



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 898
ANCHORAGE, ALASKA 99506-0898

CEPOA-PM-M (200-1c)

1 July 1999

MEMORANDUM FOR Commander, U.S. Army Alaska, ATTN: APVR-RPW-ENV
(Fosbrook), 600 Richardson, #6505, Bldg. 724,
Fort Richardson, AK 99505-6505

SUBJECT: Vapor Extraction System Operational Status Report,
Building 986 Remedial Action, DACA85-94-D-0016, Delivery Order 8,
Fort Richardson, Alaska

1. Five copies of the subject document are enclosed.
2. Please contact me at (907) 753-2695 if you have any questions.

FOR THE COMMANDER:

Encl

MOLLIE TEVRUCHT, Ph.D.
Project Manager, Army Program

CF:

Commander, U.S. Army Alaska, ATTN: APVR-RPW-ENV (Gardner),
600 Richardson, #6505, Bldg. 724, Fort Richardson, AK 99505-6505
(w/o encl)

CEPOA-PM-M-A (TeVrucht)
CEPOA-EN-G-MI (Archibald)
CEPOA-EN-EE-TE (Ginter)
FTR Adm File
FTR Rec File

TeVrucht\1 Jul 99

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**emcon Alaska, Inc.**

4701 Business Park Boulevard • Suite 36 • Anchorage, Alaska 99503-7166 • (907) 562-3452 • Fax (907) 563-2814

June 10, 1999

Project 55016-008.000 Task 8E

Serial Letter No. D0008-029

Mr. Lynden Belin
Richardson Resident Office
U.S. Army Engineer District, Alaska
P.O. Box 898
Anchorage, Alaska 99506-0898

Re: Vapor Extraction System Operational Status Report, Building 986 Remedial Action,
Fort Richardson, Alaska

Dear Mr. Belin:

EMCON Alaska, Inc. (EMCON), has been retained by U.S. Army Corps of Engineers, Alaska District (USACE), under Delivery Order 008, Contract No. DACA85-94-D-0016, to perform operation and monitoring of the vapor extraction (VE) system at Building 986, Fort Richardson, Alaska. Throughout VE system operation, EMCON is conducting periodic monitoring and sampling to assess VE system performance. This letter report presents a summary of VE system performance from January 13, 1998, through EMCON's last sampling event on April 19, 1999.

Operational Monitoring

Since VE system start-up, EMCON has performed ten operational monitoring events at the Building 986 VE system. These events were performed on August 20, September 3, September 14, October 16, October 30, December 10, 1998; and January 13 through 16, February 10, March 16, and April 19, 1999. During each of the ten events, EMCON documented extraction flow rates and applied vacuum levels, and monitored hydrocarbon vapor concentrations in VE system effluent. The VE system operational data is presented in Table 1 (attached).

After documenting the system operating parameters and collecting analytical samples, EMCON performed system adjustments to stabilize VE well flow rates. The stabilization of flow rates is desirable for maintaining consistent flow rates for calculating mass-removal rates. To stabilize flow rates, each VE well was isolated by applying the entire system vacuum to only one VE well. The duration of VE well isolation ranged from 10

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minutes during initial attempts to 24 hours during the January 1999 visit. VE well isolation was performed on each of the three VE wells to increase the vacuum gradient and clear flow channels in the vicinity of the VE well. Following VE well isolation, the stabilized flow rates were documented for comparison with flow rates at the start of the next monitoring event. During the February and April visits the VE wells were not isolated due to consistent, stable readings for flow rate and applied vacuum.

Effluent Sampling

During seven of the ten operational monitoring events, effluent samples were collected from the VE system exhaust stack to estimate hydrocarbon-mass removal rates. Samples were collected from the exhaust stack using laboratory-prepared, 1-liter Silco Summa[®] canisters. Samples were sent to Performance Analytical, Inc., of Simi Valley, California, for analysis. Analytical results from the VE system effluent sampling are summarized in Table 2 (attached). Effluent samples were analyzed for the following parameters:

- Total petroleum hydrocarbons as gasoline (TPH-G) by U.S. Environmental Protection Agency (USEPA) Method TO-3
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) by California Air Resources Board (CARB) Method 410
- Hydrogen sulfide (H₂S) by USEPA Method 16
- Methane (CH₄), carbon dioxide (CO₂), oxygen (O₂), and nitrogen (N₂) by USEPA Method 25C

Findings

To assess VE system performance, analytical results and flow rates were used to estimate the daily rate of hydrocarbon removal from soil within the influence of the VE system. Additionally, soil gas extracted from the site was analyzed for H₂S, CH₄, N₂, O₂, and CO₂ in an effort to document changes in soil gas composition to assess potential effectiveness of future bioremediation options for the site.

Analytical data from the seven sampling events indicate declining concentrations of TPH-G and BTEX in effluent from the exhaust stack. Concentrations of TPH-G have declined from 190 parts per million (ppm) to 37 ppm. Concentrations of BTEX

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constituents declined from 0.77 ppm to 0.19 ppm, then elevated to a peak of 1.01 ppm. The results of the most recent sample collected on April 19, 1999, show a decline to 0.39 ppm.

In addition to analysis of VE system effluent for petroleum-hydrocarbon constituents, effluent samples were analyzed for H_2S and CH_4 . Only one of the samples collected from the VE system exhaust stack showed a concentration of H_2S above the method detection limit. The February sample had a H_2S concentration of 3.45 parts per billion (ppb). Concentrations of methane detected in effluent samples were between 0.71 ppm and 1.4 ppm.

The stability of VE system flow rates and applied vacuum levels has tended to decrease between monitoring events over the winter. Applied vacuum levels at the VE blower have ranged between 30 inches and 44 inches of water, decreasing over the winter. The average VE system extraction flow rates have ranged between 45.5 cubic feet per minute (cfm) and 56.8 cfm, increasing over the winter.

Figure 1 (attached) is a plot of hydrocarbon mass removal rates for TPH-G and BTEX throughout the VE system operating period.

