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REPORTS

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Salt Lake city, Utah

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STATUS REPORT
REMEDIATION WORK AND
ROUND 2 LONG-TERM GROUND WATER QUALITY
MONITORING DATA RESULTS
FOR MAVERIK REFINERY AND TANK FARM
KIRTLAND, NEW MEXICO
FOR MAVERIK COUNTRY STORES, INC.

DAMES & MOORE

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EXECUTIVE SUMMARY

This report presents the status of the remediation work, and the data results of the Round 2 long-term ground water quality monitoring and additional off-site soil and surface water quality monitoring conducted by Dames & Moore, from July through September 1989 at the Maverik Refinery and Tank Farm in Kirtland, New Mexico.

To date, the work as detailed in the amended remediation work plan has been conducted in accordance with the estimated time schedule and Phase I Remediation Plan components as agreed to by Maverik Country Stores, Inc. and the New Mexico Environmental Improvement Division (EID). The work which is detailed in this report includes a discussion of additional remediation work not originally scheduled, on-site tank clean-out and the grouting of an abandoned well on-site; the Round 2 long-term ground water quality monitoring, sampling and analytical data evaluation report; and additional off-site soil and surface water quality analytical data. The results of the biodegradation studies completed to date will be presented in a subsequent report.

The results of Round 2 long-term ground water monitoring and data analysis are similar to Round 1. Results continue to indicate that the ground water quality off-site south of the refinery tank farm has not been impacted and that the ground water west and southwest of the refinery tank farm, although impacted, has not degraded since monitoring began in 1987. The ground water quality appears to be improving slightly. As indicated in previous reports, this may be due to the influence of the on-site interceptor trench and piping of the Westside Irrigation Ditch waters, thereby limiting free-product contaminant movement off-site. The trench, a passive collection system, was constructed in March 1988, and the irrigation ditch piping along the western edge of the tank farm was completed in April 1989.

Although not required, surface water quality and soil analytical data were also obtained off-site from drainage ditches located on and along Virginia Murray's property and just south of the refinery. The surface water and soil data and the Rounds 1 and 2 long-term ground water quality data indicate that off-site refinery tank farm-related contaminant concentrations, downgradient from the tank farm and the refinery, are very low or non-detectable.

STATUS REPORT
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LONG-TERM GROUND WATER QUALITY MONITORING DATA RESULTS
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KIRTLAND, NEW MEXICO
FOR MAVERIK COUNTRY STORES, INC.

INTRODUCTION

This status report summarizes the remediation work completed to date at the Maverik Refinery and Tank Farm in Kirtland, New Mexico. A general site vicinity map and location map which show the areas where remediation work has been conducted, the off-site soil and surface water quality sample sites and the long-term ground water quality monitoring well sites are included on Plates 1 and 2, respectively. Rounds 1 and 2 long-term ground water quality monitoring data results are included herein.

Comprehensive ground water quality analytical data from previous baseline sampling Rounds 1, 2 and 3 for these monitor wells included in the long-term ground water quality monitoring program (monitor wells MW-9, MW-10 and MW-13), are also included in this report. The detailed ground water quality data and contaminant evaluations are presented in Dames & Moore reports completed in 1988 and 1989, as listed in the reference section herein.

PURPOSE AND SCOPE

The work completed in July through September 1989 and presented in this report was conducted in accordance with the "Amended Ground Water Remediation Plan for Maverik Country Stores, Inc., Kirtland, New Mexico, Refinery Tank Farm" (August 8, 1989). This work was completed within the estimated time schedule as outlined in this letter from Dames & Moore to the New Mexico Environmental Improvement Division (EID). The aforementioned letter, (the amended Ground Water Remediation Plan) is included in Appendix A. The amended plan is similar to the original (September 14, 1988) remediation plan, with the pri-

mary exception that due to the low permeability of the shallow contaminated zone, biodegradation in conjunction with pumping and treating, rather than soil vapor extraction, will be utilized.

The work conducted to date, including this status report, completes components 1 and 4a, 4b, 4c and 4d and part of components 4f and 10 of the Phase I Remediation Plan for ground water remediation at the refinery and tank farm.

The scope of work conducted since the July 1989 status report includes completion of the following tasks:

- Soil and ground water samples were taken from the southwest corner of the tank farm for laboratory tests to characterize the contaminated soil environment and the microbial consortium, and to conduct a primary biodegradation screen. The results of this work are to be submitted in November 1989.
- Round 2 long-term ground water and additional off-site surface water quality sampling, laboratory analysis and data evaluation were completed.
- This written report was completed that includes conclusions based on the data collected to date as part of the Ground Water Remediation Plan.

