob,

The following table compares the 8015 data to an estimated value derived by a TIC search by GCMS.

Marathon Oil Company Data				
Comparison of 8015 (TO12) vs TO14 (estimated) Data				
SAMPLE		8015(Total)	8015(hexane)	TO14
		ug/L (=Mg/M ^{3})	ug/L (=Mg/M ^{3})	Mg/M^3
70351-01(VE3)		680	680	0.34
70351-02(VE1)		1590	900	8.00
70351-03(VE2)		960	960	0.41
70351-04(VE4)		390	390	0.47
70351-05(VE5)		ND	ND	N/A
70351-06(VE5 EFF)		1800	1800	12

As illustrated in the Table, there is an incongruity between the hexane value established by Method 8015 and TO14. While EPA Method 8015 used n-hexane for calculations, TO-14 is an estimated value based on the EPA TIC calculation method. In all cases the value for n-hexane is lower by TO-14.

In review of the chromatograms associated with each method, I believe that the lower n-Hexane results indicated by TO-14 should be used for air emission calculations. My rationale is that I believe that the chromatography was more discriminating and, of course, the mass spectrometer is more selective. Furthermore, in reviewing the mass spectrometer reconstructed ion chromatograms it is obvious that there are substantially more peaks than was indicated by the Mod. 8015 methodology.

2709-D Pan American Freeway, NE • Albuquerque, NM 87107 • (505) 344-3777 • Fax (602) 344-4413

In future analyses I will recommend that the n-hexane be quantified by TO-14.

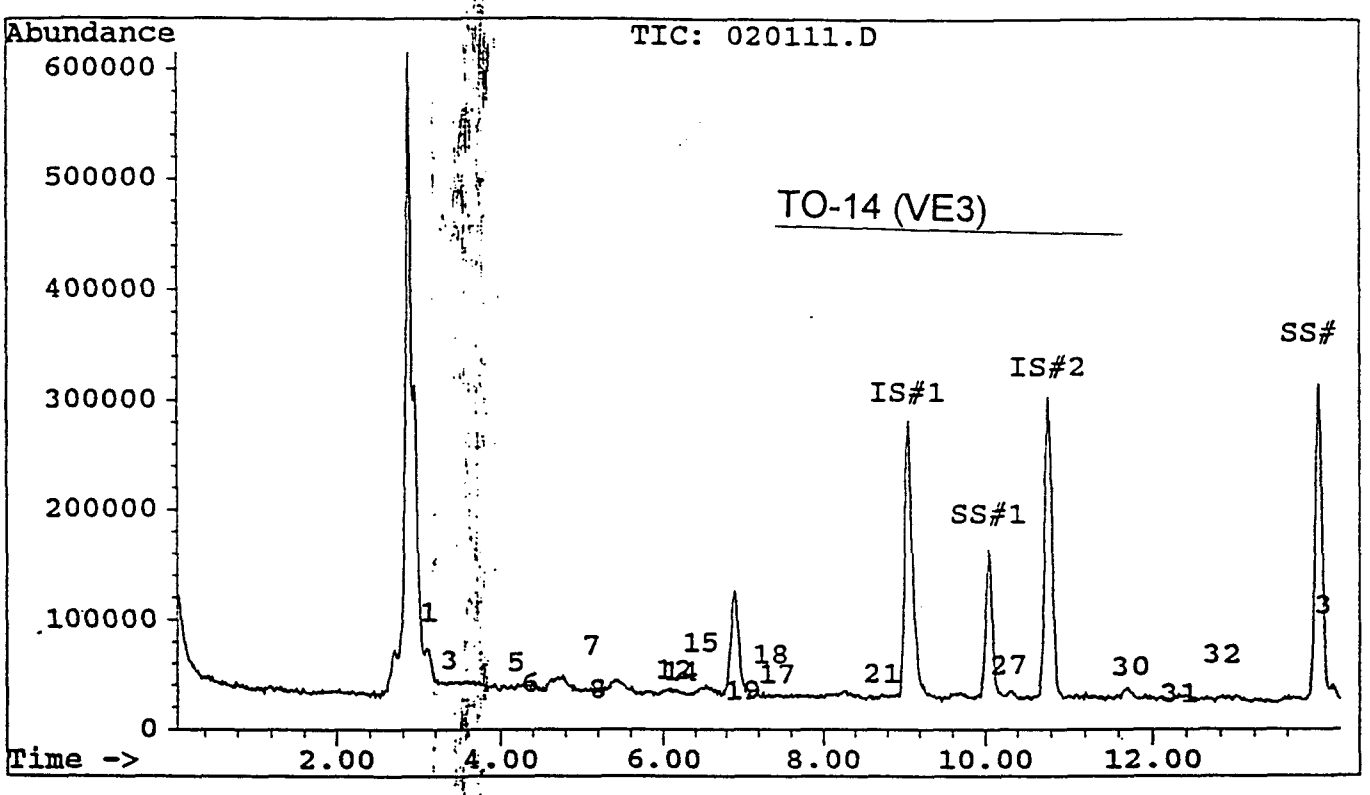
If you have any questions or suggestions please do not hesitate to contact me at (505) 344-3777. I have attached and labeled the chromatograms for your review.

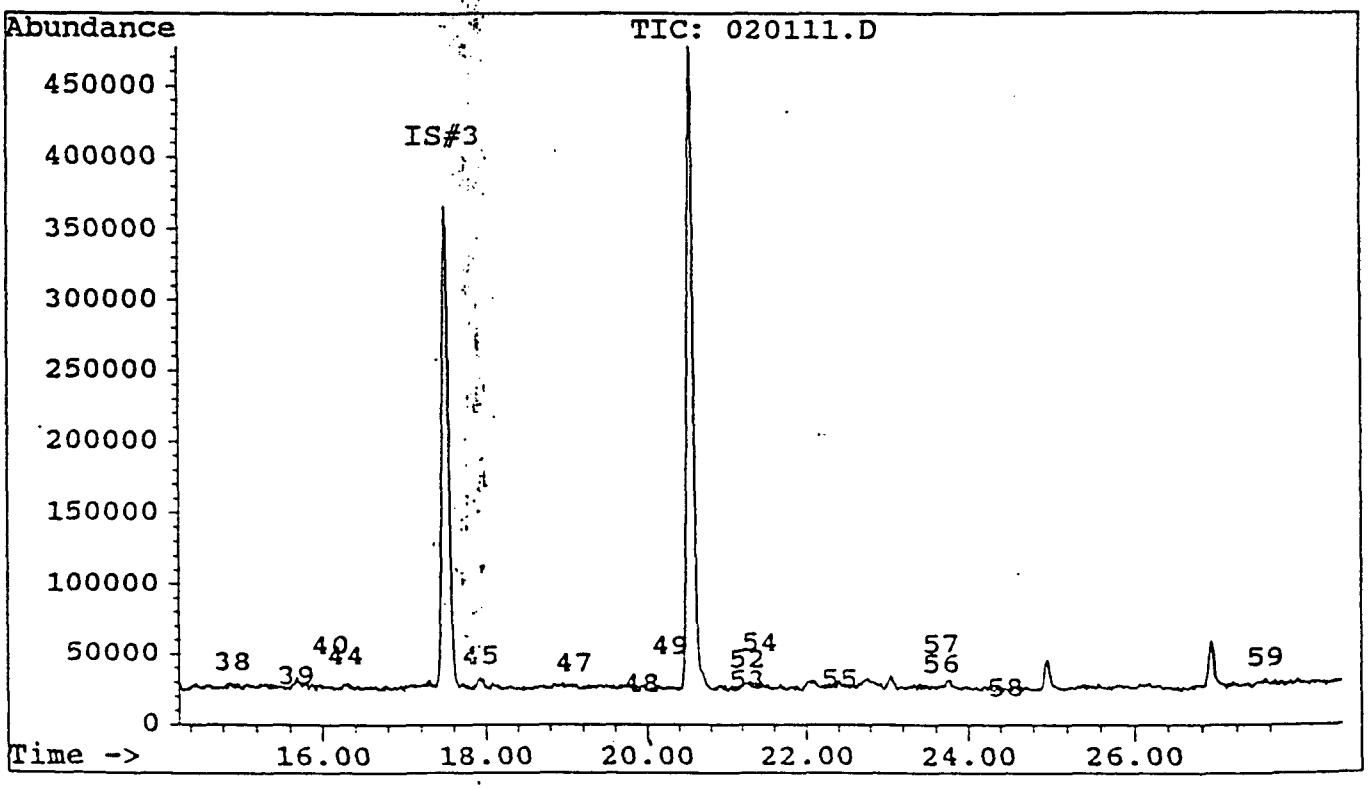
Sincerely,

Mitch Rubenstein, Ph.D.
General Manager

Analytical Technologies Inc.

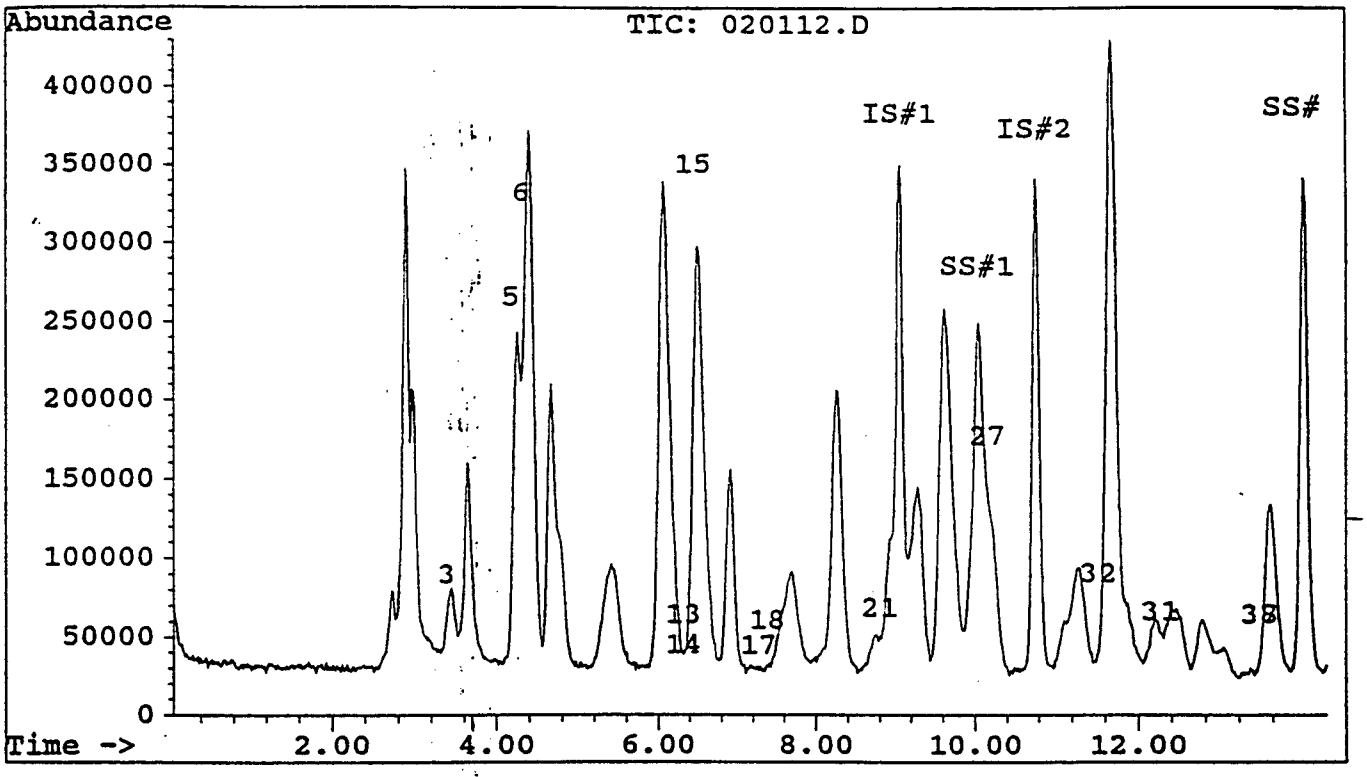
Operator ID: bv
Name: 702011-1
Misc: 500cc
Title: TO14/8240 Purgeables Calibration

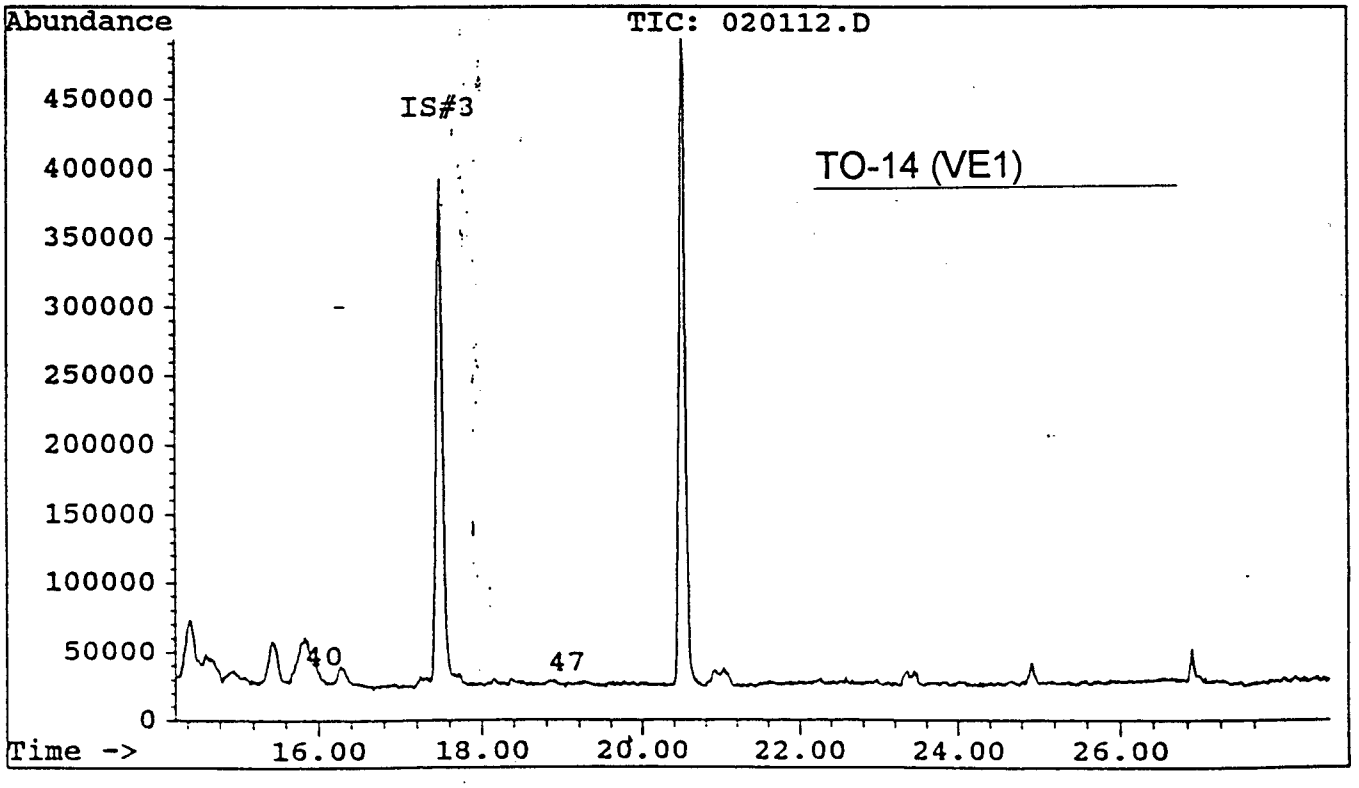




Analytical Technologies Inc.