The TPH-G mass removal rates, calculated using system flow rates and analytical results, have decreased since VE system initiation. Although the plot of long-term mass removal rates is expected to decrease logarithmically, the mass removal rate for TPH-G from August 1998 through April 1999 has decreased linearly. As the VE system continues to operate, the decrease in mass removal rates should become asymptotic and representative of logarithmic decay. Estimated mass removal rates for TPH-G have decreased from an initial 2.96 pounds per day (lbs/day) to 0.62 lbs/day during the last sampling event (Table 3).

The hydrocarbon mass removal rate with respect to BTEX declined initially, but elevated concentrations of BTEX components showed a secondary increase in mass removal for these compounds. Mass removal rates for BTEX constituents have decreased from an initial 0.014 lbs/day to 0.008 lbs/day during the most recent (April 1999) sampling event.

Mass removal rates are presented in Table 3. The mass removal rate for TPH-G is an estimated calculation using an interpretation of the linear regression line. The mass removal rate for BTEX is nonlinear with no apparent trend. The estimated mass removal rate for BTEX was calculated using the estimated average daily mass removal rate. The total mass of TPH-G and BTEX removed with the VE system between August 10, 1998,

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and April 19, 1999, is estimated at 406.1 lbs. and 3.02 lbs., respectively (See attached calculation sheet).

Air sample analytical results indicate that O₂ and N₂ levels in the soil gas approximate atmospheric concentrations; 20.9 percent and 78.1 percent, respectively. Concentrations of CO₂ in the soil gas have decreased since VE system initiation, but remain slightly elevated compared to atmospheric concentrations (0.033 percent).

Conclusions

Review of monitoring and analytical data indicates that the VE system is successfully remediating subsurface soil near the site of the dry well formerly located at Building 986. Observations to date indicate that remediation is progressing by two processes: physical removal of hydrocarbon vapors and, to a lesser degree, bioremediation through the utilization of oxygen in the soil gas.

Evidence of physical treatment and bioremediation is obtained through sampling and analysis of the extracted soil gas. Analysis of VE system effluent for petroleum hydrocarbons indicate that the VE system is successfully extracting contaminants. The presence of slightly elevated CO₂ concentrations in soil gas analyzed from the VE system exhaust stack may be an indication of hydrocarbon biodegradation in site soils. In addition, atmospheric oxygen concentrations in the soil gas indicate that oxygen is not currently limiting hydrocarbon biodegradation.

Recommendations

Based on the linear reduction in TPH-G, and the non-linear reduction in BTEX mass removal rates during the operation of the VE system, it is recommended that the VE system be operated for an additional year before a determination is made regarding installation of the passive bioventing system.


At the end of the first year of operation, confirmation samples will be collected from the site. During this phase of the project selected borings could be completed as vapor-pressure monitoring points and soil-gas monitoring points. The installation of monitoring points will allow for the collection of in situ data which will assist in determining the biodegradation of contaminants at the site. These monitoring points will be sampled using a multi-gas meter at the time of system operation and maintenance and

Mr. Lynden Belin
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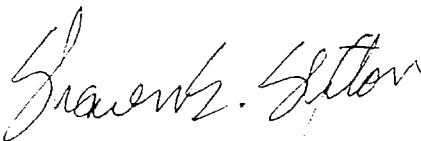
Project 55016-008.000 Task 8E

performance sampling. System shut-down testing should also be performed to determine the effectiveness of bioremediation or passive bioventing.

Sincerely,
EMCON Alaska, Inc.



Lance Raymore,
CQC Systems Manager



Shaun Sexton, P.E.
Project Manager

Attachments: Limitations
Table 1 VE System Operational Data
Table 2 VE System Effluent Analytical Results
Table 3 VE System Removal Rate Calculations
Figure 1 Removal Rate Trends
Analytical Laboratory Report
Calculations

cc: Cody Black. EIT Alternate CQC Systems Manager

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

Table 1
VE System Operation Data
Building 986 Remedial Action

Vent Well	Date	Flow (cfm)	Vacuum (inches H ₂ O)	PID (ppm)	Extraction Well Adjustment (% Open)	Average Total System Flow Rate
VE-1	8/20/98	20	27.5	--	100	
	9/03/98	20	27.0	2	100	
	9/14/98	18	25.0	0.6	20	
	10/16/98	13-20	25-32	50	20	
	10/30/98	13-20	25-32	80	30	
	12/10/98	0-15	24-30	--	100	
	1/13/99	0-23	26-32	50	100	
	1/16/99	18	25.0	63	100	
	2/10/99	20-21	25-26	29	100	
	3/16/99	18-21	25-26	22	100	
	4/19/99	26	26.0	19	100	
VE-2	8/20/98	16	7.0	--	10	
	9/03/98	16	7.0	16	10	
	9/14/98	16	7.0	1.1	10	
	10/16/98	13-16	9-16	15	10	
	10/30/98	13-16	12-15	90	10	
	12/10/98	23	13.0	5	15	
	1/13/99	13-18	10-20	21	10	
	1/16/99	18	10.0	23	10	
	2/10/99	18-19	11-25	10	10	
	3/16/99	15	11-16	11	10	
	4/19/99	19	13-17	9	10	
VE-3	8/20/98	14	5.0	--	15	
	9/03/98	14	6.0	121	15	
	9/14/98	15	6.0	48	15	
	10/16/98	13-15	8-20	85	15	
	10/30/98	25	10-18	80	15	
	12/10/98	15-22	10-15	49	15	
	1/13/99	13-18	10-20	111	15	
	1/16/99	20	10.0	104	15	
	2/10/99	18-19	11-15	81	10	
	3/16/99	13-18	11-20	87	15	
	4/19/99	13-18	12-25	51	15	
Total System	8/20/98	--	44	NA	NA	
	9/03/98	--	35	NA	NA	
	9/14/98	--	35	NA	NA	
	10/16/98	--	34-36	NA	NA	
	10/30/98	--	34-36	NA	NA	
	12/10/98	--	30-34	NA	NA	
	1/13/99	--	35-38	NA	NA	
	1/16/99	--	32	NA	NA	
	2/10/99	--	36-37	NA	NA	
	3/16/99	--	34-36	NA	NA	
	4/19/99	--	32-34	NA	NA	
Exhaust Stack	8/20/98	--	NA	--	NA	50.0
	9/03/98	--	NA	--	NA	
	9/14/98	--	NA	36	NA	49.5
	10/16/98	--	NA	80	NA	45.5
	10/30/98	--	NA	135	NA	
	12/10/98	--	NA	--	NA	53.0
	1/13/99	--	NA	60	NA	
	1/16/99	--	NA	65	NA	
	2/10/99	--	NA	37	NA	56.8
	3/16/99	--	NA	33	NA	53.8
	4/19/99	--	NA	30	NA	55.3
Average total system flow rates are calculated by summing the average individual VE well flow rates between sampling events. # indicates sampling events NA Not Applicable PID photoionization detector -- Not Measured						