REMEDIATION WORK

TANK PRODUCT REMOVAL

As a result of product leakage from the spout of an above-ground tank at the refinery, that was observed by Bill Olsen of the EID in the spring of 1989, this tank was then removed. Dames & Moore subsequently requested the firm of Rocky Mountain Construction Company, Inc. of Farmington, New Mexico to: (1) check all of the tanks at the tank farm to establish if there is any product remaining in these tanks, and if so, the volumes and types of product remaining and (2) if product is present, to remove and either reprocess or dispose of the product (with most of the product being fuel oil). Mesa Oil,

Inc. of Albuquerque, New Mexico has agreed to transport and recycle the product. They are a designated transporter, storer and treater of used oil. All product removal and delivery will be manifested. Product that cannot be reprocessed will be disposed of in compliance with all State of New Mexico and Federal Environmental Protection Agency (EPA) regulations.

In addition, all of the tank piping will be dismantled, drained and capped to prevent potential product leakage from the piping in the future.

Rocky Mountain Construction Company, Inc. has been directed to secure all of the necessary certifications and written approvals from the Federal EPA, the New Mexico EID and the New Mexico Division of Oil & Gas, Oil Conservation Division (OCD), prior to removal of any tank product from the site.

WELL GROUTING

An existing 10-inch diameter steel cased well (designated as W-3) located on-site in the southwest corner of the tank farm is scheduled to be grouted. The well has been previously sampled by Dames & Moore (February 1988) and its depth was measured at 21 feet. Since the well extends below the contaminated zone and its construction is not known, the well will be grouted to eliminate a potential pathway for contaminant migration to the underlying aquifer. The steel casing will be perforated with a Mills knife or similar tool. The well will then be pressure grouted with a neat cement grout to ground surface.

LONG-TERM GROUND WATER QUALITY MONITORING, ROUND 2

The long-term ground water quality monitoring program agreed to by the New Mexico EID was implemented in April 1989 with the completion of Round 1 sampling and analyses. The plan requires tri-annual, bi-annual and annual monitoring of one on-site and four off-site monitor wells over a three-year period, respectively. Monitoring includes water level measurements and laboratory analysis for volatile organics (aromatic and halogenated), total dis-

solved solids, sulfate and chloride (Table 1). The field and laboratory data for these selected monitor wells for both Round 1 and Round 2 long-term remediation monitoring and, as previously mentioned, comprehensive data from prior sampling Rounds 1, 2 and 3 for wells MW-9, MW-10 and MW-13, are also presented in Appendix B. The off-site soil and surface water data collected in addition to the required long-term monitoring data are also included in Appendix B and are discussed in a separate section in this report.

INORGANIC CONSTITUENTS

The laboratory results for both Rounds 1 and 2 long-term ground water quality monitoring for the inorganic constituents are summarized in Table 2. These include total dissolved solids (TDS), sulfate (SO_4) and chloride (Cl). The data from Round 2 should be compared to the November 1987 Round 1 data, since there was flow in the Farmers Mutual Irrigation Ditch during both time periods and the maximum effects of these flows to the ground water would have occurred at these times.

The TDS, SO_4 and Cl concentrations in MW-10 (on-site in the southern part of the refinery tank farm) and MW-9 (off-site and southwest of the tank farm) have continued to decrease since the November 1987 Round 1 sampling. The recent August 1989 concentrations for TDS, SO_4 and Cl at MW-10 were 990, 470 and 45 mg/l, respectively, as compared to the Round 1 concentrations of these constituents at MW-10 of 1,240, 568 and 46 mg/l, respectively. Similarly, the August 1989 concentrations for TDS, SO_4 and Cl at MW-9 were 1,200, 624 and 37 mg/l, as compared to the Round 1 concentrations of 1,520, 863 and 43 mg/l, respectively. In addition, the water quality in MW-13 also improved, with TDS, SO_4 and Cl concentrations of 2,660, 1,350 and 78 mg/l as compared to Round 1 concentrations of 3,700, 1,980 and 257 mg/l, respectively.

The reduction in the concentration of these inorganic constituents in the water quality at MW-9, MW-10 and MW-13, in particular, is believed to be due to piping of the Westside Irrigation Ditch. Previously, the surface waters in the ditch seeped into the subsurface, through the upper unsaturated zone and into the water table. It is very likely that these waters tended to flush constituents out of the unsaturated zone and into the ground water.

The water quality in these five monitor wells has also improved since the April/May 1989 long-term sampling round. The most significant decrease in TDS concentration was observed in MW-14, where the recent TDS concentration was 2,560 mg/l versus 6,140 mg/l measured previously in Round 1.

ORGANIC CONSTITUENTS

The laboratory results for the (August 1989) Round 2 and Round 1 long-term monitoring and for the previous rounds for the five organic constituents detected (halogenated and aromatic volatile organics) are presented in Table 3. Those detected were 1-2 dichloroethane (1-2 DCA), total xylenes, ethylbenzene, toluene and benzene.