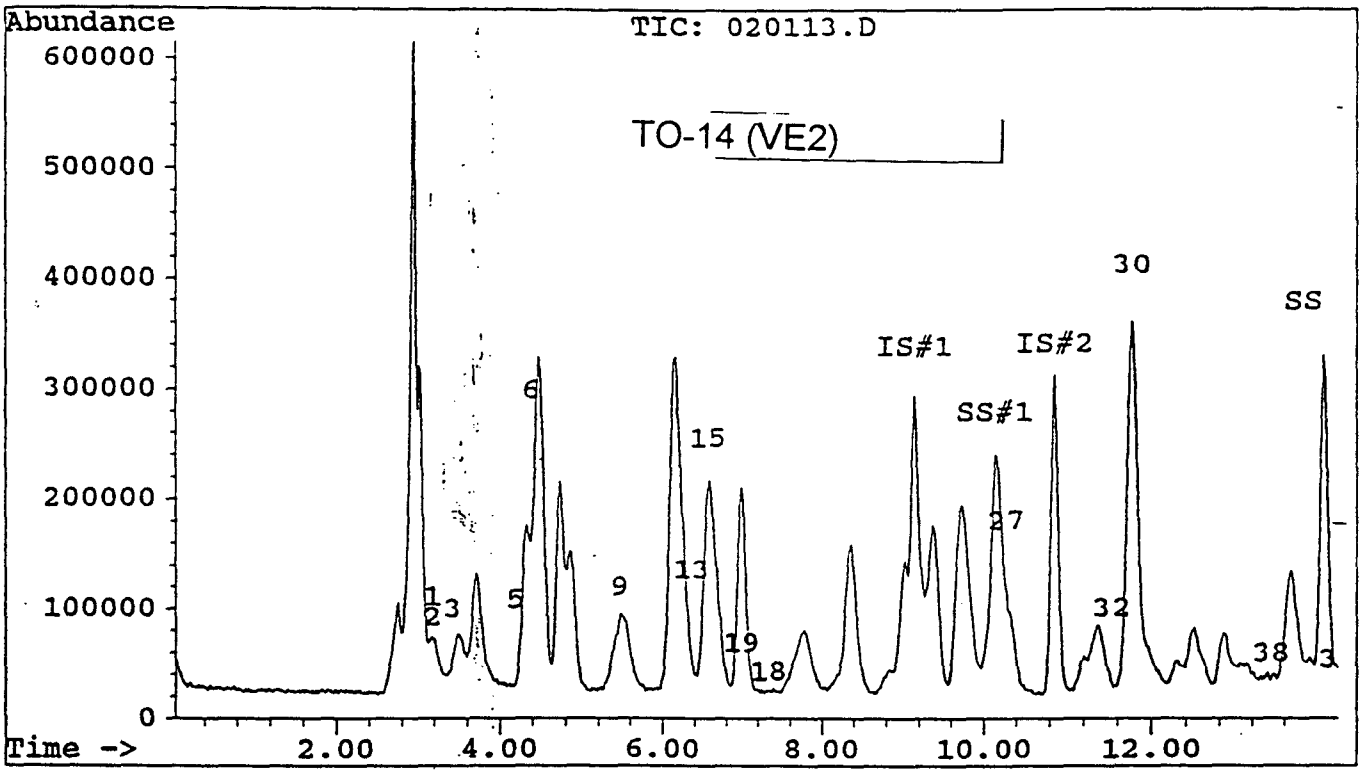
Operator ID: bv
Name: 702011-2
Misc: 20cc
Title: TO14/8240 Purgeables Calibration

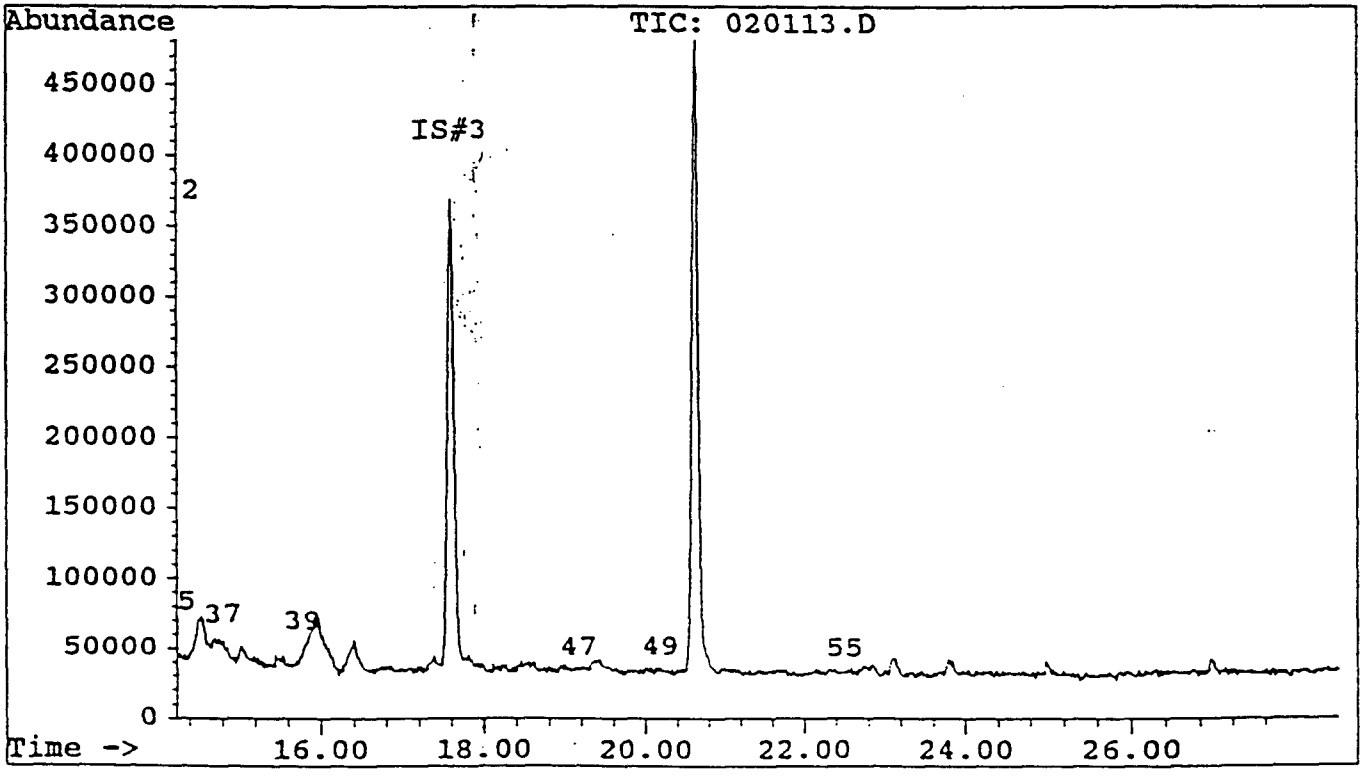




Analytical Technologies Inc.

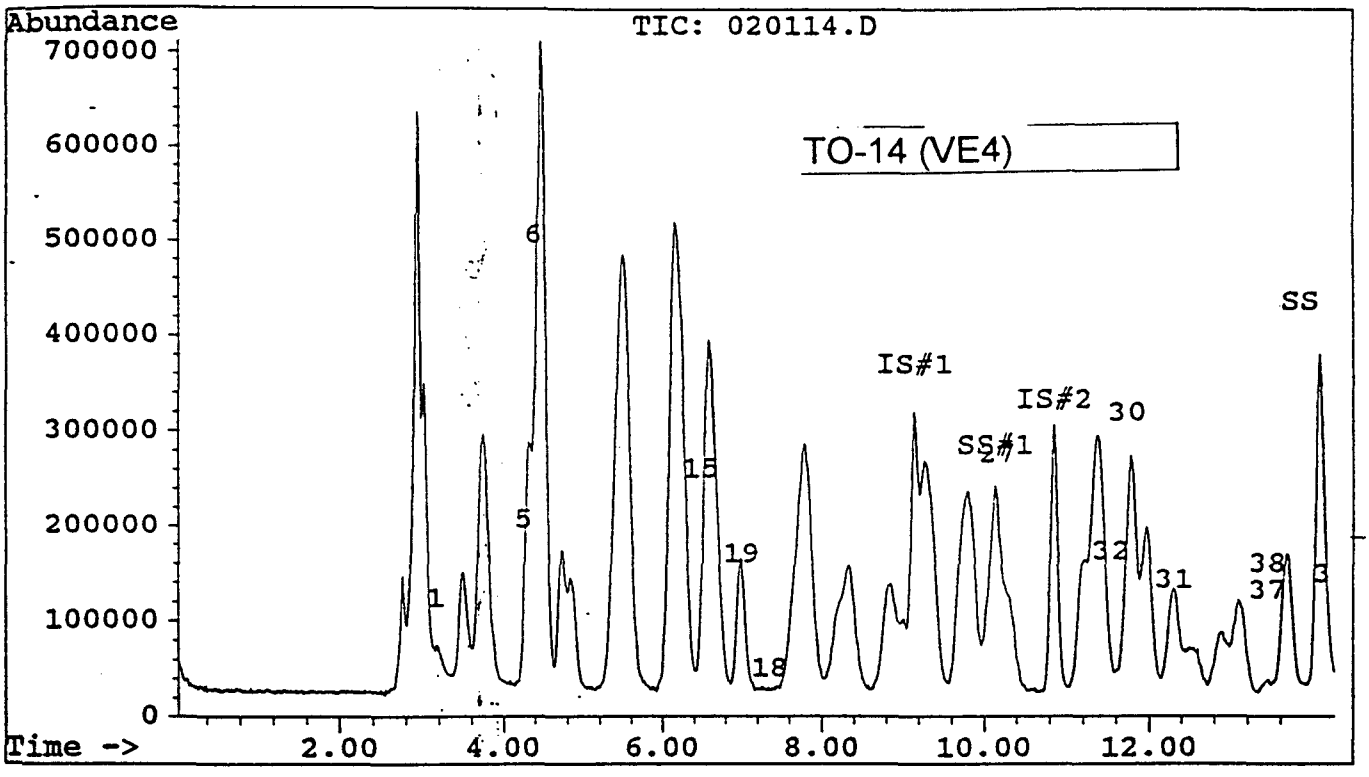
Operator ID: bv
Name: 702011-3
Misc: 500cc
Title: TO14/8240 Purgeables Calibration

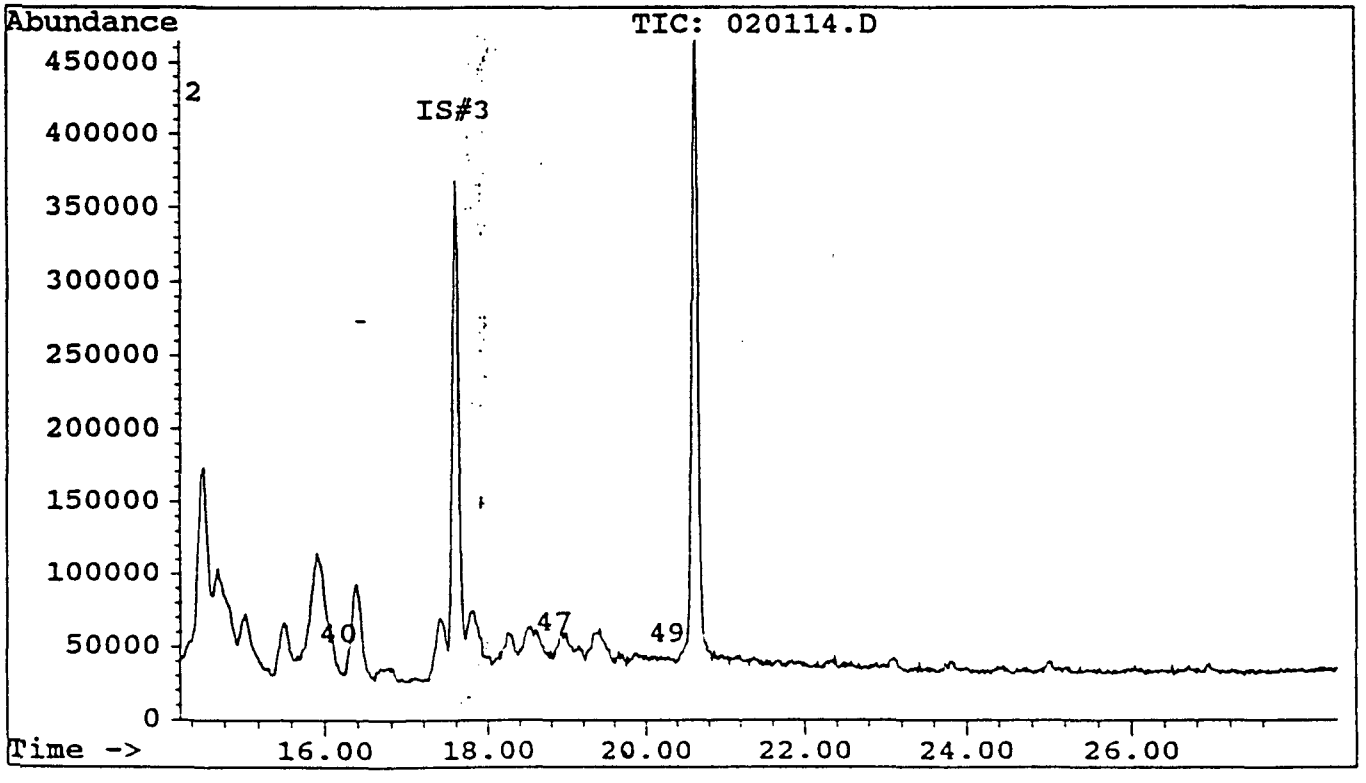




Analytical Technologies Inc.

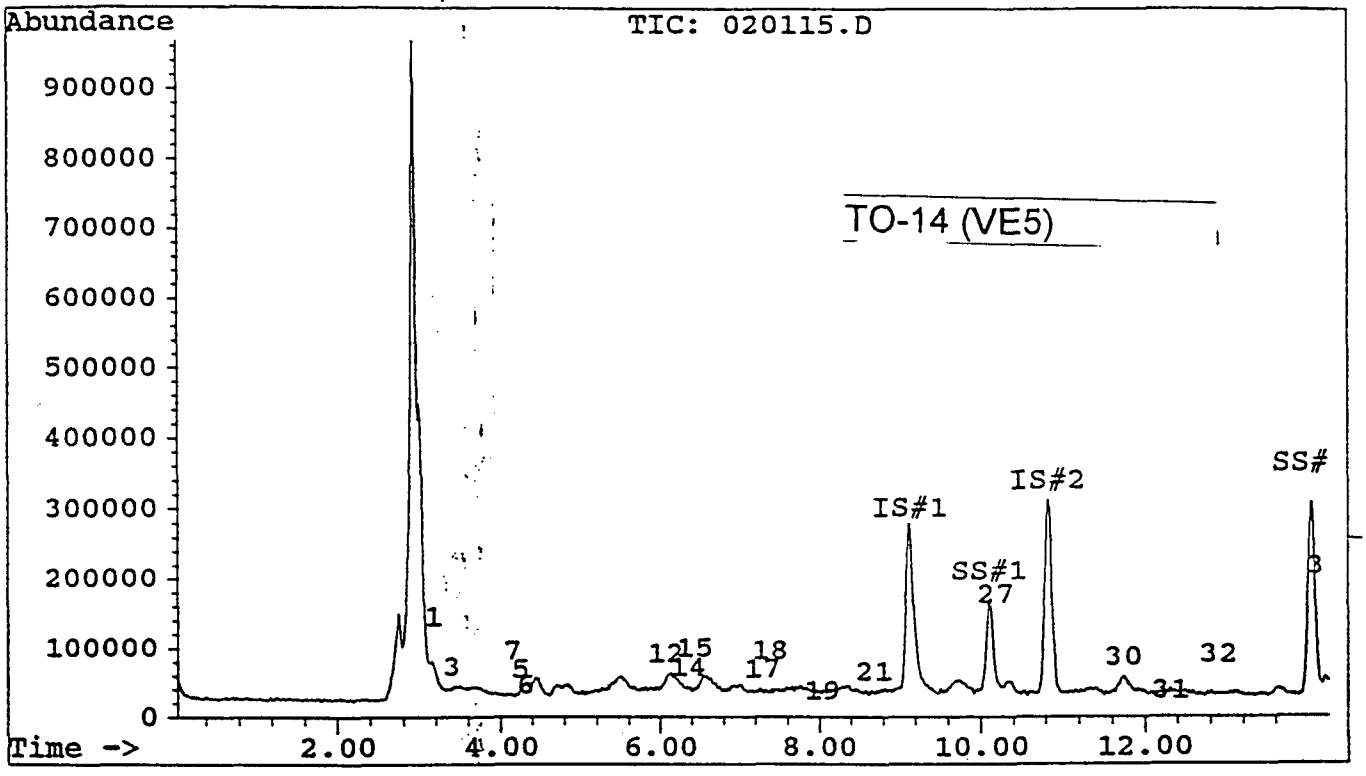
Operator ID: bv
Name: 702011-4
Misc: 250cc
Title: TO14/8240 Purgeables Calibration