Table 2
VE System Effluent Analytical Results
Building 986 Remedial Action

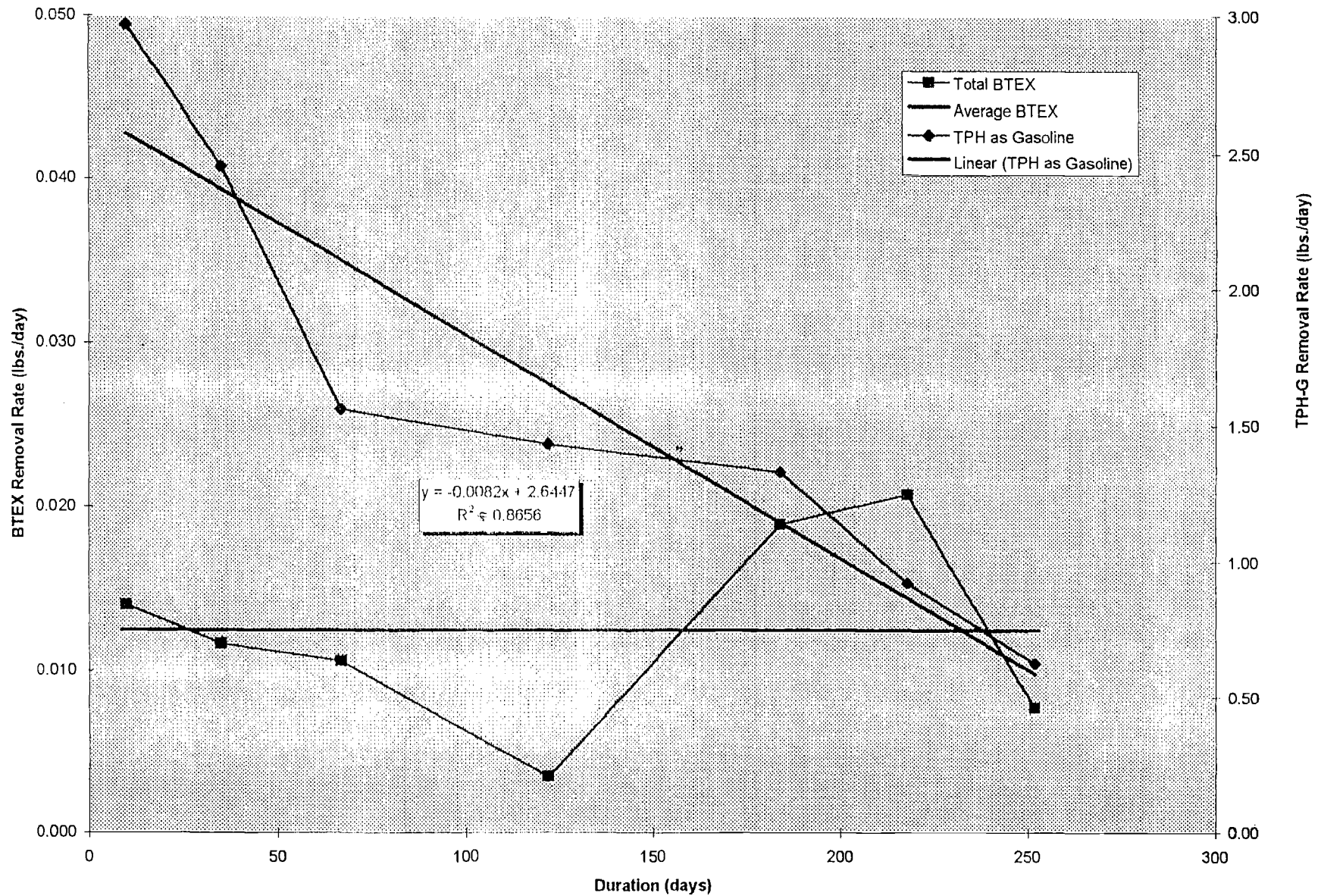
Sample Number	Date	Hydrogen Sulfide (ppb)	Methane (ppm)	TPH as Gasoline (ppm)	Total BTEX (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	m- & p-Xylenes (ppm)	o-Xylenes (ppm)	Oxygen (%)	Nitrogen (%)	Carbon Dioxide (%)
98POL008AG	8/20/98	ND	0.84	190	0.77	ND	0.47	ND	0.30	ND	20.8	78	1.17
98POL009AG	9/14/98	ND	0.98	160	0.64	ND	0.29	ND	0.35	ND	21.2	77.9	0.949
98POL010AG	10/16/98	ND	1.1	110	0.62	ND	0.28	ND	0.22	0.012	16.6	82.7	0.695
98POL011AG	12/10/98	ND	0.71	86	0.19	ND	0.19	ND	ND	ND	21.6	77.8	0.628
99POL012AG	2/10/99	3.45	0.87	75	0.85	ND	ND	ND	0.43	0.42	22.1	77.4	0.488
99POL013AG	3/16/99	ND	0.61	55	1.01	ND	0.22	0.45	0.06	0.28	21.2	78.3	0.486
99POL014AG	4/19/99	ND	1.4	37	0.39	ND	0.13	ND	0.26	ND	21.1	78.5	0.435
Method Reporting Limit (MRL)	--	4.00	0.50	1.0	--	0.05	0.05	0.05	0.05	0.05	--	--	--

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Table 3
VE System Removal Rate Calculations
Building 986 Remedial Action