The concentrations of the organic contaminants at MW-10 (on-site) have decreased slightly, but are essentially the same as those concentrations measured in previous sampling rounds. The concentrations were very low, well below the State of New Mexico and federal Environmental Protection Agency constituent concentrations for drinking water. Similar conditions were present at MW-9, MW-13, MW-14 and MW-15, except that the concentration of 1-2 DCA in MW-14 increased from <1.0 ug/l in Round 1 to 3.2 ug/l in Round 2. This concentration however, is still well below the New Mexico drinking water quality concentration level of 10 ug/l. The concentration of total xylene in MW-14 decreased from 3.2 ug/l in Round 1 to <1.0 ug/l in Round 2 and toluene from 1.1 ug/l to <0.50 ug/l. As in Round 1, no organic contaminants were detected at MW-15 which is located off-site, south of Highway 489.

OFF-SITE SOIL AND SURFACE WATER MONITORING

In addition to the required Round 2 long-term ground water quality sampling, off-site soil and ground water samples were taken from soils at a seep located immediately downgradient of the refinery and the Farmers Mutual Irrigation Ditch (OSS-5); from soils along Virginia Murray's drainage ditches located just west of the tank farm (OSS-1 through OSS-4); and from surface waters in two of these ditches (OSSW-1 and OSSW-2) (Plate 2).

Off-site surface water samples had been taken previously along the Westside Irrigation Ditch (prior to piping) and from one of Virginia Murray's drainage ditches. These samples had been taken in November 1987 and February 1988 and analyzed for organic constituents. These data were presented in a previous Dames & Moore report (January 1989).

Off-site soil samples had also been taken in April 1988 near Virginia Murray's drainage ditches and analyzed for organic constituents. These data were presented in the June 1988 Dames & Moore report.

The 1987 and 1988 off-site soil and surface water quality sampling results indicated little to no off-site contamination from the tank farm along Virginia Murray's northernmost east-west drainage ditch and/or along the Westside Irrigation Ditch at Highway 489.

The purpose in sampling the off-site soils and surface waters in August 1989 was to verify that conditions off-site in and along Virginia Murray's drainage ditches have not degraded; to evaluate the quality of the residual seepage waters near the Westside Irrigation Ditch pipeline at Highway 489; and to evaluate the organic constituent concentrations in the soils at the seep downgradient of the refinery.

As shown in Table 4, the only volatile organic constituent detected in either the soils or surface waters off-site was 1,2 dichloroethane (1,2 DCA) in OSSW-1, (the surface water seepage site along the Westside Irrigation Ditch pipeline). The concentration was very low, only 1.3 ug/l. Total chromatographable organics were detected only at OSS-2 at a low concentration of 2,600 ug/kg. This soil sample was taken from Virginia Murray's drainage ditch, along the western end along Highway 489. The data indicate the contaminant to be gasoline.

The results of the August 1989 off-site ground water and soil and surface water quality analyses continue to indicate that off-site contamination from the tank farm and the refinery is not significant. This is of particular importance with respect to surface water drainage off of Virginia Murray's property, since it flows into two downgradient irrigation ditches (the waters of which are also used for stockwatering) and ultimately into the San Juan River.

CONCLUSIONS

These summary conclusions and recommendations are based on the remediation work conducted to date and all of Dames & Moore's previous work conducted at the Maverik Refinery and Tank Farm since 1987.

- Piping of the Westside Irrigation Ditch flows has served to limit the amount of refinery tank farm related free-product phase contaminants that potentially could enter off-site irrigation and drainage ditch waters. Additional future on-site surface and subsurface clean-up will also serve to minimize the source and potential of future off-site irrigation and drainage ditch water contamination.

- The results of the pumping test conducted in May 1989 at the refinery tank farm indicate that the upper saturated silty, clayey fine-grained sand zone that is contaminated and which has a saturated thickness of only about 8 feet, has a low hydraulic conductivity of about 1 to 5 ft/day, a low transmissivity of about 300 gpd/ft and a specific yield of about 0.02 such that pump-and-treat technology alone would not be effective. The results of the biodegradation

studies to date indicate that enhanced biodegradation in conjunction with pumping-and-treating would be more effective in site remediation.

- The water quality data from Rounds 1 and 2 long-term ground water quality monitoring indicate that the ground water quality 100 feet south of the refinery tank farm at MW-15 has not been impacted by the refinery tank farm. Although high levels of inorganic constituents were detected in Round 1 in the ground water (130 feet west-southwest of the refinery tank farm) at MW-14, concentrations were much lower in Round 2, indicating that Round 1 data may have monitored the influence of natural ground water discharge. A very low concentration of 1-2 DCA (3.2 ug/l) was detected at MW-14. These concentrations are well below New Mexico drinking water standards and any impacts to the ground water at MW-14 from the refinery tank farm do not appear to be significant. The monitor well data continue to indicate that off-site ground water contamination from the tank farm is not significant.

- Off-site soil and surface water impacts from the tank farm and/or refinery do not appear to have changed significantly since 1987 and 1988. Soil and surface water quality analytical data continue to indicate off-site contaminant concentrations in the surficial soils and in the surface waters at non-detectable levels or at concentrations well below New Mexico drinking water concentration standards.