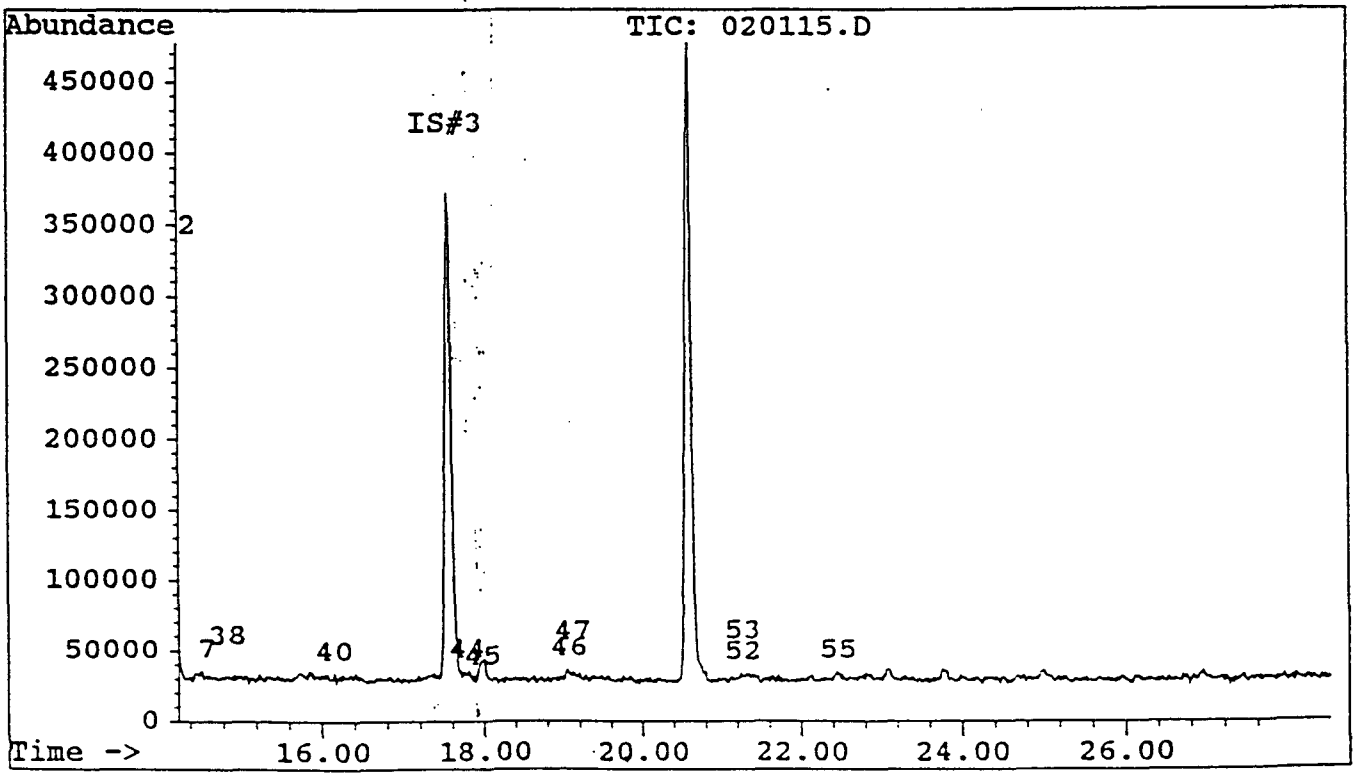




Analytical Technologies Inc.

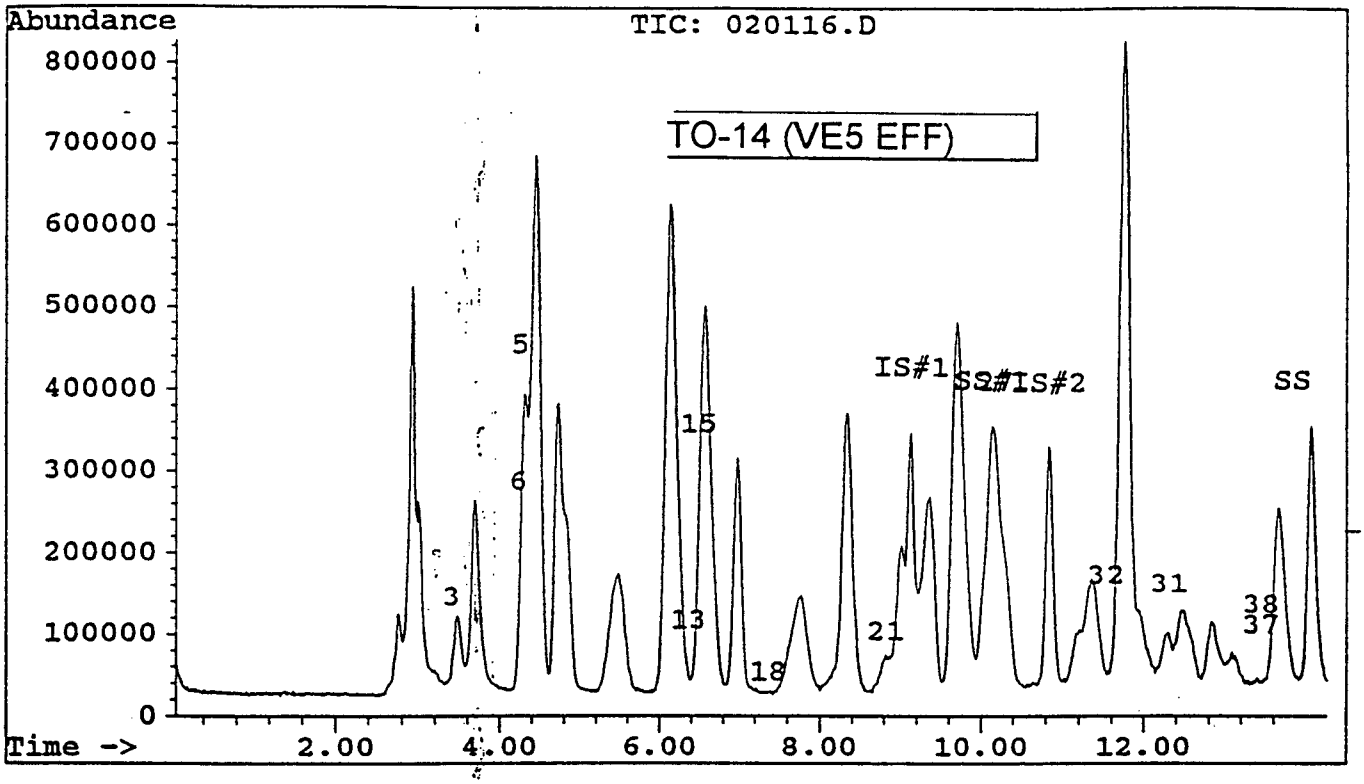
Operator ID: bv
Name: 702011-5
Misc: 500cc
Title: TO14/8240 Purgeables Calibration

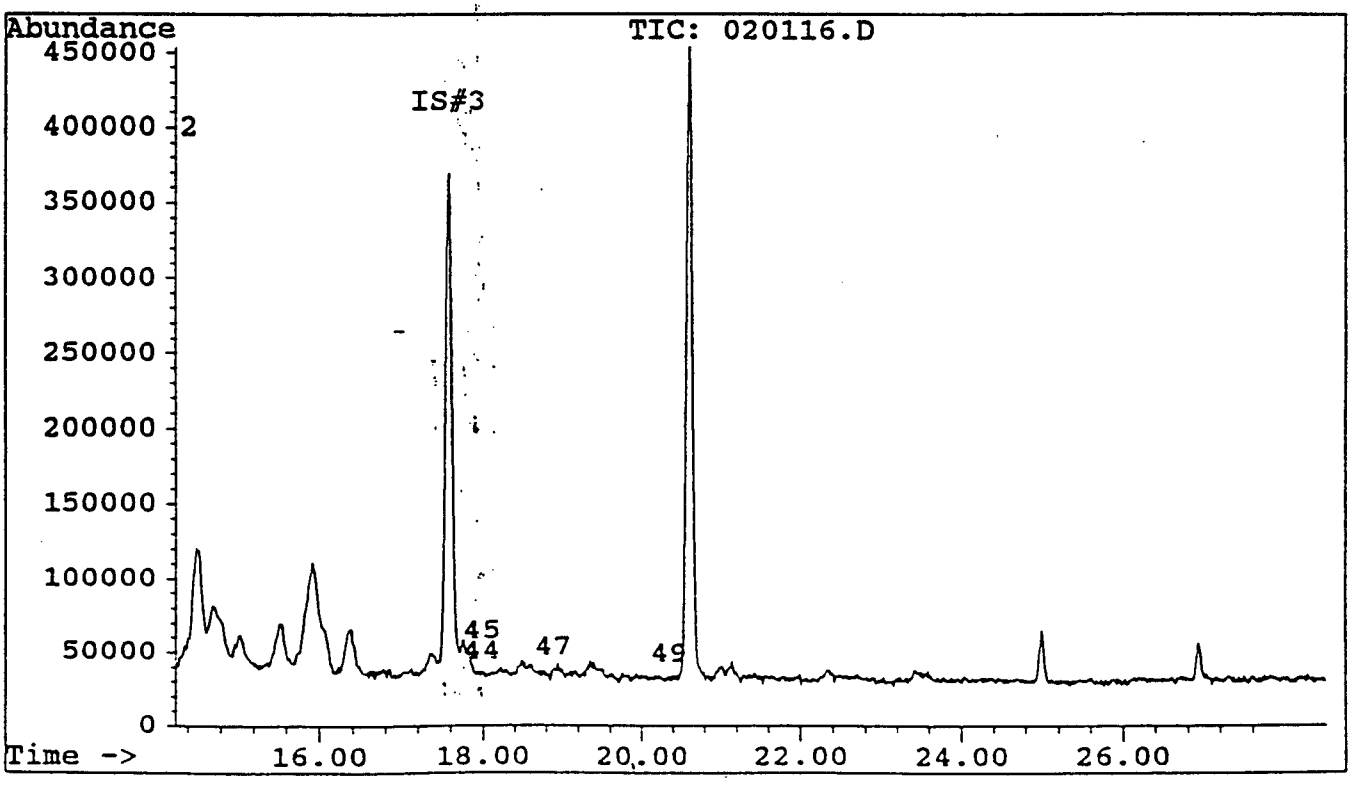




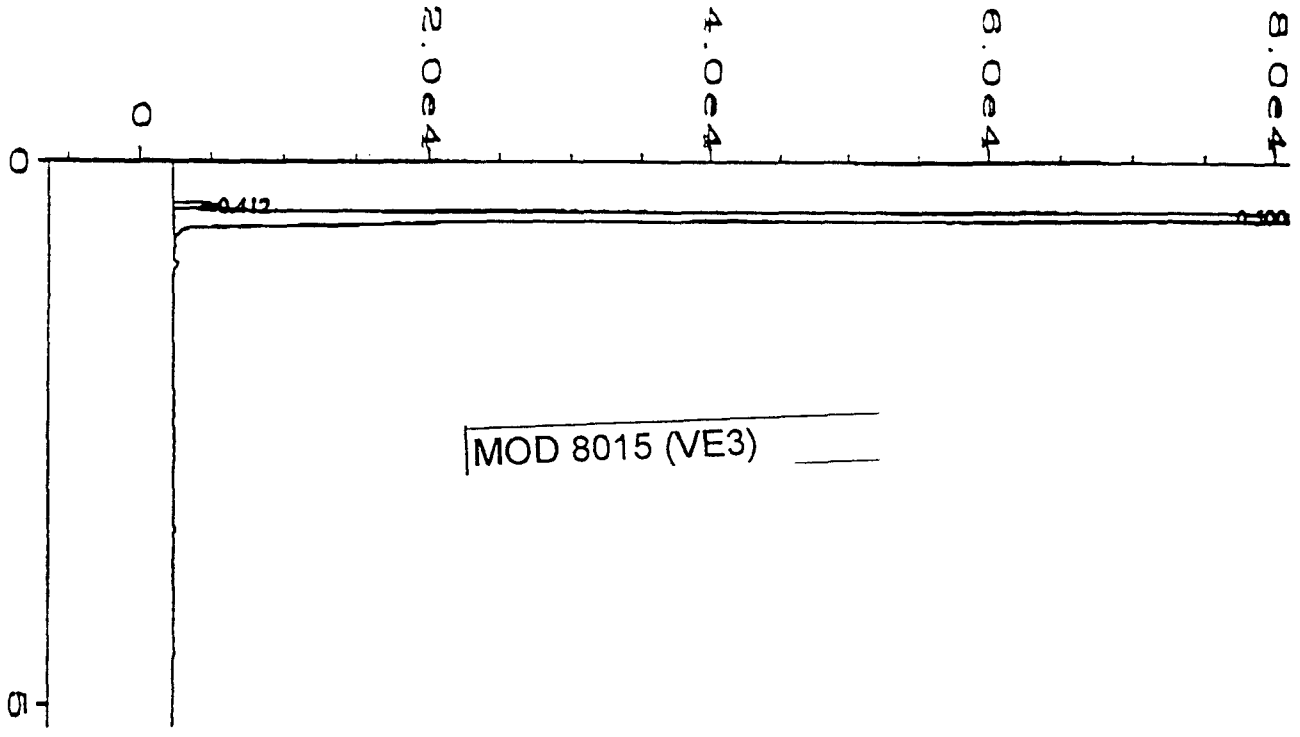
Analytical Technologies Inc.

Operator ID: bv
Name: 702011-6
Misc: 20cc
Title: TO14/8240 Purgeables Calibration





HEXANE



External Standard Report

Data File Name : C:\HPCHEM\1\DATA\020797\006R0101.D
Operator :
Instrument : FRANCENE
Sample Name : 2011-1
Run Time Bar Code:
Acquired on : 07 Feb 97 04:32 PM
Report Created on: 07 Feb 97 04:38 PM
Last Recalib on : 07 FEB 97 04:16 PM
Multiplier : 1

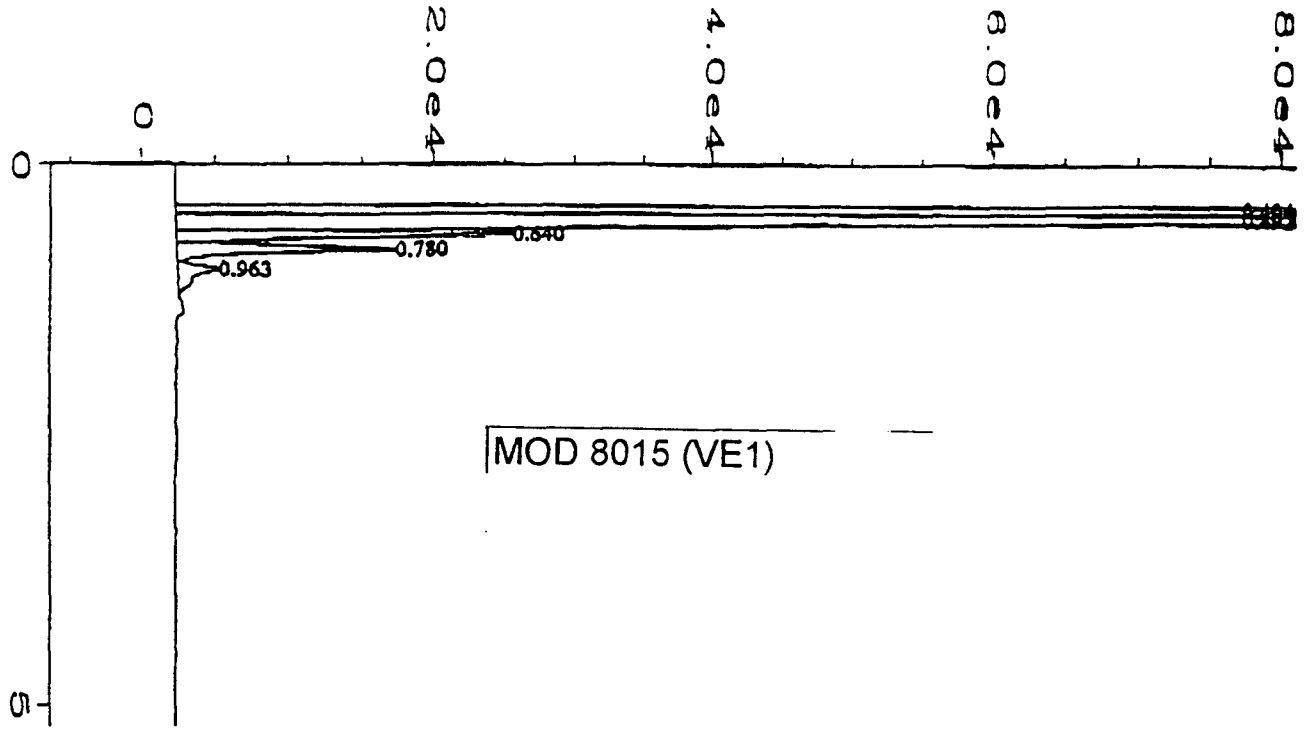
Page Number : 1
Vial Number : 6
Injection Number : 1
Sequence Line : 1
Instrument Method: N-HEXANE.MTH
Analysis Method : N-HEXANE.MTH
Sample Amount : 0
ISTD Amount :