Sample Number	Date	Days	TPH as Gasoline *(mg/m ³)	Total BTEX (mg/m ³)	Average Flow Rate (cfm)	Estimated Removal Rate (lbs/day)	
						TPH as Gasoline	Total BTEX
98POL008AG	8/20/98	10	660	3.10	50.0	2.96	0.014
98POL009AG	9/14/98	35	550	2.60	49.5	2.44	0.012
98POL010AG	10/16/98	67	380	2.57	45.5	1.55	0.010
98POL011AG	12/10/98	122	300	0.71	53.0	1.43	0.003
99POL012AG	2/10/99	184	260	3.70	56.8	1.33	0.019
99POL013AG	3/16/99	218	190	4.29	53.8	0.92	0.021
99POL014AG	4/19/99	252	130	1.59	53.3	0.62	0.008
MRL	--		3.6				
Milligrams per cubic meter (mg/m ³)							

Figure 1
Removal Rate Trends
Building 986 Remedial Action





Performance Analytical Inc.

Air Quality Laboratory
A Division of Columbia Analytical Services, Inc.
An Employee Owned Company

EMCON Alaska, Inc.

MAR 26 1999

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LABORATORY REPORT

Client:	EMCON ALASKA, INC.	Date of Report:	03/12/99
Address:	4701 Business Park Blvd., Suite 36	Date Received:	02/12/99
	Anchorage, AK 99503	PAI Project No:	P9900293
Contact:	Mr. Cody Black	Purchase Order:	15836
Client Project ID: POL Lab #55016-008.00o			

One (1) Silco Canister labeled:

"99POL012AG"

The sample was received at the laboratory under chain of custody on February 12, 1999. The sample was received intact. The dates of analyses are indicated on the attached data sheets.

Hydrogen Sulfide Analysis

The sample was analyzed for Hydrogen sulfide using a gas chromatograph equipped with a sulfur chemiluminescence detector.

Methane Analysis

The sample was also analyzed for Methane according to EPA Method 25C. The analyses were performed by gas chromatography using flame ionization detection/total combustion analysis.

Fixed Gases Analysis

The sample was also analyzed for fixed gases (Oxygen, Nitrogen and Carbon dioxide) using a Hewlett Packard Model 5890 gas chromatograph equipped with a thermal conductivity detector (TCD).

Data Release Authorization:

Wade Henton
Analytical Chemist

Reviewed and Approved:

Michael Tuday
Laboratory Director



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Total Petroleum Hydrocarbons as Gasoline Analysis

The sample was also analyzed for total petroleum hydrocarbons as Gasoline using a gas chromatograph equipped with a flame ionization detector.

BTEX Analysis

The sample was also analyzed for Benzene, Toluene, Ethylbenzene and total Xylenes according to modified CARB Method 410 using a gas chromatograph equipped with a photoionization detector.

The results of analyses are given on the attached data summary sheets.



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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client: Emcon Alaska, Inc.

Client Project ID: POL Lab/55016-008.000

PAI Project ID: P9900293

Test Code: GC/SCD for Sulfur
Instrument ID: HP 5890A/SCD #5
Analyst: Wade Henton
Matrix: Silco Canister(s)

Date Sampled: 2/10/99
Date Received: 2/12/99
Date Analyzed: 2/12/99
Volume(s) Analyzed: 1.0 ml

Client Sample ID	PAI Sample ID	D.F.	Hydrogen Sulfide			
			Result $\mu\text{g}/\text{m}^3$	Reporting Limit $\mu\text{g}/\text{m}^3$	Result ppb	Reporting Limit ppb
99POL012AG	P9900293-001	1.79	4.81	2.80	3.45	2.00
Method Blank	P990212-MB	1.00	ND	2.80	ND	2.00

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Verified By: RG

Date: 2/11/99

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RESULTS OF METHANE ANALYSIS

PAGE 1 OF 1

Client: Emcon Alaska, Inc.**Client Project ID: POL Lab/55016-008.000****PAI Project ID: P9900293**

Test Code: EPA Method 25C

Instrument ID: HP5890A/FID/TCA

Analyst: Wade Henton

Matrix: Silco Canister(s)

Date Sampled: 2/10/99

Date Received: 2/12/99

Date Analyzed: 2/16/99

Volume(s) Analyzed: 0.50 ml

Client Sample ID	PAI Sample ID	D.F.	Methane	
			Concentration in ppm, v/v	
			Result	Reporting Limit
99POL012AG	P9900293-001	1.19	0.87	0.50
Method Blank	P990216-MB	1.00	ND	0.50

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Verified by : RGDate : 3/1/99


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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.
Client Sample ID : 99POL012AG
PAI Sample ID : P9900293-001

Test Code : GC/TCD
 Instrument : HP5890/TCD #1
 Analyst : John Yokoyama
 Matrix : Silco Canister

Date Sampled : 2/10/99
 Date Received : 2/12/99
 Date Analyzed : 2/16/99
 Volume(s) Analyzed : 0.10 ml

Pi 1 = 0.7 Pf 1 = 3.7

D.F. = 1.19

CAS #	COMPOUND	RESULT : (%, v/v)	REPORTING LIMIT (%, v/v)
7782-44-7	Oxygen	22.1	0.100
7727-37-9	Nitrogen	77.4	0.100
124-38-9	Carbon Dioxide	0.488	0.100

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

 Verified By: RG Date: 3/1/99

Page No


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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.
Client Sample ID : Method Blank
PAI Sample ID : P990216-MB

Test Code : GC/TCD
Instrument : HP5890/TCD #1
Analyst : John Yokoyama
Matrix : Silco Canister

Date Sampled : NA
Date Received : NA
Date Analyzed : 2/16/99
Volume(s) Analyzed : 0.10 ml

Pi 1 = 0.0 Pf 1 = 0.0

D.F. = 1.00

CAS #	COMPOUND	RESULT (%, v/v)	REPORTING LIMIT (%, v/v)
7782-44-7	Oxygen	ND	0.100
7727-37-9	Nitrogen	ND	0.100
124-38-9	Carbon Dioxide	ND	0.100