In summary, based on the results of the biodegradation study and the revised Remediation Plan:

1. The volume of contaminated ground water that can be pumped and treated from an on-site east-west interceptor trench completed in the upper contaminated silty sand zone is about 10 gpm. The treatment facility size and capacity will be developed based on this approximate pumpage rate.

2. The configuration and size of the interceptor and recharge trench(s) will likely be expanded in order to expand the area of influence of biodegradation activity and to increase hydraulic control of the nutrients injected.

REFERENCES

Dames & Moore, February 1988. Phase I Hydrogeologic Evaluation, Maverik Refinery and Tank Farm, Kirtland, New Mexico.

Dames & Moore, June 1988. Addendum to Phase I Hydrogeologic Evaluation, Maverik Refinery and Tank Farm, Kirtland, New Mexico.

Dames & Moore, June 1988. Phase II Subsurface Soil and Solid Waste Contaminant Evaluation For Maverik Refinery and Tank Farm, Kirtland, New Mexico.

Dames & Moore, September 14, 1988. Ground Water Remediation Plan for Maverik Country Stores, Inc., Kirtland, New Mexico Refinery Tank Farm.

Dames & Moore, January 1989. Water Quality Data Summary Report For Completion of The Hydrogeologic Evaluation, Maverik Refinery and Tank Farm, Kirtland, New Mexico For Maverik Country Stores, Inc.

Dames & Moore, July 1989. Status Report, Remediation Work, Aquifer Pump Test and Round 1 Long-Term Ground Water Quality Monitoring Data Results For Maverik Refinery and Tank Farm, Kirtland, New Mexico, For Maverik Country Stores, Inc.

Dames & Moore, August 8, 1989. Amended Ground Water Remediation Plan.

EPA, October 1986. Superfund Public Health Evaluation Manual, EPA 540/1-86/060.

New Mexico EID, January 25, 1989, Letter of Agreement for Implementation of The (Original Preliminary) Ground Water Remediation Plan For Maverik Country Stores, Inc., Kirtland, New Mexico Refinery Tank Farm.

TABLE 1

LONG-TERM MONITORING
LABORATORY WATER QUALITY PARAMETERS

General Inorganics

Chloride
Sulfate
Total Dissolved Solids

Halogenated Volatile Organics
EPA Method 601

Chloromethane
Bromomethane (Methylbromide)
Vinyl chloride
Chloroethane
Methylene chloride
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene (cis/trans)
Chloroform
1,1,2-Trichloro-2,2,1-trifluoroethane
1,2-Dichloroethane
1,1,1-Trichloroethane
Carbon tetrachloride
Bromodichloromethane
1,2-Dichloropropane
trans-1,3-Dichloropropene
Trichloroethene
Chlorodibromomethane
cis-1,3-Dichloropropene
1,1,2-Trichloroethane
EDB (1,2-Dibromoethane)
Bromoform
1,1,2,2-Tetrachloroethane
Chlorobenzene

Aromatic Volatile Organics
EPA Method 602

Benzene
Toluene
Chlorobenzene
Ethylbenzene
Total xylenes
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene

Note: For detail of methodology see ENSECO's (RMAL) attached report (Appendix B)

TABLE 2

LABORATORY RESULTS FOR MAJOR IONS, ROUND 2
LONG-TERM MONITORING, (AND PRIOR ANALYTICAL DATA RESULTS)
FOR MAVERIK COUNTRY STORES, REFINERY TANK FARM, KIRTLAND, NEW MEXICO

Sample Site Designation(1)	pH(3) (field)				TDS(3) (mg/l)				Sulfate(3) mg/l				Chloride(3) mg/l			
NM MCL	6-9				1,000				600				250			
EPA MCL	6.5-8.5		(Long-Term)		500		(Long-Term)		250		(Long-Term)		250		(Long-Term)	
Rounds	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Wells																
On-Site																
MW10(3)	7.66	8.22	6.46	-	1,240*	2,725*	2,310*	990	568	1,640*	1,190*	470	46	191	146	45
Off-Site																
MW9(3)	7.11	7.08	7.04	-	1,520*	2,160*	1,420*	1,200*	863*	1,510*	727*	624*	43	81	39	37
MW13(3)	8.14	8.36	8.06	-	3,700*	1,850*	2,480*	2,660	1,980*	920*	1,350*	1,350*	257*	82	94	78
MW14(3)	-	-	7.08	-	-	-	6,140*	2,560*	-	-	3,320*	1,360*	-	-	406*	114
MW15(3)	-	-	6.45	-	-	-	2,360*	1,900*	-	-	1,220*	1,030*	-	-	178	139

Footnotes:
(1) Data from Rounds 1 and 2 and from Round 1 long-term monitoring are presented for each sample site in subsequent columns, respectively.
- Indicates not analyzed
(Round 2 Long-Term Monitoring, sampled August 10, 1989)
(2) (Round 1 Long-Term Monitoring, sampled April 27, 1989 and May 4, 1989)
(Round 1 Sampled November 10-27, 1987)
(Round 2 Sampled February 22-24, 1988)
(Round 3 Sampled October 12-13, 1988 no laboratory analysis for inorganics)
(3) Sample parameters for long-term monitoring only from those wells as indicated.
* Exceeds New Mexico MCL For Drinking Water.