Sig. 2 in C:\HPCHEM\1\DATA\020797\006R0101.D

Ret Time	Area	Type	Width	Ref#	ug/ml	Name
0.500	2902105	VB	0.048	1	0.873	n-hexane
0.412	7866	BV	0.041		1.493	* uncalibrated *

$$\frac{2.90 \times 10^{6}}{2.85 \times 10^{7}} \times 6.67 = 6.78 \times 10^{-1} = 678 \text{ ppb}$$

$$= 680$$



External Standard Report

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Operator :
Instrument : FRANCENE
Sample Name : 2011-2
Run Time Bar Code:
Acquired on : 07 Feb 97 04:40 PM
Report Created on: 07 Feb 97 04:46 PM
Last Recalib on : 07 FEB 97 04:16 PM
Multiplier : 1

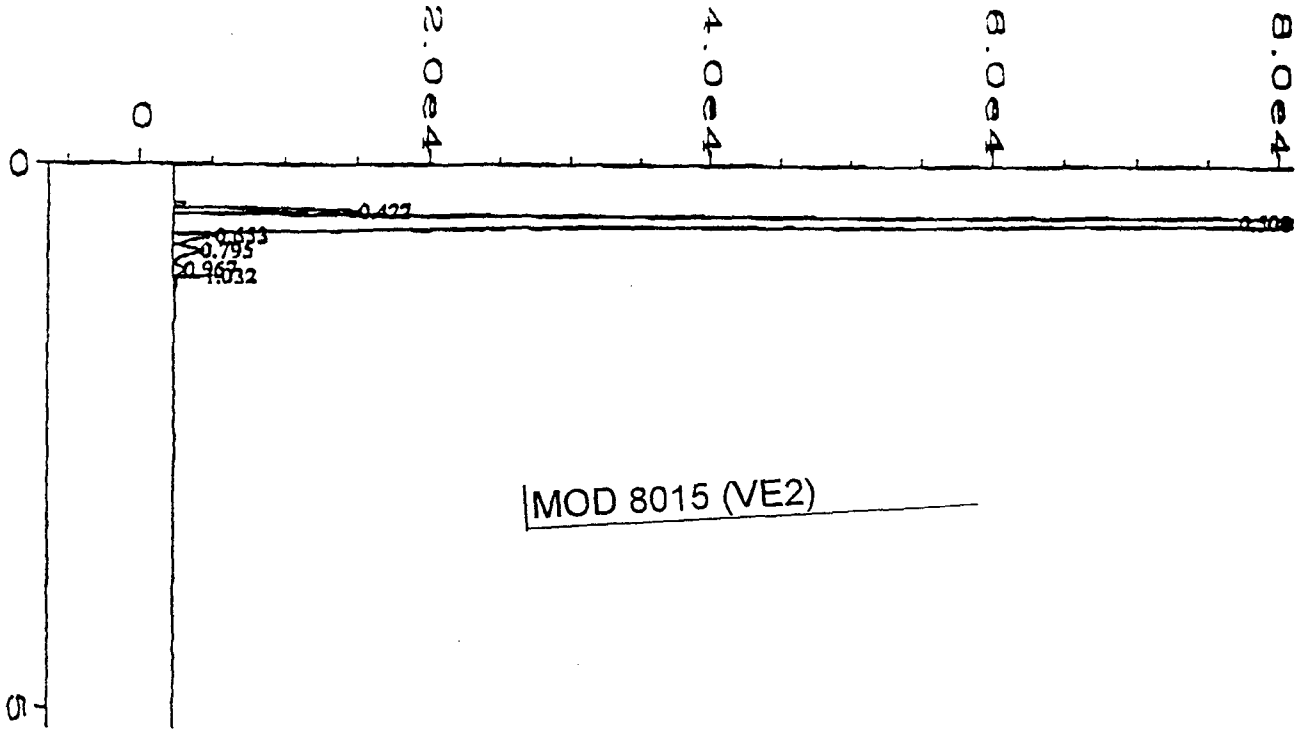
Page Number : 1
Vial Number : 7
Injection Number : 1
Sequence Line : 1
Instrument Method: N-HEXANE.MTH
Analysis Method : N-HEXANE.MTH
Sample Amount : 0
ISTD Amount :

Sig. 2 in C:\HPCHEM\1\DATA\020797\007R0101.D

Ret Time	Area	Type	Width	Ref#	ug/ml	Name
0.492	3828215	VV	0.050	1	1.152	n-hexane
0.404	2759841	BV	0.043		523.818	* uncalibrated *
0.640	91082	VV	0.059		17.287	* uncalibrated *
0.780	66042	VV	0.067		12.535	* uncalibrated *
0.963	20412	VV	0.102		3.874	* uncalibrated *

$$\frac{3.828215 \times 10^6}{2.85 \times 10^7} \times 6.67 = 8.96 \times 10^{-1} = 896\ ppb = 900\ ppb$$

$$TPH = \frac{2.94 \times 10^6}{2.85 \times 10^7} \times 6.67 = 6.88 \times 10^{-1} = .688\ ppm = 688\ ppb = 690\ ppb$$



External Standard Report

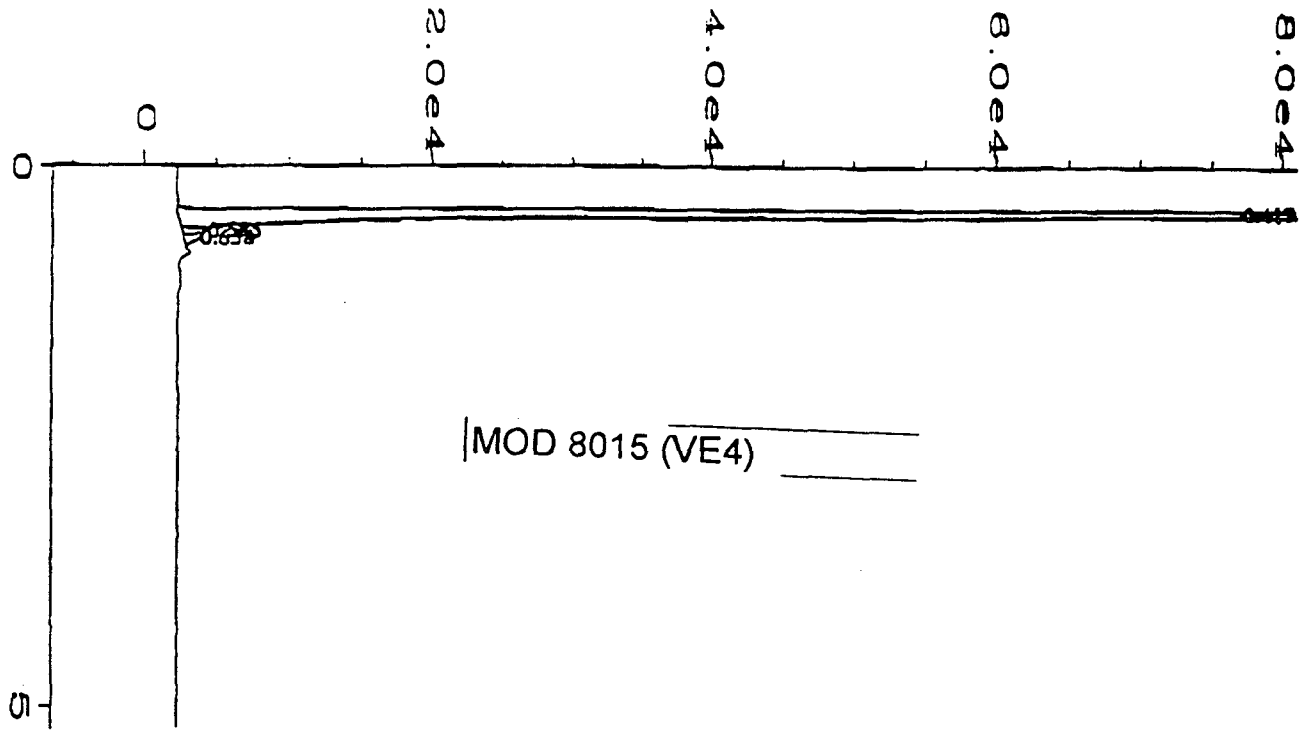
Data File Name	: C:\HPCHEM\1\DATA\020797\008R0101.D		
Operator	:	Page Number	: 1
Instrument	: FRANCENE	Vial Number	: 8
Sample Name	: 2011-3	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 07 Feb 97 04:53 PM	Instrument Method:	N-HEXANE.MTH
Report Created on:	07 Feb 97 04:59 PM	Analysis Method	: N-HEXANE.MTH
Last Recalib on	: 07 FEB 97 04:16 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 2 in C:\HPCHEM\1\DATA\020797\008R0101.D

Ret Time	Area	Type	Width	Ref#	ug/ml	Name
0.508	4119719	VV	0.049	1	1.240	n-hexane
0.422	33351	BV	0.043		6.330	* uncalibrated *
0.653	10282	VV	0.052		1.951	* uncalibrated *
0.795	9215	VV	0.072		1.749	* uncalibrated *
0.967	3387	VV	0.065		0.643	* uncalibrated *
1.032	2344	PB	0.011		0.445	* uncalibrated *

$$\frac{4.12\times10^{6}}{2.85\times10^{7}} \times 6.67 = 9.64\times10^{-1} = 964 = 960\ ppb$$

$$TPH = \frac{5.86\times10^{4}}{2.85\times10^{7}} \times 6.67 = 13.7\times10^{-3} = ND$$



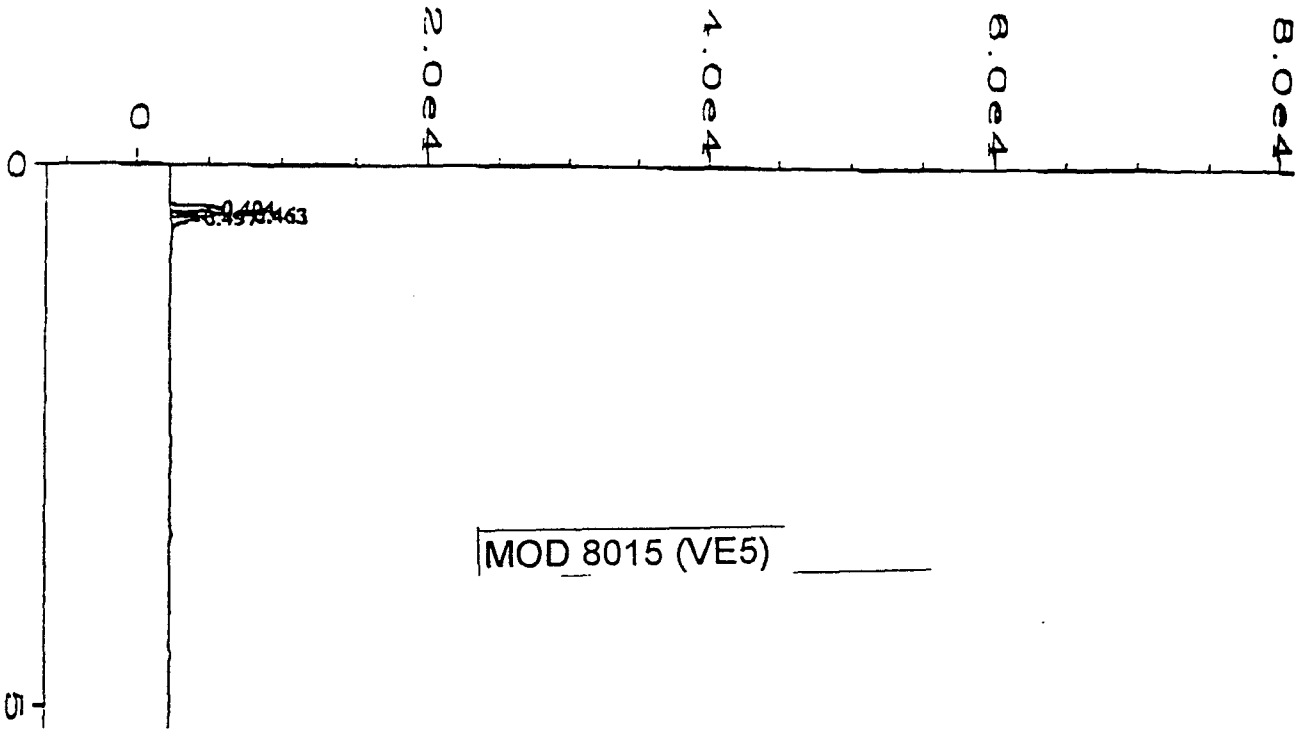
External Standard Report

Data File Name	: C:\HPCHEM\1\DATA\020797\009R0101.D		
Operator	:	Page Number	: 1
Instrument	: FRANCENE	Vial Number	: 9
Sample Name	: 2011-4	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 07 Feb 97 05:11 PM	Instrument Method	: N-HEXANE.MTH
Report Created on	: 07 Feb 97 05:16 PM	Analysis Method	: N-HEXANE.MTH
Last Recalib on	: 07 FEB 97 04:16 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 2 in C:\HPCHEM\1\DATA\020797\009R0101.D

Ret Time	Area	Type	Width	Ref#	ug/ml	Name
0.585	5344	VV	0.044	1	0.00161	n-hexane
0.417	1671909	BV	0.037		317.328	* uncalibrated *
0.658	4567	VV	0.055		0.867	* uncalibrated *

$$\frac{1.67 \times 10^6}{2.85 \times 10^7} \times 6.67 = 0.391 = 390 \text{ ppb}$$



MOD 8015 (VE5)

External Standard Report

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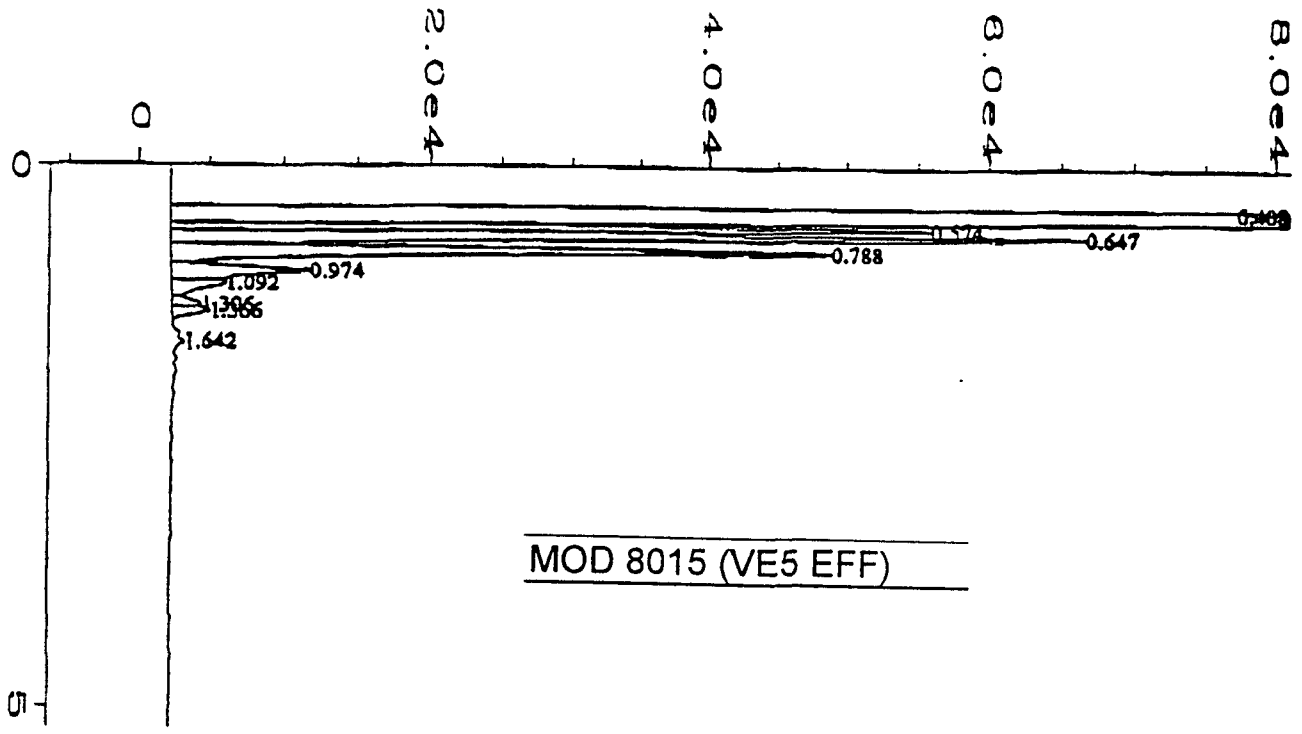
Instrument : FRANCENE
Sample Name : 2011-5
Run Time Bar Code:
Acquired on : 07 Feb 97 05:18 PM
Report Created on: 07 Feb 97 05:23 PM
Last Recalib on : 07 FEB 97 04:16 PM
Multiplier : 1