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

 Verified By: RG Date: 3/1/99

Page No


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RESULTS OF TOTAL PETROLEUM HYDROCARBON (TPH) ANALYSIS

PAGE 1 OF 1

Client : **Emcon Alaska, Inc.**Client Project ID: **POL Lab/55016-008.000**PAI Project ID: **P9900293**

Test Code : GC/FID

Date Sampled : 2/10/99

Instrument : HP5890A/FID #2

Date Received : 2/12/99

Analyst : Wade Henton

Date Analyzed : 2/12/99

Matrix : Silco Canister(s)

Volume(s) Analyzed : 1.00 ml

Client Sample ID	PAI Sample ID	D. F.	Total Petroleum Hydrocarbons as Gasoline			
			Result	Reporting	Result	Reporting
			mg/m ³	Limit mg/m ³	ppm	Limit ppm
99POL012AG	P9900293-001	1.19	260	3.6	75	1.0
Method Blank	P990212-MB	1.00	ND	3.6	ND	1.0

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Parts Per Million Results Are Based on a Molecular Weight of 86.18

Verified By: RCDate: 3/1/99



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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.

Client Sample ID : 99POL012AG

PAI Sample ID : P9900293-001

Test Code : Modified CARB Method 410

Analyst : Wade Henton

Instrument : HP5890/PID #2

Matrix : Silco Canister

Date Sampled : 2/10/99

Date Received : 2/12/99

Date Analyzed : 2/12/99

Volume(s) Analyzed : 1.00 ml

Pi 1 = 0.7

Pf 1 = 3.7

D.F. = 1.19

CAS #	COMPOUND	RESULT mg/m ³	REPORTING LIMIT mg/m ³	RESULT ppm	REPORTING LIMIT ppm
71-43-2	Benzene	ND	0.16	ND	0.050
108-88-3	Toluene	ND	0.19	ND	0.050
100-41-4	Ethylbenzene	ND	0.22	ND	0.050
1330-20-7	m- & p-Xylenes	1.9	0.22	0.43	0.050
95-47-6	o-Xylene	1.8	0.22	0.42	0.050

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Verified by : RCT

Date : 3/1/99


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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.
Client Sample ID : N/A
PAI Sample ID : PAI Method Blank

Test Code : Modified CARB Method 410

Analyst : Wade Henton

Instrument : HP5890/PID #2

Matrix : Silco Canister

Date Sampled : N/A

Date Received : N/A

Date Analyzed : 2/12/99

Volume(s) Analyzed : 1.00 ml

Pi 1 = 0.0 Pf 1 = 0.0

D.F. = 1.00

CAS #	COMPOUND	RESULT mg/m ³	REPORTING LIMIT mg/m ³	RESULT ppm	REPORTING LIMIT ppm
71-43-2	Benzene	ND	0.16	ND	0.050
108-88-3	Toluene	ND	0.19	ND	0.050
100-41-4	Ethylbenzene	ND	0.22	ND	0.050
1330-20-7	m- & p-Xylenes	ND	0.22	ND	0.050
95-47-6	o-Xylene	ND	0.22	ND	0.050

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

 Verified by : EC

 Date : 3/1/99

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2665 Park Center Drive, Suite D

Simi Valley, California 93065

Phone (805) 526-7161

Fax (805) 526-7270

Chain of Custody Record Analytical Services Request

Client / Address EMCON Alaska, Inc. 4701 Business Park, #3C Anchorage AK 99503			Phone 907 562 3452			Fax 907 563 2814			ANALYSES			PAI Project No. P9900293		
Client Project Name / Location POL Lab, Bldg 986 UE System			Client Project No. 55016 - 008.000											
Contact Cody Black			Sampler (Signature) Lance Raymore <i>Lance Raymore</i>			P.O. No. 15-836								
Client Sample ID	Date Collected	Time Collected	Lab Sample No.	Type of Sample	Container ID (Serial#)	Regulator ID (Serial#)	Carb 410-BTEX	TPH Gas-TOS	EPA 35C-CH ₄	Methane Gas-CJ	H ₂ S CO ₂ O ₂ H ₂	EPA H ₆	Expected Turnaround Time	Remarks
99POL012AG	2/10/99	1330	-001	Air	1203		x	x	x					
Relinquished by : (Signature) <i>[Signature]</i>					Date 2/10/99	Time 1400	Received by : (Signature) <i>Peter D Z</i>					Date 2/12/99	Time 0930	
Relinquished by : (Signature)					Date	Time	Received by : (Signature)					Date	Time	
Relinquished by : (Signature)					Date	Time	Received by : (Signature)					Date	Time	

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**Performance Analytical Inc.**

Air Quality Laboratory
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EMCON Alaska, Inc.

APR 19 1999

LABORATORY REPORT

Client:	EMCON ALASKA, INC.	Date of Report:	04/09/99
Address:	4701 Business Park Blvd., Suite 36	Date Received:	03/17/99
	Anchorage, AK 99503	PAI Project No:	P9900544
Contact:	Mr. Cody Black	Purchase Order:	16053
Client Project ID: POL Lab #55016-008.000			

One (1) Silco Canister labeled: "99POL013AG"

The sample was received at the laboratory under chain of custody on March 17, 1999. The sample was received intact. The dates of analyses are indicated on the attached data sheets.

Hydrogen Sulfide Analysis

The sample was analyzed for Hydrogen sulfide using a gas chromatograph equipped with a sulfur chemiluminescence detector.

Methane Analysis

The sample was also analyzed for Methane according to EPA Method 25C. The analyses were performed by gas chromatography using flame ionization detection/total combustion analysis.

Fixed Gases Analysis

The sample was also analyzed for fixed gases (Oxygen/Argon, Nitrogen and Carbon dioxide) using a Hewlett Packard Model 5890 gas chromatograph equipped with a thermal conductivity detector (TCD).

Data Release Authorization:

Wade Henton
Analytical Chemist

Reviewed and Approved:

John Yokoyama
Senior Chemist



Performance Analytical Inc.