TABLE 3

LABORATORY RESULTS FOR DETECTED ORGANIC CONSTITUENTS, ROUND 2 LONG-TERM MONITORING
(AND PRIOR ANALYTICAL DATA RESULTS)
FOR MAVERIK COUNTRY STORES, REFINERY TANK FARM, KIRTLAND, NEW MEXICO

(Round 2 Long-Term Monitoring Sampled August 10, 1989)
(Round 1 Long-Term Monitoring Sampled April 27, 1989 and May 4, 1989)
(Round 1 Sampled November 10-27, 1987)
(Round 2 Sampled February 22-24, 1988)
(Round 3 Selective Sampling October 12-13, 1988)

Sample Site Designation[1]	1-2 DCA[2] (ug/l)					Total Xylene[2] (ug/l)					Ethylbenzene[2] (ug/l)					Toluene[2] (ug/l)					Benzene[2] (ug/l)				
NM MCL	10					620					750					750					10				
EPA MCL	5			(Long-Term)		NA			(Long-Term)		NA			(Long-Term)		2,000			(long-Term)		5			(Long-Term)	
Rounds	1	2	3	1	2	1	2	3	1	2	1	2	3	1	2	1	2	3	1	2	1	2	3	1	2
Wells																									
On-Site																									
MW10[2]	3.2	1.3	5.7	3.3	1.6	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Off-Site																									
MW9[2]	8.3	8.6	5.6	4.5	3.4	<0.50	<0.50	<0.50	<1.0	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
MW13[2]	<1	1.9	1.9	7.4	6.0	2.23	1.68	<0.50	<1.0	<1.0	0.54	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
MW14[2]	-	-	-	<1.0	3.2	-	-	-	3.2	<1.0	-	-	-	<0.50	<0.50	-	-	-	1.1	<0.50	-	-	-	<0.50	<0.50
MW15[2]	-	-	-	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	<0.50	<0.50	-	-	-	<0.50	<0.50	-	-	-	<0.50	<0.50

Footnotes:
(1) Data from each round are presented for each sample site in the first, second, third and fourth columns, respectively.
(2) Sample parameters for long-term monitoring, only from those wells as indicated.
The values indicated as less than (<) are detection limits only, and not actual concentrations.
- Indicates not analyzed.
* Exceeds New Mexico MCL for drinking water.

TABLE 4

LABORATORY RESULTS FOR OFF-SITE SURFACE WATER AND SOILS
(AND PRIOR ANALYTICAL DATA RESULTS)
FOR MAVERIK COUNTRY STORES, REFINERY TANK FARM, KIRTLAND, NEW MEXICO
(Sampled August 9, 10, 1989)

Sample Site Designation(1)	1-2 DCA(2) (ug/l)	Total Xylene(2) (ug/l)	Ethylbenzene(2) (ug/l)	Toluene(2) (ug/l)	Benzene(2) (ug/l)
NM MCL (3)	10	620	750	750	10
EPA MCL (3)	5	NA	NA	2,000	5
Surface Water Samples					
OSSW-1	1.3	<0.50	<0.50	<0.50	<0.50
OSSW-2	<0.50	<0.50	<0.50	<0.50	<0.50

Soil Samples	Total Chromatographable(2) Organics (TCO) (mg/kg)	Total Xylene(2) (ug/kg)	Ethylbenzene(2) (ug/kg)	Toluene(2) (ug/kg)	Benzene(2) (ug/kg)
OSS-1	ND	<100	<50	<50	<50
OSS-2	ND	<100	<50	<50	<50
OSS-3	ND	<100	<50	<50	<50
OSS-4	ND	<100	<50	<50	<50
OSS-5	-	<100	<50	<50	<50

(1) OSS-1,2,3,4 Designate soil samples from Virginia Murray's ditches.
OSS-5 Designates soil sample from below the refinery near Virginia Murray's northern property boundary.

OSSW-1,2 Designates surface water samples from Virginia Murray's ditch at the Westside Irrigation Ditch pipeline and from Virginia Murray's east-west drainage ditch.

(2) The values indicated as less than (<) are detection limits only, and not actual concentrations.

(3) For drinking water

- Indicates not analyzed.

* Exceeds New Mexico MCL for drinking water.