Page Number : 1
Vial Number : 10
Injection Number : 1
Sequence Line : 1
Instrument Method: N-HEXANE.MTH
Analysis Method : N-HEXANE.MTH
Sample Amount : 0
ISTD Amount :

Sig. 2 in C:\HPCHEM\1\DATA\020797\010R0101.D

Ret Time	Area	Type	Width	Ref#	ug/ml	Name
0.497	6413	VB	0.041	1	0.00193	n-hexane
0.404	10552	BV	0.043		2.003	* uncalibrated *
0.463	7686	VV	0.019		1.459	* uncalibrated *



External Standard Report

Data File Name	: C:\HPCHEM\1\DATA\020797\011R0101.D		
Operator	:	Page Number	: 1
Instrument	: FRANCENE	Vial Number	: 11
Sample Name	: 2011-6	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 07 Feb 97 05:26 PM	Instrument Method	: N-HEXANE.MTH
Report Created on	: 07 Feb 97 05:31 PM	Analysis Method	: N-HEXANE.MTH
Last Recalib on	: 07 FEB 97 04:16 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 2 in C:\HPCHEM\1\DATA\020797\011R0101.D

Ret Time	Area	Type	Width	Ref#	ug/ml	Name
0.574	181494	VV	0.052	1	0.0546	n-hexane
0.408	7781375	BV	0.048		1476.905	* uncalibrated *
0.647	263955	VV	0.062		50.099	* uncalibrated *
0.788	208301	VV	0.068		39.536	* uncalibrated *
0.974	53994	VV	0.083		10.248	* uncalibrated *
1.092	21910	VV	0.086		4.159	* uncalibrated *
1.306	8868	VV	0.066		1.683	* uncalibrated *
1.366	11532	VV	0.066		2.189	* uncalibrated *
1.642	292	PBA	0.034		0.0554	* uncalibrated *

TPH

~~1.51494 X 10^5~~

$\frac{7,751,375 \times 10^{-6}}{2.85 \times 10^{7}} \times 6.67 = 18.2 \times 10^{-1}$ 1800

7.41

~~25,034.6 X 10^5~~ / 2.85×10^{7} = ~~2.53 X 10^-2~~ 0.026 ~~X 10^3~~ = 26 ppb

American Environmental Network, Inc.

RECEIVED
MAR 2 1 1997

AEN I.D. 701371

March 21, 1997

MARATHON OIL COMPANY
PO BOX 552
MIDLAND TX, 79702

Project Name IB REMEDIATION
Project Number 23350173.60

Attention: BOB MENZIE

On 1/24/97 American Environmental Network (NM), Inc. (ADHS License No. AZ0015), received a request to analyze **air** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

All analyses were performed by American Environmental Network (FL) Inc., 11 East Olive Road, Pensacola, FL.

If you have any questions or comments, please do not hesitate to contact us at (505)344-3777.

Kimberly D. McNeill
Project Manager

H. Mitchell Rubenstein, Ph. D.
General Manager

MR: mt

Enclosure

American Environmental Network, Inc.

CLIENT	: MARATHON OIL COMPANY	AEN I.D.	: 701371
PROJECT #	: 23350173.60	DATE RECEIVED	: 1/24/97
PROJECT NAME	: IB REMEDIATION	REPORT DATE	: 3/21/97

AEN ID. #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	VE3	AIR	1/21/97
02	VE1	AIR	1/20/97
03	VE2	AIR	1/21/97
04	VE4	AIR	1/21/97
05	VE5	AIR	1/21/97
06	VE5 EFF	AIR	1/23/97

"FINAL REPORT FORMAT - SINGLE"

Accession: 702011
Client: AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number: 701371
Project Name: MARATHON OIL CO.
Project Location: IB REMEDIATION
Test: TO14
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A
Matrix: AIR
QC Level: I

Lab Id: 001
Client Sample Id: 701371-01
Sample Date/Time: 21-JAN-97 1155
Received Date: 01-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
TRICHLOROTRIFLUOROETHANE	MG/M3	ND	0.07	
4-ETHYLTOLUENE	MG/M3	ND	0.07	
BROMOFLUOROBENZENE	%REC/SURR	107	90-111	
1,2-DICHLOROETHANE-D4	%REC/SURR	97	85-115	
TOLUENE-D8	%REC/SURR	107	85-111	
ANALYST	INITIALS	BV		

Comments:

American Environmental Network, Inc.

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	001	Sample Date/Time:	21-JAN-97 1155
Client Sample Id:	701371-01	Received Date:	01-FEB-97

"Sample Tic Report"

Number of Tics Found: 1
Concentration Units: MG/M3

Cas Number:	Compound Name:	RT:	Est Conc:	Q:
000110-54-3	N-HEXANE	6.90	0.3	J

Accession: 702011
Client: AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number: 701371
Project Name: MARATHON OIL CO.
Project Location: IB REMEDIATION
Test: GENERIC GROUP GC/SEMI-VOLATILE

Parameter:	Units:	Results:	Rpt Lmts:	Q:
Sample Number:001 Dry Weight %:N/A		Client Id: 701371-01		
N-HEXANE	UG/L	680	50	
TOTAL PETROLEUM HYDROCARBON	UG/L	ND	50	
Comments: ANALYST: SW				
Sample Number:002 Dry Weight %:N/A		Client Id: 701371-02		
N-HEXANE	UG/L	900	50	
TOTAL PETROLEUM HYDROCARBON	UG/L	690	50	
Comments: ANALYST: SW				
Sample Number:003 Dry Weight %:N/A		Client Id: 701371-03		
N-HEXANE	UG/L	960	50	
TOTAL PETROLEUM HYDROCARBON	UG/L	ND	50	
Comments: ANALYST: SW				
Sample Number:004 Dry Weight %:N/A		Client Id: 701371-04		
N-HEXANE	UG/L	390	50	
TOTAL PETROLEUM HYDROCARBON	UG/L	ND	50	
Comments: ANALYST: SW				
Sample Number:005 Dry Weight %:N/A		Client Id: 701371-05		
N-HEXANE	UG/L	ND	50	
TOTAL PETROLEUM HYDROCARBON	UG/L	ND	50	
Comments: ANALYST: SW				
Sample Number:006 Dry Weight %:N/A		Client Id: 701371-06		
N-HEXANE	UG/L	1800	50	
TOTAL PETROLEUM HYDROCARBON	UG/L	ND	50	
Comments: ANALYST: SW				

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	001	Sample Date/Time:	21-JAN-97 1155
Client Sample Id:	701371-01	Received Date:	01-FEB-97
Batch: MAB017		Extraction Date:	N/A
Blank: B	Dry Weight %: N/A	Analysis Date:	09-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
ALPHA-CHLOROTOLUENE	MG/M3	ND	0.07	
BENZENE	MG/M3	ND	0.07	
BROMOMETHANE	MG/M3	ND	0.07	
CARBON TETRACHLORIDE	MG/M3	ND	0.07	
CHLOROBENZENE	MG/M3	ND	0.07	
CHLOROETHANE	MG/M3	ND	0.07	
CHLOROFORM	MG/M3	ND	0.07	
CHLOROMETHANE	MG/M3	ND	0.07	
CIS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.07	
DICHLORODIFLUOROMETHANE	MG/M3	ND	0.07	
1,1-DICHLOROETHANE	MG/M3	ND	0.07	
1,2-DICHLOROETHANE	MG/M3	ND	0.07	
1,2-DICHLOROPROPANE	MG/M3	ND	0.07	
CIS-1,3-DICHLOROPROPENE	MG/M3	ND	0.07	
TRANS-1,3-DICHLOROPROPENE	MG/M3	ND	0.07	
DICHLOROTETRAFLUOROETHANE	MG/M3	ND	0.07	
ETHYL BENZENE	MG/M3	ND	0.07	
HEXACHLOROBUTADIENE	MG/M3	ND	0.07	
M-DICHLOROBENZENE	MG/M3	ND	0.07	
M,P-XYLENE	MG/M3	ND	0.07	
METHYLENE CHLORIDE	MG/M3	ND	0.2	
O-DICHLOROBENZENE	MG/M3	ND	0.07	
O-XYLENE	MG/M3	ND	0.07	
P-DICHLOROBENZENE	MG/M3	ND	0.07	
STYRENE	MG/M3	ND	0.07	
1,1,2,2-TETRACHLOROETHANE	MG/M3	ND	0.07	
TETRACHLOROETHYLENE	MG/M3	ND	0.07	
TOLUENE	MG/M3	ND	0.07	
1,1,2-TRICHLOROETHANE	MG/M3	ND	0.07	
TRICHLOROETHYLENE	MG/M3	ND	0.07	
TRICHLOROFLUOROMETHANE	MG/M3	ND	0.07	
VINYL CHLORIDE	MG/M3	ND	0.07	
1,2-DIBROMOETHANE (EDB)	MG/M3	ND	0.07	
1,2,4 TRICHLOROBENZENE	MG/M3	ND	0.07	
1,2,4-TRIMETHYLBENZENE	MG/M3	ND	0.07	
1,3,5-TRIMETHYLBENZENE	MG/M3	ND	0.07	
1,1-DICHLOROETHENE	MG/M3	ND	0.07	
1,1,1-TRICHLOROETHANE	MG/M3	ND	0.07	

"FINAL REPORT FORMAT - SINGLE"

Accession: 702011
Client: AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number: 701371
Project Name: MARATHON OIL CO.
Project Location: IB REMEDIATION
Test: TO14
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A
Matrix: AIR
QC Level: I

Lab Id: 002
Client Sample Id: 701371-02
Sample Date/Time: 20-JAN-97 1630
Received Date: 01-FEB-97

Batch: MAB017
Blank: A
Dry Weight %: N/A
Extraction Date: N/A
Analysis Date: 08-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
ALPHA-CHLOROTOLUENE	MG/M3	ND	1.7	
BENZENE	MG/M3	ND	1.7	
BROMOMETHANE	MG/M3	ND	1.7	
CARBON TETRACHLORIDE	MG/M3	ND	1.7	
CHLOROBENZENE	MG/M3	ND	1.7	
CHLOROETHANE	MG/M3	ND	1.7	
CHLOROFORM	MG/M3	ND	1.7	
CHLOROMETHANE	MG/M3	ND	1.7	
CIS 1,2 DICHLOROETHYLENE	MG/M3	ND	1.7	
DICHLORODIFLUOROMETHANE	MG/M3	ND	1.7	
1,1-DICHLOROETHANE	MG/M3	ND	1.7	
1,2-DICHLOROETHANE	MG/M3	ND	1.7	
1,2-DICHLOROPROPANE	MG/M3	ND	1.7	
CIS-1,3-DICHLOROPROPENE	MG/M3	ND	1.7	
TRANS-1,3-DICHLOROPROPENE	MG/M3	ND	1.7	
DICHLOROTETRAFLUOROETHANE	MG/M3	ND	1.7	
ETHYL BENZENE	MG/M3	ND	1.7	
HEXACHLOROBUTADIENE	MG/M3	ND	1.7	
M-DICHLOROBENZENE	MG/M3	ND	1.7	
M,P-XYLENE	MG/M3	ND	1.7	
METHYLENE CHLORIDE	MG/M3	ND	4.1	
O-DICHLOROBENZENE	MG/M3	ND	1.7	
O-XYLENE	MG/M3	ND	1.7	
P-DICHLOROBENZENE	MG/M3	ND	1.7	
STYRENE	MG/M3	ND	1.7	
1,1,2,2-TETRACHLOROETHANE	MG/M3	ND	1.7	
TETRACHLOROETHYLENE	MG/M3	ND	1.7	
TOLUENE	MG/M3	ND	1.7	
1,1,2-TRICHLOROETHANE	MG/M3	ND	1.7	
TRICHLOROETHYLENE	MG/M3	ND	1.7	
TRICHLOROFLUOROMETHANE	MG/M3	ND	1.7	
VINYL CHLORIDE	MG/M3	ND	1.7	
1,2-DIBROMOETHANE (EDB)	MG/M3	ND	1.7	
1,2,4 TRICHLOROBENZENE	MG/M3	ND	1.7	
1,2,4-TRIMETHYLBENZENE	MG/M3	ND	1.7	
1,3,5-TRIMETHYLBENZENE	MG/M3	ND	1.7	
1,1-DICHLOROETHENE	MG/M3	ND	1.7	
1,1,1-TRICHLOROETHANE	MG/M3	ND	1.7	

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	002	Sample Date/Time:	20-JAN-97 1630
Client Sample Id:	701371-02	Received Date:	01-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
TRICHLOROTRIFLUOROETHANE	MG/M3	ND	1.7	
4-ETHYLTOLUENE	MG/M3	ND	1.7	
BROMOFLUOROBENZENE	%REC/SURR	102	90-111	
1,2-DICHLOROETHANE-D4	%REC/SURR	98	85-115	
TOLUENE-D8	%REC/SURR	103	85-111	
ANALYST	INITIALS	BV		

Comments:

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	002	Sample Date/Time:	20-JAN-97 1630
Client Sample Id:	701371-02	Received Date:	01-FEB-97

"Sample Tic Report"

Number of Tics Found: 1
Concentration Units: MG/M3

Cas Number:	Compound Name:	RT:	Est Conc:	Q:
000110-54-3	N-HEXANE	6.92	8	

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	003	Sample Date/Time:	21-JAN-97 1350
Client Sample Id:	701371-03	Received Date:	01-FEB-97
Batch: MAB017		Extraction Date:	N/A
Blank: B	Dry Weight %: N/A	Analysis Date:	09-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
ALPHA-CHLOROTOLUENE	MG/M3	ND	0.07	
BENZENE	MG/M3	ND	0.07	
BROMOMETHANE	MG/M3	ND	0.07	
CARBON TETRACHLORIDE	MG/M3	ND	0.07	
CHLOROBENZENE	MG/M3	ND	0.07	
CHLOROETHANE	MG/M3	ND	0.07	
CHLOROFORM	MG/M3	ND	0.07	
CHLOROMETHANE	MG/M3	ND	0.07	
CIS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.07	
DICHLORODIFLUOROMETHANE	MG/M3	ND	0.07	
1,1-DICHLOROETHANE	MG/M3	ND	0.07	
1,2-DICHLOROETHANE	MG/M3	ND	0.07	
1,2-DICHLOROPROPANE	MG/M3	ND	0.07	
CIS-1,3-DICHLOROPROPENE	MG/M3	ND	0.07	
TRANS-1,3-DICHLOROPROPENE	MG/M3	ND	0.07	
DICHLOROTETRAFLUOROETHANE	MG/M3	ND	0.07	
ETHYL BENZENE	MG/M3	ND	0.07	
HEXACHLOROBUTADIENE	MG/M3	ND	0.07	
M-DICHLOROBENZENE	MG/M3	ND	0.07	
M,P-XYLENE	MG/M3	ND	0.07	
METHYLENE CHLORIDE	MG/M3	ND	0.2	
O-DICHLOROBENZENE	MG/M3	ND	0.07	
O-XYLENE	MG/M3	ND	0.07	
P-DICHLOROBENZENE	MG/M3	ND	0.07	
STYRENE	MG/M3	ND	0.07	
1,1,2,2-TETRACHLOROETHANE	MG/M3	ND	0.07	
TETRACHLOROETHYLENE	MG/M3	ND	0.07	
TOLUENE	MG/M3	ND	0.07	
1,1,2-TRICHLOROETHANE	MG/M3	ND	0.07	
TRICHLOROETHYLENE	MG/M3	ND	0.07	
TRICHLOROFLUOROMETHANE	MG/M3	ND	0.07	
VINYL CHLORIDE	MG/M3	ND	0.07	
1,2-DIBROMOETHANE (EDB)	MG/M3	ND	0.07	
1,2,4 TRICHLOROBENZENE	MG/M3	ND	0.07	
1,2,4-TRIMETHYLBENZENE	MG/M3	ND	0.07	
1,3,5-TRIMETHYLBENZENE	MG/M3	ND	0.07	
1,1-DICHLOROETHENE	MG/M3	ND	0.07	
1,1,1-TRICHLOROETHANE	MG/M3	ND	0.07	