Air Quality Laboratory

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Total Petroleum Hydrocarbons as Gasoline Analysis

The sample was also analyzed for total petroleum hydrocarbons as gasoline using a gas chromatograph equipped with a flame ionization detector.

BTEX Analysis

The sample was also analyzed for Benzene, Toluene, Ethylbenzene and total Xylenes according to modified CARB Method 410 using a gas chromatograph equipped with a photoionization detector.

The results of analyses are given on the attached data summary sheets.


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RESULTS OF ANALYSIS
PAGE 1 OF 1
Client: Emcon Alaska, Inc.
Client Project ID: POL Lab #55016-00 8.000
PAI Project ID: P9900544

Test Code: GC/FPD for Sulfur

Instrument ID: HP 5890A/FPD #4

Analyst: Wade Henton / Madeleine Khoubessarian

Matrix: Silco Canister(s)

Date Sampled: 3/16/99

Date Received: 3/17/99

Date Analyzed: 3/17/99

Volume(s) Analyzed: 10.0 ml

Client Sample ID	PAI Sample ID	D.F.	Hydrogen Sulfide			
			Result	Reporting Limit	Result	Reporting Limit
			$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	ppb	ppb
99POL013 AG	P9900544-001	1.20	ND	5.60	ND	4.00
Method Blank	P990317-MB	1.00	ND	5.60	ND	4.00

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Verified By: RG Date: 3/31/99

**Performance Analytical Inc.**

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RESULTS OF METHANE ANALYSIS

PAGE 1 OF 1

Client: Emcon Alaska, Inc.**Client Project ID: POL Lab/55016-00 8.000****PAI Project ID: P9900544**

Test Code: EPA Method 25C
Instrument ID: HP5890A/FID/TCA
Analyst: Madeleine Khoubesserian
Matrix: Silco Canister(s)

Date Sampled: 3/16/99
Date Received: 3/17/99
Date Analyzed: 3/19/99
Volume(s) Analyzed: 0.50 ml

Client Sample ID	PAI Sample ID	D.F.	Methane	
			Concentration in ppm, v/v	
			Result	Reporting Limit
99POL013 AG	P9900544-001	1.20	0.61	0.50
Method Blank	P990319-MB	1.00	ND	0.50

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Verified by : RC Date : 3/31/99


Performance Analytical Inc.

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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.

Client Sample ID : 99POL013 AG

PAI Sample ID : P9900544-001

Test Code : GC/TCD
 Instrument : HP5890/TCD #1
 Analyst : John Yokoyama
 Matrix : Silco Canister

Date Sampled : 3/16/99
 Date Received : 3/17/99
 Date Analyzed : 3/19/99
 Volume(s) Analyzed : 0.10 ml

Pi 1 = 0.6 Pf 1 = 3.6

D.F. = 1.20

CAS #	COMPOUND	RESULT : (%, v/v)	REPORTING LIMIT (%, v/v)
7782-44-7	Oxygen +		
7440-37-1	Argon *	21.2	0.100
7727-37-9	Nitrogen	78.3	0.100
124-38-9	Carbon Dioxide	0.486	0.100

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

* = Coeluting Compounds: Assumes A Ratio Of 22.53:1 By Volume

 Verified By: RC

 Date: 3/31/99

Page No


Performance Analytical Inc.

Air Quality Laboratory
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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.
Client Sample ID : Method Blank
PAI Sample ID : P990319-MB

Test Code : GC/TCD
 Instrument : HP5890/TCD #1
 Analyst : John Yokoyama
 Matrix : Silco Canister

Date Sampled : NA
 Date Received : NA
 Date Analyzed : 3/19/99
 Volume(s) Analyzed : 0.10 ml

Pi 1 = 0.0 Pf 1 = 0.0

D.F. = 1.00

CAS #	COMPOUND	RESULT (%, v/v)	REPORTING LIMIT (%, v/v)
7782-44-7	Oxygen -		
7440-37-1	Argon *	ND	0.100
7727-37-9	Nitrogen	ND	0.100
124-38-9	Carbon Dioxide	ND	0.100

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

* = Coeluting Compounds: Assumes A Ratio Of 22.53:1 By Volume

 Verified By: RC Date: 3/31/99

Page No



Performance Analytical Inc.

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RESULTS OF TOTAL PETROLEUM HYDROCARBON (TPH) ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.

Client Project ID: POL Lab/55016-00 8.000

PAI Project ID: P9900544

Test Code : GC/FID
Instrument : HP5890A/FID #2
Analyst : John Yokoyama
Matrix : Silco Canister(s)

Date Sampled : 3/16/99
Date Received : 3/17/99
Date Analyzed : 3/19/99
Volume(s) Analyzed : 1.00 ml

Client Sample ID	PAI Sample ID	D. F.	Total Petroleum Hydrocarbons as Gasoline			
			Result mg/m ³	Reporting Limit mg/m ³	Result ppm	Reporting Limit ppm
99POL013 AG	P9900544-001	1.20	190	3.6	55	1.0
Method Blank	P990319-MB	1.00	ND	3.6	ND	1.0

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Parts Per Million Results Are Based on a Molecular Weight of 86.18

Verified By: RC

Date: 3/31/99

Page No.:


Performance Analytical Inc.

Air Quality Laboratory

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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.
Client Sample ID : 99POL013 AG
PAI Sample ID : P9900544-001

Test Code : Modified CARB Method 410

Date Sampled : 3/16/99

Analyst : John Yokoyama

Date Received : 3/17/99

Instrument : HP5890/PID #2

Date Analyzed : 3/19/99

Matrix : Silco Canister

Volume(s) Analyzed : 1.00 ml

Pi 1 = 0.6

Pf 1 = 3.6

D.F. = 1.20

CAS #	COMPOUND	RESULT mg/m ³	REPORTING LIMIT mg/m ³	RESULT ppm	REPORTING LIMIT ppm
71-43-2	Benzene	ND	0.16	ND	0.050
108-88-3	Toluene	0.83	0.19	0.22	0.050
100-41-4	Ethylbenzene	2.0	0.22	0.45	0.050
1330-20-7	m- & p-Xylenes	0.26	0.22	0.060	0.050
95-47-6	o-Xylene	1.2	0.22	0.28	0.050

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Verified By: RC Date: 3/31/99



Performance Analytical Inc.