ND Indicates not detected

TABLE 5

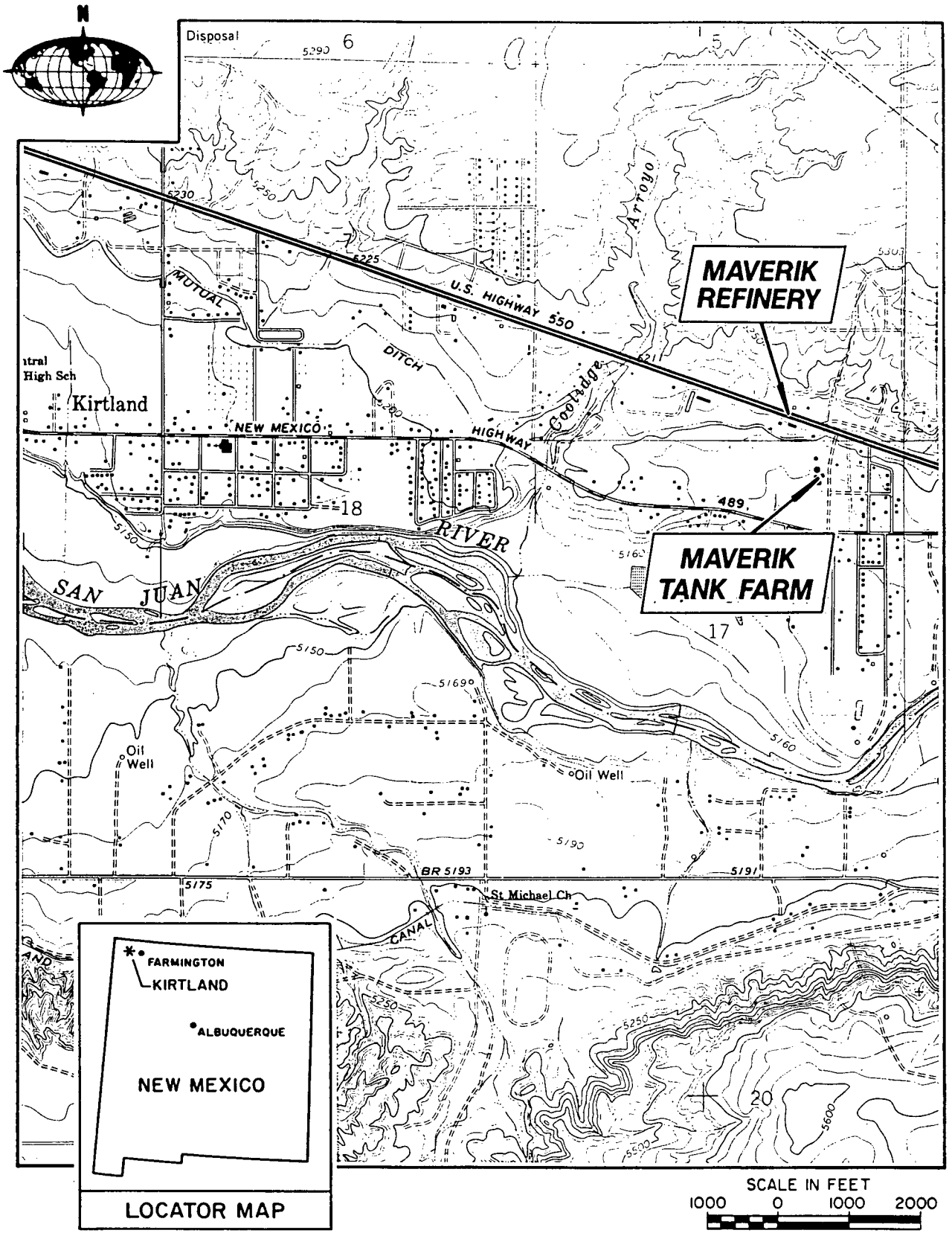
CHARACTERISTICS OF ORGANIC COMPOUNDS DETECTED
LONG-TERM REMEDIATION MONITORING

	Molecular Weight	Density (gm/cm^3)	Water Solubility (mg/l)	Vapor Pressure (mm Hg)	K_{oc}(1) (ml/g)	K_{ow}(2)
Volatile Organic Parameters						
Benzene	78	0.88	1,750	95	83	132
Ethylbenzene	106	0.87	152	7	1,100	1,412
Toluene	92	0.87	535	28	300	537
Xylene, m	106	0.86	130	10	871	1,820
Xylene, p	106	0.86	192	10	676	1,412
Xylene, o	106	0.88	175	10	426	891
1,2-Dichloroethane	99	1.26	8,520	64	14	30

(1) Organic carbon partition coefficient, a measure of the tendency for organics to be adsorbed by soil and sediment.

(2) Octanol-water partition coefficient, a measure of the tendency of a chemical at equilibrium to distribute between an organic phase (octanol) and water.

Source: Superfund Public Health Evaluation Manual, EPA 540/1-86/060, October 1986; Land Treatment of Appendix VIII Constituents in Petroleum Industry Wastes, American Petroleum Institute Publication 4379, May 1984.