"FINAL REPORT FORMAT - SINGLE"

Accession: 702011
Client: AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number: 701371
Project Name: MARATHON OIL CO.
Project Location: IB REMEDIATION
Test: TO14
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A
Matrix: AIR
QC Level: I

Lab Id: 003
Client Sample Id: 701371-03
Sample Date/Time: 21-JAN-97 1350
Received Date: 01-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
TRICHLOROTRIFLUOROETHANE	MG/M3	ND	0.07	
4-ETHYLTOLUENE	MG/M3	ND	0.07	
BROMOFLUOROBENZENE	%REC/SURR	107	90-111	
1,2-DICHLOROETHANE-D4	%REC/SURR	100	85-115	
TOLUENE-D8	%REC/SURR	102	85-111	
ANALYST	INITIALS	BV		

Comments:

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	003	Sample Date/Time:	21-JAN-97 1350
Client Sample Id:	701371-03	Received Date:	01-FEB-97

"Sample Tic Report"

Number of Tics Found: 1
Concentration Units: MG/M3

Cas Number:	Compound Name:	RT:	Est Conc:	Q:
000110-54-3	N-HEXANE	7.00	0.4	J

"FINAL REPORT FORMAT - SINGLE"

Accession: 702011
Client: AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number: 701371
Project Name: MARATHON OIL CO.
Project Location: IB REMEDIATION
Test: TO14
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A
Matrix: AIR
QC Level: I

Lab Id: 004
Client Sample Id: 701371-04
Sample Date/Time: 21-JAN-97 1545
Received Date: 01-FEB-97

Batch: MAB017
Blank: B
Dry Weight %: N/A
Extraction Date: N/A
Analysis Date: 09-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
ALPHA-CHLOROTOLUENE	MG/M3	ND	0.1	
BENZENE	MG/M3	ND	0.1	
BROMOMETHANE	MG/M3	ND	0.1	
CARBON TETRACHLORIDE	MG/M3	ND	0.1	
CHLOROBENZENE	MG/M3	ND	0.1	
CHLOROETHANE	MG/M3	ND	0.1	
CHLOROFORM	MG/M3	ND	0.1	
CHLOROMETHANE	MG/M3	ND	0.1	
CIS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.1	
DICHLORODIFLUOROMETHANE	MG/M3	ND	0.1	
1,1-DICHLOROETHANE	MG/M3	ND	0.1	
1,2-DICHLOROETHANE	MG/M3	ND	0.1	
1,2-DICHLOROPROPANE	MG/M3	ND	0.1	
CIS-1,3-DICHLOROPROPENE	MG/M3	ND	0.1	
TRANS-1,3-DICHLOROPROPENE	MG/M3	ND	0.1	
DICHLOROTETRAFLUOROETHANE	MG/M3	ND	0.1	
ETHYL BENZENE	MG/M3	ND	0.1	
HEXACHLOROBUTADIENE	MG/M3	ND	0.1	
M-DICHLOROBENZENE	MG/M3	ND	0.1	
M,P-XYLENE	MG/M3	ND	0.1	
METHYLENE CHLORIDE	MG/M3	ND	0.3	
O-DICHLOROBENZENE	MG/M3	ND	0.1	
O-XYLENE	MG/M3	ND	0.1	
P-DICHLOROBENZENE	MG/M3	ND	0.1	
STYRENE	MG/M3	ND	0.1	
1,1,2,2-TETRACHLOROETHANE	MG/M3	ND	0.1	
TETRACHLOROETHYLENE	MG/M3	ND	0.1	
TOLUENE	MG/M3	ND	0.1	
1,1,2-TRICHLOROETHANE	MG/M3	ND	0.1	
TRICHLOROETHYLENE	MG/M3	ND	0.1	
TRICHLOROFLUOROMETHANE	MG/M3	ND	0.1	
VINYL CHLORIDE	MG/M3	ND	0.1	
1,2-DIBROMOETHANE (EDB)	MG/M3	ND	0.1	
1,2,4 TRICHLOROBENZENE	MG/M3	ND	0.1	
1,2,4-TRIMETHYLBENZENE	MG/M3	ND	0.1	
1,3,5-TRIMETHYLBENZENE	MG/M3	ND	0.1	
1,1-DICHLOROETHENE	MG/M3	ND	0.1	
1,1,1-TRICHLOROETHANE	MG/M3	ND	0.1	

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	004	Sample Date/Time:	21-JAN-97 1545
Client Sample Id:	701371-04	Received Date:	01-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
TRICHLOROTRIFLUOROETHANE	MG/M3	ND	0.1	
4-ETHYLTOLUENE	MG/M3	ND	0.1	
BROMOFLUOROBENZENE	%REC/SURR	106	90-111	
1,2-DICHLOROETHANE-D4	%REC/SURR	96	85-115	
TOLUENE-D8	%REC/SURR	104	85-111	
ANALYST	INITIALS	BV		

Comments:

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	004	Sample Date/Time:	21-JAN-97 1545
Client Sample Id:	701371-04	Received Date:	01-FEB-97

"Sample Tic Report"

Number of Tics Found: 1
Concentration Units: MG/M3

Cas Number:	Compound Name:	RT:	Est Conc:	Q:
000110-54-3	N-HEXANE	6.99	0.5	

American Environmental Network, Inc.

"FINAL REPORT FORMAT - SINGLE"

Accession: 702011
Client: AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number: 701371
Project Name: MARATHON OIL CO.
Project Location: IB REMEDIATION
Test: TO14
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A
Matrix: AIR
QC Level: I

Lab Id: 005
Client Sample Id: 701371-05
Sample Date/Time: 21-JAN-97 1730
Received Date: 01-FEB-97

Batch: MAB017
Blank: B
Dry Weight %: N/A
Extraction Date: N/A
Analysis Date: 09-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
ALPHA-CHLOROTOLUENE	MG/M3	ND	0.07	
BENZENE	MG/M3	ND	0.07	
BROMOMETHANE	MG/M3	ND	0.07	
CARBON TETRACHLORIDE	MG/M3	ND	0.07	
CHLOROBENZENE	MG/M3	ND	0.07	
CHLOROETHANE	MG/M3	ND	0.07	
CHLOROFORM	MG/M3	ND	0.07	
CHLOROMETHANE	MG/M3	ND	0.07	
CIS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.07	
DICHLORODIFLUOROMETHANE	MG/M3	ND	0.07	
1,1-DICHLOROETHANE	MG/M3	ND	0.07	
1,2-DICHLOROETHANE	MG/M3	ND	0.07	
1,2-DICHLOROPROPANE	MG/M3	ND	0.07	
CIS-1,3-DICHLOROPROPENE	MG/M3	ND	0.07	
TRANS-1,3-DICHLOROPROPENE	MG/M3	ND	0.07	
DICHLOROTETRAFLUOROETHANE	MG/M3	ND	0.07	
ETHYL BENZENE	MG/M3	ND	0.07	
HEXACHLOROBUTADIENE	MG/M3	ND	0.07	
M-DICHLOROBENZENE	MG/M3	ND	0.07	
M,P-XYLENE	MG/M3	ND	0.07	
METHYLENE CHLORIDE	MG/M3	ND	0.2	
O-DICHLOROBENZENE	MG/M3	ND	0.07	
O-XYLENE	MG/M3	ND	0.07	
P-DICHLOROBENZENE	MG/M3	ND	0.07	
STYRENE	MG/M3	ND	0.07	
1,1,2,2-TETRACHLOROETHANE	MG/M3	ND	0.07	
TETRACHLOROETHYLENE	MG/M3	ND	0.07	
TOLUENE	MG/M3	0.10	0.07	
1,1,2-TRICHLOROETHANE	MG/M3	ND	0.07	
TRICHLOROETHYLENE	MG/M3	ND	0.07	
TRICHLOROFLUOROMETHANE	MG/M3	ND	0.07	
VINYL CHLORIDE	MG/M3	ND	0.07	
1,2-DIBROMOETHANE (EDB)	MG/M3	ND	0.07	
1,2,4 TRICHLOROBENZENE	MG/M3	ND	0.07	
1,2,4-TRIMETHYLBENZENE	MG/M3	ND	0.07	
1,3,5-TRIMETHYLBENZENE	MG/M3	ND	0.07	
1,1-DICHLOROETHENE	MG/M3	ND	0.07	
1,1,1-TRICHLOROETHANE	MG/M3	ND	0.07	

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	005	Sample Date/Time:	21-JAN-97 1730
Client Sample Id:	701371-05	Received Date:	01-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
TRICHLOROTRIFLUOROETHANE	MG/M3	ND	0.07	
4-ETHYLTOLUENE	MG/M3	ND	0.07	
BROMOFLUOROBENZENE	%REC/SURR	105	90-111	
1,2-DICHLOROETHANE-D4	%REC/SURR	97	85-115	
TOLUENE-D8	%REC/SURR	104	85-111	
ANALYST	INITIALS	BV		

Comments:

American Environmental Network, Inc.

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	005	Sample Date/Time:	21-JAN-97 1730
Client Sample Id:	701371-05	Received Date:	01-FEB-97

"Sample Tic Report"

Number of Tics Found: 0
Concentration Units: MG/M3

Cas Number:	Compound Name:	RT:	Est Conc:	Q:

"FINAL REPORT FORMAT - SINGLE"

Accession: 702011
Client: AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number: 701371
Project Name: MARATHON OIL CO.
Project Location: IB REMEDIATION
Test: TO14
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A
Matrix: AIR
QC Level: I

Lab Id: 006 Sample Date/Time: 23-JAN-97 1100
Client Sample Id: 701371-06 Received Date: 01-FEB-97

Batch: MAB017 Extraction Date: N/A
Blank: A Dry Weight %: N/A Analysis Date: 09-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
ALPHA-CHLOROTOLUENE	MG/M3	ND	2	
BENZENE	MG/M3	ND	2	
BROMOMETHANE	MG/M3	ND	2	
CARBON TETRACHLORIDE	MG/M3	ND	2	
CHLOROBENZENE	MG/M3	ND	2	
CHLOROETHANE	MG/M3	ND	2	
CHLOROFORM	MG/M3	ND	2	
CHLOROMETHANE	MG/M3	ND	2	
CIS 1,2 DICHLOROETHYLENE	MG/M3	ND	2	
DICHLORODIFLUOROMETHANE	MG/M3	ND	2	
1,1-DICHLOROETHANE	MG/M3	ND	2	
1,2-DICHLOROETHANE	MG/M3	ND	2	
1,2-DICHLOROPROPANE	MG/M3	ND	2	
CIS-1,3-DICHLOROPROPENE	MG/M3	ND	2	
TRANS-1,3-DICHLOROPROPENE	MG/M3	ND	2	
DICHLOROTETRAFLUOROETHANE	MG/M3	ND	2	
ETHYL BENZENE	MG/M3	ND	2	
HEXACHLOROBUTADIENE	MG/M3	ND	2	
M-DICHLOROBENZENE	MG/M3	ND	2	
M,P-XYLENE	MG/M3	ND	2	
METHYLENE CHLORIDE	MG/M3	ND	4	
O-DICHLOROBENZENE	MG/M3	ND	2	
O-XYLENE	MG/M3	ND	2	
P-DICHLOROBENZENE	MG/M3	ND	2	
STYRENE	MG/M3	ND	2	
1,1,2,2-TETRACHLOROETHANE	MG/M3	ND	2	
TETRACHLOROETHYLENE	MG/M3	ND	2	
TOLUENE	MG/M3	ND	2	
1,1,2-TRICHLOROETHANE	MG/M3	ND	2	
TRICHLOROETHYLENE	MG/M3	ND	2	
TRICHLOROFLUOROMETHANE	MG/M3	ND	2	
VINYL CHLORIDE	MG/M3	ND	2	
1,2-DIBROMOETHANE (EDB)	MG/M3	ND	2	
1,2,4 TRICHLOROBENZENE	MG/M3	ND	2	
1,2,4-TRIMETHYLBENZENE	MG/M3	ND	2	
1,3,5-TRIMETHYLBENZENE	MG/M3	ND	2	
1,1-DICHLOROETHENE	MG/M3	ND	2	
1,1,1-TRICHLOROETHANE	MG/M3	ND	2	

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	006	Sample Date/Time:	23-JAN-97 1100
Client Sample Id:	701371-06	Received Date:	01-FEB-97

Parameter:	Units:	Results:	Rpt Lmts:	Q:
TRICHLOROTRIFLUOROETHANE	MG/M3	ND	2	
4-ETHYLTOLUENE	MG/M3	ND	2	
BROMOFLUOROBENZENE	%REC/SURR	100	90-111	
1,2-DICHLOROETHANE-D4	%REC/SURR	99	85-115	
TOLUENE-D8	%REC/SURR	103	85-111	
ANALYST	INITIALS	BV		

Comments:

"FINAL REPORT FORMAT - SINGLE"

Accession:	702011
Client:	AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number:	701371
Project Name:	MARATHON OIL CO.
Project Location:	IB REMEDIATION
Test:	TO14
Analysis Method:	TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method:	N/A
Matrix:	AIR
QC Level:	I

Lab Id:	006	Sample Date/Time:	23-JAN-97 1100
Client Sample Id:	701371-06	Received Date:	01-FEB-97

"Sample Tic Report"

Number of Tics Found: 1
Concentration Units: MG/M3

Cas Number:	Compound Name:	RT:	Est Conc:	Q:
000110-54-3	N-HEXANE	6.98	12	

American Environmental Network, Inc.