Air Quality Laboratory
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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.

Client Sample ID : Method Blank

PAI Sample ID : P990319-MB

Test Code : Modified CARB Method 410

Date Sampled : NA

Analyst : John Yokoyama

Date Received : NA

Instrument : HP5890/PID #2

Date Analyzed : 3/19/99

Matrix : Silco Canister

Volume(s) Analyzed : 1.00 ml

Pi 1 = 0.0

Pf 1 = 0.0

D.F. = 1.00

CAS #	COMPOUND	RESULT mg/m ³	REPORTING LIMIT mg/m ³	RESULT ppm	REPORTING LIMIT ppm
71-43-2	Benzene	ND	0.16	ND	0.050
108-88-3	Toluene	ND	0.19	ND	0.050
100-41-4	Ethylbenzene	ND	0.22	ND	0.050
1330-20-7	m- & p-Xylenes	ND	0.22	ND	0.050
95-47-6	o-Xylene	ND	0.22	ND	0.050

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Verified By: RC

Date: 3/31/99

Page No.:



Performance Analytical Inc.

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EMCON Alaska, Inc.

MAY 20 1999

LABORATORY REPORT

Client:	EMCON ALASKA, INC.	Date of Report:	05/07/99
Address:	4701 Business Park Blvd., Suite 36	Date Received:	04/20/99
	Anchorage, AK 99503	PAI Project No:	P9900788
Contact:	Mr. Lance Raymore	Purchase Order:	16180
Client Project ID: POL Lab #55016-008.000			

One (1) Silco Canister labeled: "99POL014AG"

The sample was received at the laboratory under chain of custody on April 20, 1999. The sample was received intact. The dates of analyses are indicated on the attached data sheets.

Hydrogen Sulfide Analysis

The sample was analyzed for Hydrogen sulfide using a gas chromatograph equipped with a flame photometric detector (FPD).


Methane Analysis

The sample was also analyzed for Methane using a gas chromatography using a flame ionization detection/total combustion analysis.

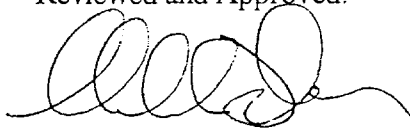
Fixed Gases Analysis

The sample was also analyzed for fixed gases (Oxygen/Argon, Nitrogen and Carbon dioxide) using a Hewlett Packard Model 5890 gas chromatograph equipped with a thermal conductivity detector (TCD).

Data Release Authorization:


John Yokoyama
Senior Chemist

Reviewed and Approved:


Michael Tuday
Laboratory Director



Performance Analytical Inc.

Air Quality Laboratory

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Total Petroleum Hydrocarbons as Gasoline Analysis

The sample was also analyzed for total petroleum hydrocarbons as gasoline using a gas chromatograph equipped with a flame ionization detector.

BTEX Analysis

The sample was also analyzed for Benzene, Toluene, Ethylbenzene and total Xylenes according to modified CARB Method 410 using a gas chromatograph equipped with a photoionization detector.

The results of analyses are given on the attached data summary sheets.



Performance Analytical Inc.

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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client: Emcon Alaska, Inc.

Client Project ID: Pol Lab #55016-008.000

PAI Project ID: P9900788

Test Code: GC/FPD for Sulfur
Instrument ID: HP 5890A/FPD #4
Analyst: John Yokoyama
Matrix: Silco Canister(s)

Date Sampled: 4/19/99
Date Received: 4/20/99
Date Analyzed: 4/20/99
Volume(s) Analyzed: 10.0 ml

Client Sample ID	PAI Sample ID	D.F.	Hydrogen Sulfide			
			Result $\mu\text{g}/\text{m}^3$	Reporting Limit $\mu\text{g}/\text{m}^3$	Result ppb	Reporting Limit ppb
99POL014AG	P9900788-001	1.21	ND	5.60	ND	4.00
Method Blank	P990420-MB	1.00	ND	5.60	ND	4.00

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified By: RG Date: 5/3/99

**Performance Analytical Inc.**

Air Quality Laboratory
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RESULTS OF METHANE ANALYSIS

PAGE 1 OF 1

Client: Emcon Alaska, Inc.**Client Project ID: Pol Lab/55016-008.000****PAI Project ID: P9900788**

Test Code: GC/FID

Instrument ID: HP5890A/FID #8

Analyst: Madeleine Khoubesserian

Matrix: Silco Canister(s)

Date Sampled: 4/19/99

Date Received: 4/20/99

Date Analyzed: 4/20/99

Volume(s) Analyzed: 1.00 ml

Client Sample ID	PAI Sample ID	D.F.	Methane	
			Concentration in ppm, v/v	
			Result	Reporting Limit
99POL014AG	P9900788-001	1.21	1.4	0.50
Method Blank	P990420-MB	1.00	ND	0.50

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Verified By: RG Date: 5/3/99



Performance Analytical Inc.

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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.

Client Sample ID : 99POL014AG

PAI Sample ID : P9900788-001

Test Code : GC/TCD

Date Sampled : 4/19/99

Instrument : HP5890/TCD #1

Date Received : 4/20/99

Analyst : W. Henton/K. Chen/M. Khoubessarian

Date Analyzed : 4/22/99

Matrix : Silco Canister

Volume(s) Analyzed : 0.10 ml

Pi 1 = 0.3 Pf 1 = 3.5

D.F. = 1.21

CAS #	COMPOUND	RESULT (%, v/v)	REPORTING LIMIT (%, v/v)
7782-44-7	Oxygen -		
7440-37-1	Argon *	21.1	0.100
7727-37-9	Nitrogen	78.5	0.100
124-38-9	Carbon Dioxide	0.435	0.100

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

* = Coeluting Compounds: Assumes A Ratio Of 22.53:1 By Volume

Verified By: RG Date: 5/3/99

Page No

Air Quality Laboratory
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PAGE 1 OF 1

Client Sample ID : Method Blank
PAI Sample ID : P990422-MB

Pi 1 = 0.0 Pf 1 = 0.0
D.F. = 1.00

CAS #	COMPOUND	RESULT (%, v/v)	REPORTING LIMIT (%, v/v)
7782-44-7	Oxygen +		
7440-37-1	Argon *	ND	0.100
7727-37-9	Nitrogen	ND	0.100
124-38-9	Carbon Dioxide	ND	0.100

* = Coeluting Compounds: Assumes A Ratio Of 22.53:1 By Volume

Verified By: RC Date: 5/3/99


Performance Analytical Inc.