VICINITY MAP

REFERENCE
U.S.G.S. QUADRANGLE ENTITLED
"KIRTLAND, NEW MEXICO" – 1966,
PHOTOREVISED 1979.

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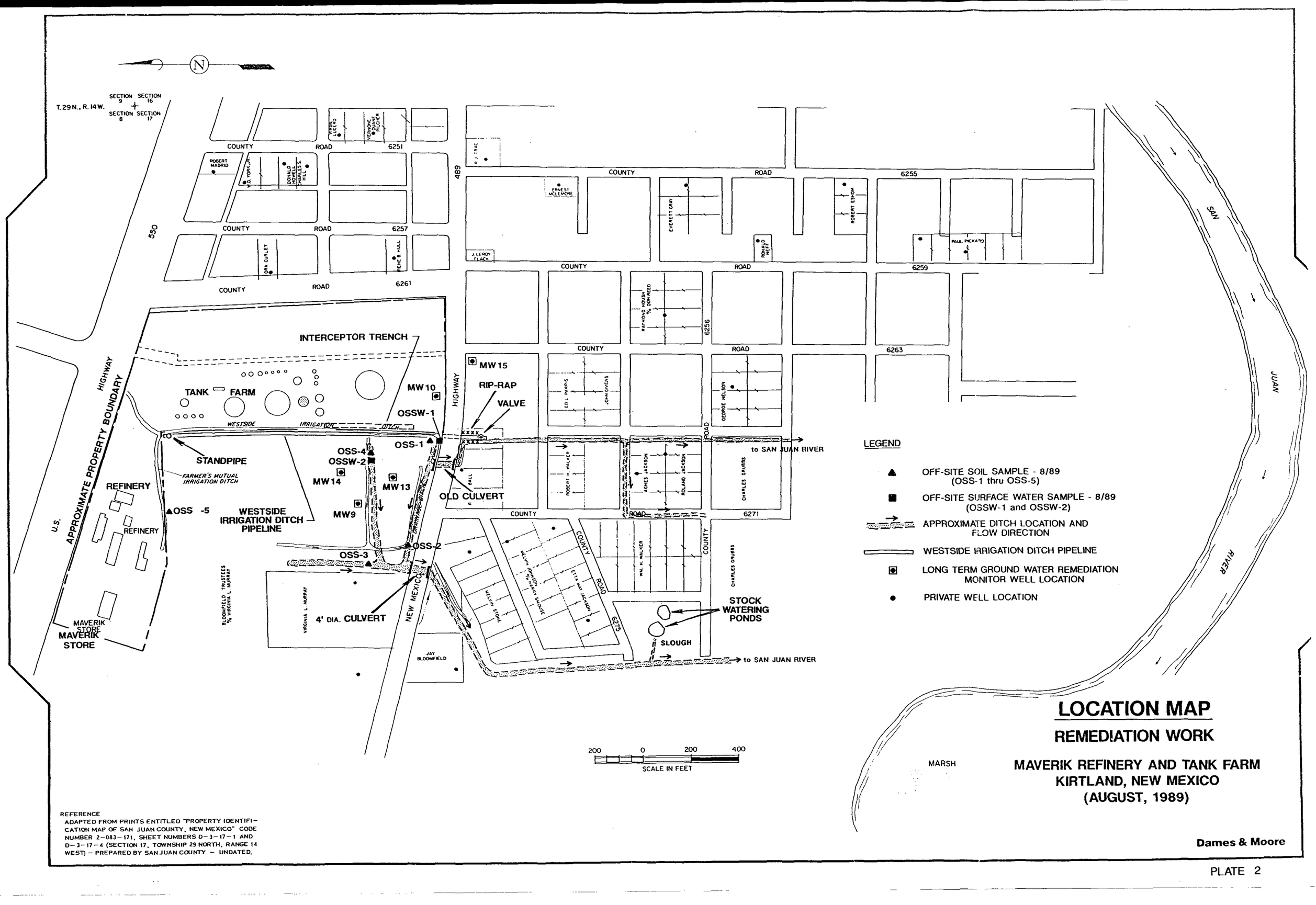
PLATE 1



LOCATION MAP

REMEDIATION WORK

MAVERIK REFINERY AND TANK FARM
KIRTLAND, NEW MEXICO
(AUGUST, 1989)

REFERENCE
ADAPTED FROM PRINTS ENTITLED "PROPERTY IDENTIFICATION MAP OF SAN JUAN COUNTY, NEW MEXICO" CODE NUMBER 2-083-171, SHEET NUMBERS D-3-17-1 AND D-3-17-4 (SECTION 17, TOWNSHIP 29 NORTH, RANGE 14 WEST) - PREPARED BY SAN JUAN COUNTY - UNDATED.