"Method Report Summary"

Accession Number: 702011
Client: AMERICAN ENVIRONMENTAL NETWORK (NEW MEXICO) INC.
Project Number: 701371
Project Name: MARATHON OIL CO.
Project Location: IB REMEDIATION
Test: TO14

Client Sample Id:	Parameter:	Unit:	Result:
701371-05	TOLUENE	MG/M3	0.10

"QC Report"

Title: Bag/Can Blank
Batch: MAB017
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A

Blank Id: B Date Analyzed: 09-FEB-97 Date Extracted: N/A

Parameters:	Units:	Results:	Reporting Limits:
ALPHA-CHLOROTOLUENE	MG/M3	ND	0.03
ACROLEIN	MG/M3	ND	1.0
ACETONE	MG/M3	ND	0.1
ACRYLONITRILE	MG/M3	ND	1.0
BENZENE	MG/M3	ND	0.03
BROMOMETHANE	MG/M3	ND	0.03
BROMOFORM	MG/M3	ND	0.03
2-BUTANONE	MG/M3	ND	0.10
BROMODICHLOROMETHANE	MG/M3	ND	0.03
CARBON TETRACHLORIDE	MG/M3	ND	0.03
CARBON DISULFIDE	MG/M3	ND	0.03
CHLOROBENZENE	MG/M3	ND	0.03
CHLOROETHANE	MG/M3	ND	0.03
CHLOROFORM	MG/M3	ND	0.03
CHLOROMETHANE	MG/M3	ND	0.03
CIS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.03
TRANS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.03
DICHLORODIFLUOROMETHANE	MG/M3	ND	0.03
DIBROMOCHLOROMETHANE	MG/M3	ND	0.03
1,1-DICHLOROETHANE	MG/M3	ND	0.03
1,2-DICHLOROETHANE	MG/M3	ND	0.03
1,2-DICHLOROPROPANE	MG/M3	ND	0.03
CIS-1,3-DICHLOROPROPENE	MG/M3	ND	0.03
TRANS-1,3-DICHLOROPROPENE	MG/M3	ND	0.03
DICHLOROTETRAFLUOROETHANE	MG/M3	ND	0.03
1,4-DICHLORO-2-BUTENE	MG/M3	ND	0.03
ETHYL BENZENE	MG/M3	ND	0.03
HEXACHLOROBUTADIENE	MG/M3	ND	0.03
2-HEXANONE	MG/M3	ND	0.10
M-DICHLOROBENZENE	MG/M3	ND	0.03
M,P-XYLENE	MG/M3	ND	0.03
METHYLENE CHLORIDE	MG/M3	ND	0.07
4-METHYL-2-PENTANONE	MG/M3	ND	0.10
O-DICHLOROBENZENE	MG/M3	ND	0.03
O-XYLENE	MG/M3	ND	0.03
P-DICHLOROBENZENE	MG/M3	ND	0.03
STYRENE	MG/M3	ND	0.03
1,1,2,2-TETRACHLOROETHANE	MG/M3	ND	0.03
TETRACHLOROETHYLENE	MG/M3	ND	0.03
TOLUENE	MG/M3	ND	0.03
1,1,2-TRICHLOROETHANE	MG/M3	ND	0.03
TRICHLOROETHYLENE	MG/M3	ND	0.03
TRICHLOROFLUOROMETHANE	MG/M3	ND	0.03
VINYL CHLORIDE	MG/M3	ND	0.03
VINYL ACETATE	MG/M3	ND	0.03
1,2-DIBROMOETHANE (EDB)	MG/M3	ND	0.03

"QC Report"

Title: Bag/Can Blank
Batch: MAB017
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A

Parameters:	Units:	Results:	Reporting Limits:
1,2,4 TRICHLOROBENZENE	MG/M3	ND	0.03
1,2,4-TRIMETHYLBENZENE	MG/M3	ND	0.03
1,3,5-TRIMETHYLBENZENE	MG/M3	ND	0.03
1,1-DICHLOROETHENE	MG/M3	ND	0.03
1,1,1-TRICHLOROETHANE	MG/M3	ND	0.03
TRICHLOROTRIFLUOROETHANE	MG/M3	ND	0.03
4-ETHYLTOLUENE	MG/M3	ND	0.03
BROMOFLUOROBENZENE	%REC/SURR	105	90-111
1,2-DICHLOROETHANE-D4	%REC/SURR	98	85-115
TOLUENE-D8	%REC/SURR	105	85-111
ANALYST	INITIALS	BV	

Comments:

"QC Report"

Title: Bag/Can Blank
Batch: MAB017
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A

Blank Id: A Date Analyzed: 09-FEB-97 Date Extracted: N/A

Parameters:	Units:	Results:	Reporting Limits:
ALPHA-CHLOROTOLUENE	MG/M3	ND	0.03
ACROLEIN	MG/M3	ND	1.0
ACETONE	MG/M3	ND	0.1
ACRYLONITRILE	MG/M3	ND	1.0
BENZENE	MG/M3	ND	0.03
BROMOMETHANE	MG/M3	ND	0.03
BROMOFORM	MG/M3	ND	0.03
2-BUTANONE	MG/M3	ND	0.10
BROMODICHLOROMETHANE	MG/M3	ND	0.03
CARBON TETRACHLORIDE	MG/M3	ND	0.03
CARBON DISULFIDE	MG/M3	ND	0.03
CHLOROBENZENE	MG/M3	ND	0.03
CHLOROETHANE	MG/M3	ND	0.03
CHLOROFORM	MG/M3	ND	0.03
CHLOROMETHANE	MG/M3	ND	0.03
CIS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.03
TRANS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.03
DICHLORODIFLUOROMETHANE	MG/M3	ND	0.03
DIBROMOCHLOROMETHANE	MG/M3	ND	0.03
1,1-DICHLOROETHANE	MG/M3	ND	0.03
1,2-DICHLOROETHANE	MG/M3	ND	0.03
1,2-DICHLOROPROPANE	MG/M3	ND	0.03
CIS-1,3-DICHLOROPROPENE	MG/M3	ND	0.03
TRANS-1,3-DICHLOROPROPENE	MG/M3	ND	0.03
DICHLOROTETRAFLUOROETHANE	MG/M3	ND	0.03
1,4-DICHLORO-2-BUTENE	MG/M3	ND	0.03
ETHYL BENZENE	MG/M3	ND	0.03
HEXACHLOROBUTADIENE	MG/M3	ND	0.03
2-HEXANONE	MG/M3	ND	0.10
M-DICHLOROBENZENE	MG/M3	ND	0.03
M,P-XYLENE	MG/M3	ND	0.03
METHYLENE CHLORIDE	MG/M3	ND	0.07
4-METHYL-2-PENTANONE	MG/M3	ND	0.10
O-DICHLOROBENZENE	MG/M3	ND	0.03
O-XYLENE	MG/M3	ND	0.03
P-DICHLOROBENZENE	MG/M3	ND	0.03
STYRENE	MG/M3	ND	0.03
1,1,2,2-TETRACHLOROETHANE	MG/M3	ND	0.03
TETRACHLOROETHYLENE	MG/M3	ND	0.03
TOLUENE	MG/M3	ND	0.03
1,1,2-TRICHLOROETHANE	MG/M3	ND	0.03
TRICHLOROETHYLENE	MG/M3	ND	0.03
TRICHLOROFLUOROMETHANE	MG/M3	ND	0.03
VINYL CHLORIDE	MG/M3	ND	0.03
VINYL ACETATE	MG/M3	ND	0.03
1,2-DIBROMOETHANE (EDB)	MG/M3	ND	0.03

"QC Report"

Title: Bag/Can Blank
Batch: MAB017
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A

Parameters:	Units:	Results:	Reporting Limits:
1,2,4 TRICHLOROBENZENE	MG/M3	ND	0.03
1,2,4-TRIMETHYLBENZENE	MG/M3	ND	0.03
1,3,5-TRIMETHYLBENZENE	MG/M3	ND	0.03
1,1-DICHLOROETHENE	MG/M3	ND	0.03
1,1,1-TRICHLOROETHANE	MG/M3	ND	0.03
TRICHLOROTRIFLUOROETHANE	MG/M3	ND	0.03
4-ETHYLTOLUENE	MG/M3	ND	0.03
BROMOFLUOROBENZENE	%REC/SURR	105	90-111
1,2-DICHLOROETHANE-D4	%REC/SURR	96	85-115
TOLUENE-D8	%REC/SURR	105	85-111
ANALYST	INITIALS	BV	

Comments:

American Environmental Network, Inc.

"QC Report"

Title: Bag/Can Reagent
Batch: MAB017
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A

RS Date Analyzed: 08-FEB-97 RS Date Extracted: N/A
RSD Date Analyzed: 08-FEB-97 RSD Date Extracted: N/A

Parameters:	Spike Added	Sample Conc	RS Conc	RS %Rec	RSD Conc	RSD %Rec	RPD	RPD Lmts	Rec Lmts
1,1-DICHLOROETHENE	2.0	<0.03	2.0	100	1.8	90	11	20	36-134
TRICHLOROETHENE	2.0	<0.03	1.8	90	1.8	90	0	20	65-130
BENZENE	2.0	<0.03	1.9	95	1.9	95	0	20	61-140
TOLUENE	2.0	<0.03	2.0	100	1.9	95	5	20	70-130
CHLOROBENZENE	2.0	<0.03	2.1	105	2.0	100	5	20	77-137
Surrogates:									
1,2-DICHLOROETHANE-D4				100		96			85-115
TOLUENE-D8				105		105			85-111
BROMOFLUOROBENZENE				104		99			90-111

Comments:
DUE TO THE NATURE OF THE SAMPLE MATRIX, MATRIX SPIKE/MATRIX SPIKE DUPLICATE CANNOT BE ANALYZED.

Notes:
N/S = NOT SUBMITTED N/A = NOT APPLICABLE D = DILUTED OUT
MG/M3 = PARTS PER BILLION. < = LESS THAN REPORTING LIMIT.
* = VALUES OUTSIDE OF QUALITY CONTROL LIMITS.
SOURCES FOR CONTROL LIMITS ARE INTERNAL LABORATORY QUALITY ASSURANCE PROGRAM AND REFERENCED METHOD.

Common notation for Organic reporting

N/S = NOT SUBMITTED
N/A = NOT APPLICABLE
D = DILUTED OUT
UG/L = PARTS PER BILLION.
UG/KG = PARTS PER BILLION.
MG/KG = PARTS PER MILLION.
MG/L = PARTS PER MILLION.
MG/M3 = MILLIGRAMS PER CUBIC METER.
NG = NANOGRAMS.
UG = MICROGRAMS.
PPBV = PARTS PER BILLION/VOLUME.
< = LESS THAN DETECTION LIMIT.
* = VALUES OUTSIDE OF QUALITY CONTROL LIMITS
J = THE REPORTED VALUE IS EITHER LESS THAN THE REPORTING LIMIT BUT GREATER THAN ZERO, OR QUANTITATED AS A TIC; THEREFORE, IT IS ESTIMATED.
JJ = REPORTED VALUE IS ESTIMATED DUE TO MATRIX INTERFERENCE.
ND = NOT DETECTED ABOVE REPORT LIMIT.
RPT LIMIT = REPORTING LIMITS BASED ON METHOD DETECTION LIMIT STUDIES.
RPD = RELATIVE PERCENT DIFFERENCE (OR DEVIATION)

SOURCES FOR CONTROL LIMITS ARE INTERNAL LABORATORY QUALITY ASSURANCE PROGRAM AND REFERENCED METHOD.

ORGANIC SOILS ARE REPORTED ON A DRY WEIGHT BASIS.

DUE TO THE NATURE OF THE SAMPLE MATRIX, MATRIX SPIKE/MATRIX SPIKE DUPLICATE ANALYSIS CANNOT BE PERFORMED FOR AIR ANALYSIS.

CLP SOW 1991, USEPA CONTRACT LABORATORY PROGRAM, STATEMENT OF WORK FOR ORGANICS ANALYSIS, DOCUMENT NUMBER OLM01.8, AUGUST 1991.

LP = LEVERNE PETERSON
LD = LARRY DILMORE
PL = PAUL LESCHENSKY
DWB = DAVID BOWERS
RW = RITA WINGO
LL = LANCE LARSON
BV = BEN VAUGHN

BLANK ANALYSIS

DATE: 07-FEB-97

METHOD: AEN/GC/FID

BATCH: GEA011

COMPOUND	UNITS	REPORTING LIMIT	RESULT
N-HEXANE	UG/L	50	ND

DUPLICATE SAMPLE ANALYSIS

DATE: 07-FEB-97

METHOD: AEN/GC/FID

LAB SAMPLE #: 702011-1

BATCH: GEA011

COMPOUND	SAMPLE RESULT	DUPLICATE RESULT	%RPD	QC LIMITS
N-HEXANE	680	620	9	50

ALL RESULTS REPORTED IN UG/L.

ND = NOT DETECTED
NC = NOT CALCULABLE

SOURCE FOR CONTROL LIMIT IS INTERNAL LABORATORY QUALITY ASSURANCE PROGRAM AND AEN/GC/FID.

"QC Report"

Title: Bag/Can Blank
Batch: MAB017
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A

Blank Id: B Date Analyzed: 09-FEB-97 Date Extracted: N/A

Parameters:	Units:	Results:	Reporting Limits:
ALPHA-CHLOROTOLUENE	MG/M3	ND	0.03
ACROLEIN	MG/M3	ND	1.0
ACETONE	MG/M3	ND	0.1
ACRYLONITRILE	MG/M3	ND	1.0
BENZENE	MG/M3	ND	0.03
BROMOMETHANE	MG/M3	ND	0.03
BROMOFORM	MG/M3	ND	0.03
2-BUTANONE	MG/M3	ND	0.10
BROMODICHLOROMETHANE	MG/M3	ND	0.03
CARBON TETRACHLORIDE	MG/M3	ND	0.03
CARBON DISULFIDE	MG/M3	ND	0.03
CHLOROBENZENE	MG/M3	ND	0.03
CHLOROETHANE	MG/M3	ND	0.03
CHLOROFORM	MG/M3	ND	0.03
CHLOROMETHANE	MG/M3	ND	0.03
CIS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.03
TRANS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.03
DICHLORODIFLUOROMETHANE	MG/M3	ND	0.03
DIBROMOCHLOROMETHANE	MG/M3	ND	0.03
1,1-DICHLOROETHANE	MG/M3	ND	0.03
1,2-DICHLOROETHANE	MG/M3	ND	0.03
1,2-DICHLOROPROPANE	MG/M3	ND	0.03
CIS-1,3-DICHLOROPROPENE	MG/M3	ND	0.03
TRANS-1,3-DICHLOROPROPENE	MG/M3	ND	0.03
DICHLOROTETRAFLUOROETHANE	MG/M3	ND	0.03
1,4-DICHLORO-2-BUTENE	MG/M3	ND	0.03
ETHYL BENZENE	MG/M3	ND	0.03
HEXACHLOROBUTADIENE	MG/M3	ND	0.03
2-HEXANONE	MG/M3	ND	0.10
M-DICHLOROBENZENE	MG/M3	ND	0.03
M,P-XYLENE	MG/M3	ND	0.03
METHYLENE CHLORIDE	MG/M3	ND	0.07
4-METHYL-2-PENTANONE	MG/M3	ND	0.10
O-DICHLOROBENZENE	MG/M3	ND	0.03
O-XYLENE	MG/M3	ND	0.03
P-DICHLOROBENZENE	MG/M3	ND	0.03
STYRENE	MG/M3	ND	0.03
1,1,2,2-TETRACHLOROETHANE	MG/M3	ND	0.03
TETRACHLOROETHYLENE	MG/M3	ND	0.03
TOLUENE	MG/M3	ND	0.03
1,1,2-TRICHLOROETHANE	MG/M3	ND	0.03
TRICHLOROETHYLENE	MG/M3	ND	0.03
TRICHLOROFLUOROMETHANE	MG/M3	ND	0.03
VINYL CHLORIDE	MG/M3	ND	0.03
VINYL ACETATE	MG/M3	ND	0.03
1,2-DIBROMOETHANE (EDB)	MG/M3	ND	0.03

"QC Report"

Title: Bag/Can Blank
Batch: MAB017
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A

Parameters:	Units:	Results:	Reporting Limits:
1,2,4 TRICHLOROBENZENE	MG/M3	ND	0.03
1,2,4-TRIMETHYLBENZENE	MG/M3	ND	0.03
1,3,5-TRIMETHYLBENZENE	MG/M3	ND	0.03
1,1-DICHLOROETHENE	MG/M3	ND	0.03
1,1,1-TRICHLOROETHANE	MG/M3	ND	0.03
TRICHLOROTRIFLUOROETHANE	MG/M3	ND	0.03
4-ETHYLTOLUENE	MG/M3	ND	0.03
BROMOFLUOROBENZENE	%REC/SURR	105	90-111
1,2-DICHLOROETHANE-D4	%REC/SURR	98	85-115
TOLUENE-D8	%REC/SURR	105	85-111
ANALYST	INITIALS	BV	

Comments:

"QC Report"

Title: Bag/Can Blank
Batch: MAB017
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A