Air Quality Laboratory
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RESULTS OF TOTAL PETROLEUM HYDROCARBON (TPH) ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.
Client Project ID: Pol Lab/55016-008.000
PAI Project ID: P9900788

Test Code : GC/FID

Analyst : John Yokoyama

Instrument : HP5890A/FID #2

Matrix : Silco Canister(s)

Date Sampled : 4/19/99

Date Received : 4/20/99

Date Analyzed : 4/23/99

Volume(s) Analyzed : 1.00 ml

Client Sample ID	PAI Sample ID	D. F.	Total Petroleum Hydrocarbons as Gasoline			
			Result mg/m ³	Reporting Limit mg/m ³	Result ppm	Reporting Limit ppm
99POL014AG	P9900788-001	1.21	130	3.6	37	1.0
Method Blank	P990423-MB	1.00	ND	3.6	ND	1.0

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Parts Per Million Results Are Based on a Molecular Weight of 86.18

 Verified By: RC

 Date: 5/10/99


Performance Analytical Inc.

Air Quality Laboratory
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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.
Client Sample ID : 99POL014AG
PAI Sample ID : P9900788-001

Test Code : Modified CARB Method 410

Date Sampled : 4/19/99

Analyst : John Yokoyama

Date Received : 4/20/99

Instrument : HP5890/PID #2

Date Analyzed : 4/23/99

Matrix : Silco Canister

Volume(s) Analyzed : 1.00 ml

Pi 1 = 0.3

Pf 1 = 3.5

D.F. = 1.21

CAS #	COMPOUND	RESULT mg/m ³	REPORTING LIMIT mg/m ³	RESULT ppm	REPORTING LIMIT ppm
71-43-2	Benzene	ND	0.16	ND	0.050
108-88-3	Toluene	0.49	0.19	0.13	0.050
100-41-4	Ethylbenzene	ND	0.22	ND	0.050
1330-20-7	m- & p-Xylenes	1.1	0.22	0.26	0.050
95-47-6	o-Xylene	ND	0.22	ND	0.050

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

 Verified By: RG

 Date: 5/3/99


Performance Analytical Inc.

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RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Emcon Alaska, Inc.
Client Sample ID : Method Blank
PAI Sample ID : P990423-MB

Test Code : Modified CARB Method 410

Analyst : John Yokoyama

Instrument : HP5890/PID #2

Matrix : Silco Canister

Date Sampled : NA

Date Received : NA

Date Analyzed : 4/23/99

Volume(s) Analyzed : 1.00 ml

Pi 1 = 0.0

Pf 1 = 0.0

D.F. = 1.00

CAS #	COMPOUND	RESULT mg/m ³	REPORTING LIMIT mg/m ³	RESULT ppm	REPORTING LIMIT ppm
71-43-2	Benzene	ND	0.16	ND	0.050
108-88-3	Toluene	ND	0.19	ND	0.050
100-41-4	Ethylbenzene	ND	0.22	ND	0.050
1330-20-7	m- & p-Xylenes	ND	0.22	ND	0.050
95-47-6	o-Xylene	ND	0.22	ND	0.050

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

 Verified By: RG

 Date: 5/3/99

Page No.:

**Performance Analytical Inc.**

Air Quality Laboratory

A Division of Columbia Analytical Services, Inc.

An Employee Owned Company

2665 Park Center Drive, Suite D

Simi Valley, California 93065

Phone (805) 526-7161

Fax (805) 526-7270

Chain of Custody Record Analytical Services Request

Client / Address EMCON Alaska Inc. 4701 Business Park, #1C Anchorage AK 99503						Phone 907 583 3452 Fax 907 583 2814		ANALYSES		PAT Project No. P9900788	
Client Project Name / Location POLLUTED, BTD SEG VE SYSTEM						Client Project No. SSUIG-008000					
Contact Lance Raymond				Sampler (Signature) <i>Lance Raymond</i>		P.O. No. 16180		CONS W/O - RTMEX TAM GAS - TDS BPA TEST - CHN FIXED BASES IN LANCE GUN OR VZ X J EPA 16			
Client Sample ID	Date Collected	Time Collected	Lab Sample No.	Type of Sample	Container ID (Serial#)	Regulator ID (Serial#)	X	X	X	Expected Turnaround Time	Remarks
99POL014AG	4/19/99	0800	Air								Please Fax results to Lance Raymond as soon as available
Relinquished by : (Signature) <i>[Signature]</i>						Date 4/19/99	Time 1030	Received by : (Signature) <i>[Signature]</i>		Date 4-20-99	Time 930
Relinquished by : (Signature)						Date	Time	Received by : (Signature)		Date	Time
Relinquished by : (Signature)						Date	Time	Received by : (Signature)		Date	Time

OU D 41225

May. 27, 1999

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OUD 41226**TPH vs GASOLINE**

Using Linear Curve Fit from Figure 1 → Equation $y = -0.0082x + 2.6447$
 $R^2 = 0.8656$

Operating Duration → 252 days (8.20.98 - 4.19.99)

$$y = \int_0^{252} (-0.0082x + 2.6447) dx = -\frac{0.0082x^2}{2} + 2.6447x \bigg|_0^{252}$$

$$y = 406.1 \text{ lbs} \rightarrow \text{Mass Removed} = 406.1 \text{ lbs}$$

BTEX

Using the average (mean) removal rate in lbs./day over 252 day operating duration

$$\text{Average Removal Rate} = 0.012 \text{ lbs/day}$$

$$\text{Mass Removed} = (0.012 \text{ lbs/day})(252 \text{ days})$$

$$\text{Mass Removed} = 3.02 \text{ lbs}$$