Blank Id: A Date Analyzed: 08-FEB-97 Date Extracted: N/A

Parameters:	Units:	Results:	Reporting Limits:
ALPHA-CHLOROTOLUENE	MG/M3	ND	0.03
ACROLEIN	MG/M3	ND	1.0
ACETONE	MG/M3	ND	0.1
ACRYLONITRILE	MG/M3	ND	1.0
BENZENE	MG/M3	ND	0.03
BROMOMETHANE	MG/M3	ND	0.03
BROMOFORM	MG/M3	ND	0.03
2-BUTANONE	MG/M3	ND	0.10
BROMODICHLOROMETHANE	MG/M3	ND	0.03
CARBON TETRACHLORIDE	MG/M3	ND	0.03
CARBON DISULFIDE	MG/M3	ND	0.03
CHLOROBENZENE	MG/M3	ND	0.03
CHLOROETHANE	MG/M3	ND	0.03
CHLOROFORM	MG/M3	ND	0.03
CHLOROMETHANE	MG/M3	ND	0.03
CIS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.03
TRANS 1,2 DICHLOROETHYLENE	MG/M3	ND	0.03
DICHLORODIFLUOROMETHANE	MG/M3	ND	0.03
DIBROMOCHLOROMETHANE	MG/M3	ND	0.03
1,1-DICHLOROETHANE	MG/M3	ND	0.03
1,2-DICHLOROETHANE	MG/M3	ND	0.03
1,2-DICHLOROPROPANE	MG/M3	ND	0.03
CIS-1,3-DICHLOROPROPENE	MG/M3	ND	0.03
TRANS-1,3-DICHLOROPROPENE	MG/M3	ND	0.03
DICHLOROTETRAFLUOROETHANE	MG/M3	ND	0.03
1,4-DICHLORO-2-BUTENE	MG/M3	ND	0.03
ETHYL BENZENE	MG/M3	ND	0.03
HEXACHLOROBUTADIENE	MG/M3	ND	0.03
2-HEXANONE	MG/M3	ND	0.10
M-DICHLOROBENZENE	MG/M3	ND	0.03
M,P-XYLENE	MG/M3	ND	0.03
METHYLENE CHLORIDE	MG/M3	ND	0.07
4-METHYL-2-PENTANONE	MG/M3	ND	0.10
O-DICHLOROBENZENE	MG/M3	ND	0.03
O-XYLENE	MG/M3	ND	0.03
P-DICHLOROBENZENE	MG/M3	ND	0.03
STYRENE	MG/M3	ND	0.03
1,1,2,2-TETRACHLOROETHANE	MG/M3	ND	0.03
TETRACHLOROETHYLENE	MG/M3	ND	0.03
TOLUENE	MG/M3	ND	0.03
1,1,2-TRICHLOROETHANE	MG/M3	ND	0.03
TRICHLOROETHYLENE	MG/M3	ND	0.03
TRICHLOROFLUOROMETHANE	MG/M3	ND	0.03
VINYL CHLORIDE	MG/M3	ND	0.03
VINYL ACETATE	MG/M3	ND	0.03
1,2-DIBROMOETHANE (EDB)	MG/M3	ND	0.03

"QC Report"

Title: Bag/Can Blank
Batch: MAB017
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A

Parameters:	Units:	Results:	Reporting Limits:
1,2,4 TRICHLOROBENZENE	MG/M3	ND	0.03
1,2,4-TRIMETHYLBENZENE	MG/M3	ND	0.03
1,3,5-TRIMETHYLBENZENE	MG/M3	ND	0.03
1,1-DICHLOROETHENE	MG/M3	ND	0.03
1,1,1-TRICHLOROETHANE	MG/M3	ND	0.03
TRICHLOROTRIFLUOROETHANE	MG/M3	ND	0.03
4-ETHYLTOLUENE	MG/M3	ND	0.03
BROMOFLUOROBENZENE	%REC/SURR	105	90-111
1,2-DICHLOROETHANE-D4	%REC/SURR	96	85-115
TOLUENE-D8	%REC/SURR	105	85-111
ANALYST	INITIALS	BV	

Comments:

"QC Report"

Title: Bag/Can Reagent
Batch: MAB017
Analysis Method: TO14/SIM/Compendium of Methods, EPA-600/4-87-006, June 1988.
Extraction Method: N/A

RS Date Analyzed: 08-FEB-97 RS Date Extracted: N/A
RSD Date Analyzed: 08-FEB-97 RSD Date Extracted: N/A

Parameters:	Spike Added	Sample Conc	RS Conc	RS %Rec	RSD Conc	RSD %Rec	RPD	RPD Lmts	Rec Lmts
1,1-DICHLOROETHENE	2.0	<0.03	2.0	100	1.8	90	11	20	36-134
TRICHLOROETHENE	2.0	<0.03	1.8	90	1.8	90	0	20	65-130
BENZENE	2.0	<0.03	1.9	95	1.9	95	0	20	61-140
TOLUENE	2.0	<0.03	2.0	100	1.9	95	5	20	70-130
CHLOROBENZENE	2.0	<0.03	2.1	105	2.0	100	5	20	77-137
Surrogates:									
1,2-DICHLOROETHANE-D4				100		96			85-115
TOLUENE-D8				105		105			85-111
BROMOFLUOROBENZENE				104		99			90-111

Comments:
DUE TO THE NATURE OF THE SAMPLE MATRIX, MATRIX SPIKE/MATRIX SPIKE DUPLICATE CANNOT BE ANALYZED.

Notes:
N/S = NOT SUBMITTED N/A = NOT APPLICABLE D = DILUTED OUT
MG/M3 = PARTS PER BILLION. < = LESS THAN REPORTING LIMIT.
* = VALUES OUTSIDE OF QUALITY CONTROL LIMITS.
SOURCES FOR CONTROL LIMITS ARE INTERNAL LABORATORY QUALITY ASSURANCE PROGRAM AND REFERENCED METHOD.

Common notation for Organic reporting

N/S = NOT SUBMITTED
N/A = NOT APPLICABLE
D = DILUTED OUT
UG/L = PARTS PER BILLION.
UG/KG = PARTS PER BILLION.
MG/KG = PARTS PER MILLION.
MG/L = PARTS PER MILLION.
MG/M3 = MILLIGRAMS PER CUBIC METER.
NG = NANOGRAMS.
UG = MICROGRAMS.
PPBV = PARTS PER BILLION/VOLUME.
< = LESS THAN DETECTION LIMIT.
* = VALUES OUTSIDE OF QUALITY CONTROL LIMITS
J = THE REPORTED VALUE IS EITHER LESS THAN THE REPORTING LIMIT BUT GREATER THAN ZERO, OR QUANTITATED AS A TIC; THEREFORE, IT IS ESTIMATED.
JJ = REPORTED VALUE IS ESTIMATED DUE TO MATRIX INTERFERENCE.
ND = NOT DETECTED ABOVE REPORT LIMIT.
RPT LIMIT = REPORTING LIMITS BASED ON METHOD DETECTION LIMIT STUDIES.
RPD = RELATIVE PERCENT DIFFERENCE (OR DEVIATION)

SOURCES FOR CONTROL LIMITS ARE INTERNAL LABORATORY QUALITY ASSURANCE PROGRAM AND REFERENCED METHOD.

ORGANIC SOILS ARE REPORTED ON A DRY WEIGHT BASIS.

DUE TO THE NATURE OF THE SAMPLE MATRIX, MATRIX SPIKE/MATRIX SPIKE DUPLICATE ANALYSIS CANNOT BE PERFORMED FOR AIR ANALYSIS.

CLP SOW 1991, USEPA CONTRACT LABORATORY PROGRAM, STATEMENT OF WORK FOR ORGANICS ANALYSIS, DOCUMENT NUMBER OLM01.8, AUGUST 1991.

LP = LEVERNE PETERSON	RW = RITA WINGO
LD = LARRY DILMORE	LL = LANCE LARSON
PL = PAUL LESCHENSKY	BV = BEN VAUGHN
DWB = DAVID BOWERS	

American Environmental Network (NM), Inc.
Albuquerque • Phoenix • Pensacola • Portland • Pleasant Hills • Columbia

CHAIN OF CUSTODY

DATE: 1/ PAGE: 1 OF 1

AEN LAB I.D. 70371

SHADED AREAS ARE FOR LAB USE ONLY.

PLEASE FILL THIS FORM IN COMPLETELY.

PROJECT MANAGER: BOB MENZIE

COMPANY: Marathon O/C
ADDRESS: PO Box 552
Midland TX, 79702
PHONE: (915) 687-8312
FAX: (915) 687-8305

BILL TO:
COMPANY:
ADDRESS: Same AB ABOR

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB I.D.	Petroleum Hydrocarbons (418.1) TRPH	(MOD.8015) Diesel/Direct/Inject	8015, 8020, TO14, N-Hexane BTEX Tunn	(M8015) Gas/Purge & Trap	Gasoline/BTEX & MTBE (M8015/8020)	BTXE/MTBE (8020)	BTEX & Chlorinated Aromatics (602/8020)	BTEX/MTBE/EDC & EDB (8020/8010/Short)	Chlorinated Hydrocarbons (601/8010)		504 EDB☐ / DBCP☐	Polynuclear Aromatics (610/8310)	Volatile Organics (624/8240) GC/MS	Volatile Organics (8260) GC/MS		Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)		General Chemistry:			Priority Pollutant Metals (13)	Target Analyte List Metals (23)	RCRA Metals (8)	RCRA Metals by TCLP (Method 1311)	Metals:		NUMBER OF CONTAINERS
VE3	1/21/97	1155	Air	-01			X																									1
VE1	1/20/97	1630		-02			X																									1
VE2	1/21/97	1350		-03			X																									1
VE4	1/21/97	1545		-04			X																									1
VE5	1/21/97	1730		-05			X																									1
VE5 EFF	1/23/97	1100	↓	-06			X																									1

PROJECT INFORMATION	
PROJ. NO.:	02335 0173.60
PROJ. NAME:	IB Remediation
P.O. NO.:	
SHIPPED VIA:	
SAMPLE RECEIPT	
NO. CONTAINERS:	6
CUSTODY SEALS:	N/A
RECEIVED INTACT:	Yes
BLUE ICE/ICE:	OK

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒

CERTIFICATION REQUIRED: ☐ NM ☐ SDWA ☐ OTHER

METHANOL PRESERVATION ☐

COMMENTS: FIXED FEE ☐

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.
Signature: Time: 1200	Signature: Time: 1:45
Printed Name: Clifford Boscoe Date: 1/24/97	Printed Name: Kevin Cook Date: 1/24/97
Company: Fluor Daniel GTI	Company: Fluor Daniel GTI
RECEIVED BY: 1.	**RECEIVED BY: (LAB) 2.**
Signature: Time: 1200	Signature: Time: 1245
Printed Name: Kevin Cook Date: 1/24/97	Printed Name: John Caldwell Date: 1/24/97
Company: Fluor Daniel GTI	American Environmental Network (NM), Inc.

American Environmental Network

11 East Olive Road Pensacola, Florida 32514 (904)474-1001

PROJECT SAMPLE INSPECTION FORM

Accession #: 702011 Date Received: 2/1/97

1.	Was there a Chain of Custody?	(Yes)	No	7.	Are samples preserved? (Check pH of all H_2O except 40ml vials)+	Yes	No	(N/A)
2.	Was Chain of Custody properly relinquished?	(Yes)	No	8.	Is there sufficient volume for analysis requested?	(Yes)	No	
3.	Were samples received cold? (Check Temperature of Cooler)	Yes	No (N/A)	9.	Were samples received within Holding Time?	(Yes)	No	
4.	Were all samples properly labeled and identified?	(Yes)	No	10.	Is Headspace visible > ¼" in diameter in 40ml vials?* If any headspace is evident, comment in out-of-control section.	Yes	No	(N/A)
5.	Were samples received in proper containers for analysis requested?	(Yes)	No	11.	If sent, were matrix spike bottles returned?	Yes	No	(N/A)
6.	Were all sample containers received intact?	(Yes)	No					

Airbill Number: 277257683? Shipped By: FedEx

Cooler Number: 278257562? N/A Shipping Charges: N/A

Cooler Weight: N/A Cooler Temp (°C): N/A

Out of Control Events and Inspection Comments:

Cond. recvd on 1/31/97

Cl2 recvd on 2/1/97

See discount rate on IWO, 10%, when the norm is 15%.

Inspected By: SE Date: 2/1/97 Logged By: SE Date: 2/1/97

\+ *All preservatives for the State of North Carolina and the State of New York are to be recorded on the sheet provided to record pH results (SOP 938, section 2.2.9.*

* *According to EPA, ¼" of headspace is allowed in 40ml vials, however, AEN makes it policy to record any headspace as out-of-control (SOP 938, section 2.2.12.*

American Environmental Network
Albuquerque, New Mexico

Interlab Chain of Custody

D2011

DATE: 1/24 PAGE 1 OF 1

NETWORK PROJECT MANAGER: KIMBERLY D. McNEILL

COMPANY: American Environmental Network
ADDRESS: 2709-D Pan American Freeway, NE
Albuquerque, NM 87107

CLIENT PROJECT MANAGER:

Kim McNeill

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
701371-01	1/21/97	1155	Air	1
-02	1/20	1630		2
-03	1/21	1550		3
-04	1/21	1545		4
-05	1/21	1730		5
-06	1/23	1100		6

ANALYSIS REQUEST

Metals - TAL	Metals - PP List	Metals - RCRA	RCRA Metals by TCLP (1311)	SOIS, TOTAL see hydrocarbon range calc	TOX	TOC	Gen Chemistry	Oil and Grease	BOD	COD	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral Acid Compounds GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	Polynuclear Aromatics (610/8310)	8240 (TCLP 1311) ZHE	8270 (TCLP 1311)	TO-14	Gross Alpha/Beta	NUMBER OF CONTAINERS
				X																1
				X																1
				X																1
				X																1
				X																1
				X																1

① C_6-C_{14} ② C_3-C_{32} BTEX + n-Heptane

PROJECT INFORMATION

PROJECT NUMBER: 701371
PROJECT NAME: Marathon Oil Co.
QC LEVEL: (SW) IV
QC REQUIRED: MS MSD BLANK
TAT: (STANDARD) RUSH

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS	
INTACT?	
RECEIVED GOOD COND./COLD	
LAB NUMBER	

DUE DATE: Standard
RUSH SURCHARGE:
CLIENT DISCOUNT:
SPECIAL CERTIFICATION REQUIRED: ☐YES ☐NO

SAMPLES SENT TO:

SAN DIEGO	
Paragon	
RENTON	
PENSACOLA	✓
PORTLAND	
PHOENIX	

RELINQUISHED BY: 1.

Signature: John Caldwell Time: 1700
Printed Name: John Caldwell Date: 1/24/97
Company: HEN Albuquerque

RECEIVED BY: 1.

Signature: Time:
Printed Name: Date:
Company:

RELINQUISHED BY: 2

Signature Time
Printed Name Date
Company

RECEIVED BY: (LAB) 2.

Signature: Time: 1600
Printed Name: Date: 1/24/97
Company: ACZ

Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777

American Environmental Network (NM), Inc.

Albuquerque • Phoenix • Pensacola • Portland • Pleasant Hills • Columbia

CHAIN OF CUSTODY

DATE: 1/ PAGE: 1 OF 1

AEN LAB I.D. 70371

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: BOB MEUZE

COMPANY: Marathon O/C

ADDRESS: PO Box 552

Midland Tx, 79702

PHONE: (915) 687-8312

FAX: (915) 687-8305

BILL TO:

COMPANY:

ADDRESS: Same AS ABOR

SAMPLE ID	DATE	TIME	MATRIX	LAB I.D.
VE3	1/21/97	1155	Air	-01
VE1	1/20/97	1630		-02
VE2	1/21/97	1350		-03
VE4	1/21/97	1545		-04
VE5	1/21/97	1730		-05
VE5 EFF	1/23/97	1100	↓	-06

ANALYSIS REQUEST

Petroleum Hydrocarbons (418.1) TRPH	(MOD.8015) Diesel/Direct/Inject	8015 Mod. TO 14, N-Hexane BTEX Trunit	(M8015) Gas/Purge & Trap	Gasoline/BTEX & MTBE (M8015/8020)	BTXE/MTBE (8020)	BTEX & Chlorinated Aromatics (602/8020)	BTEX/MTBE/EDC & EDB (8020/8010/Short)	Chlorinated Hydrocarbons (601/8010)		504 EDB / DBCP	Polynuclear Aromatics (610/8310)	Volatile Organics (624/8240) GC/MS	Volatile Organics (8260) GC/MS		Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)		General Chemistry:			Priority Pollutant Metals (13)	Target Analyte List Metals (23)	RCRA Metals (8)	RCRA Metals by TCLP Method (1311)	Metals		NUMBER OF CONTAINERS
		X																										1
		X																										1
		X																										1
		X																										1
		X																										1
		X																										1

PROJECT INFORMATION

PROJ. NO.: 02335 0173.60

PROJ. NAME: IB Remediation

P.O. NO.:

SHIPPED VIA:

SAMPLE RECEIPT

NO. CONTAINERS	6
CUSTODY SEALS	N/A
RECEIVED INTACT	Y
BLUE ICE/ICE	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒

CERTIFICATION REQUIRED: ☐ NM ☐ SDWA ☐ OTHER

METHANOL PRESERVATION ☐

COMMENTS: FIXED FEE ☐

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.
Signature: Time: 1200	Signature: Time: 1:45
Printed Name: Date: Clifford Duncan 1/24/97	Printed Name: Date: Kevin Cook 1/24/97
Company: Flour Daniel GTI	Company: Flour Daniel GTI
RECEIVED BY: 1.	**RECEIVED BY: (LAB) 2.**
Signature: Time: 1200	Signature: Time: 1245
Printed Name: Date: Kevin Cook 1/24/97	Printed Name: Date: John Caldwell 1/24/97
Company: Flour Daniel GTI	American Environmental Network (NM), Inc.