Dames & Moore

PLATE 2

PLATE _____ OF _____
CHECKED BY _____ DATE _____

APPENDIX A

CORRESPONDENCE: AMENDED GROUND WATER REMEDIATION PLAN

(AUGUST 8, 1989)

August 8, 1989

Mr. Bill Olsen
Hydrogeologist
Ground Water Bureau, EID
P.O. Box 968
Santa Fe, NM 87504-0968

Subject: Amended (August 1989) Ground Water Remediation Plan For Maverik Country Stores, Inc., Kirtland, New Mexico, Refinery Tank Farm

Dear Bill:

Enclosed is an "Amended Ground Water Remediation Plan" for the Maverik Country Stores, Inc. Kirtland, New Mexico Refinery Tank Farm. Your expeditious review and approval of the enclosed plan is respectfully requested to ensure that timely remedial activities can proceed. The original plan (September 14, 1988) has been amended as indicated. These changes are necessary due to the results of the recent shallow aquifer pumping test. The test was conducted by Dames & Moore in May 1989 in the southwest corner of the tank farm, to further characterize the site in support of the remedial action design.

The shallow aquifer pumping test indicated that the hydraulic conductivity of the upper shallow water table aquifer (saturated thickness of 8 feet, from about 4 feet to 12 feet in depth below ground surface) is considerably lower (about 5 ft/day) than that indicated by previous shallow well slug test data and deeper aquifer pump test data. As a result, the volume of water that can be pumped, treated and reinjected into the aquifer is now estimated to be about 10 gpm from the interceptor trench/recovery well system.

The original "Ground Water Remediation Plan" has been amended to account for the low hydraulic conductivity (about 5 ft/day) and resultant low transmissivity of this zone (about 300 gpd/ft). The changes are detailed in Attachment 1 and are shown on Plate 1. The plan includes the following key changes:

1. Continued use of and possible additional excavation of the existing north-south interceptor trench for more effective hydraulic control and continued free product capture along the southwestern boundary of the tank farm (Component 3).

2. Relocation of the east-west interceptor trench to the north about 25 feet closer to the contaminant source area, while intercepting the existing north-south interceptor trench (Component 5).

3. Utilization of large (2-3 feet in diameter) recharge wells, primarily to the north, for reinjection of treated water. If needed to maintain a water balance additional recharge wells will be installed downgradient to recharge any excess waters that are treated. Additional recharge wells would also serve to create a ground water mound (hydraulic barrier) to the south to aid in controlling potential off-site contaminant migration (Component 9). An automatic shutoff will be installed at the water treatment site such that the reinjection system would shut down automatically if the treatment system should fail.

4. Bioremediation rather than soil vapor recovery, including bacterial enhancement in both the saturated and unsaturated zones through oxygen and nutrient injection, and aeration, respectively (Component 10).

In addition, the tanks and pipelines will be rechecked to ensure that they have been properly emptied. Any product found will be appropriately disposed of off-site. The open-ended pipes will be capped and the tanks locked to prevent any future potential unauthorized use of the tanks and pipes.

The remediation plan as amended will be initiated immediately, upon your approval, as per the Implementation Schedule in Table 1. As you are aware, the project was delayed for about one month in May 1989 during negotiations between Maverik Country Stores, Inc. and a potential buyer of the tank farm. In addition, the results of the aquifer pumping test required a schedule delay during which time the necessary modifications were made to the original plan.

If you have any questions on the enclosed, please do not hesitate to contact us at (801) 521-9255. As per your request, we have also sent a copy of this proposal to Dave Tomko in your Farmington office. We are looking forward to hearing from you so that the remediation work can begin as soon as possible. Our client, Maverik Country Stores, Inc., remains committed to completing the remedial actions presented in the attached plan.

Very truly yours,

DAMES & MOORE

Peter F. Olsen
Associate

Terry D. Vandell
Project Hydrogeologist

PFO/TDV/fl

cc: Mr. Bill Call, President (with attachments
Maverik Country Stores, Inc.
Mr. Vince Memmott (with attachments)
Mr. Dave Tomko (with attachments)
Mr. Tim Holbrook, Dames & Moore

ATTACHMENT 1

MODIFIED GROUND WATER REMEDIATION PLAN FOR MAVERIK COUNTRY STORES, INC. KIRTLAND, NEW MEXICO REFINERY TANK FARM

This Remediation Plan addresses the shallow soil and ground water contamination in the southern portion of the tank farm area. Bioremediation components include ground water pumping, treatment, nutrient addition and reinjection. This plan is designed to enhance natural biodegradation.

The 10 components of the Plan include the following, as shown on Plate 1 and as designated by the following numbers:

*1. The Westside Irrigation Ditch waters which flow along the entire western edge of the tank farm property boundary will be contained in 10-inch diameter plastic pipe to prevent contamination of the irrigation waters (completed in March 1989).

2. The refinery sludge in the eastern part of the tank farm will be characterized, excavated and disposed of off-site and backfilled with clean soil.

3. The existing north-south interceptor trench will be excavated further and will continue to be utilized for capturing free product along the southwestern boundary of the tank farm.

*4. Two additional off-site monitor wells will be constructed to monitor the effectiveness of remediation off-site, downgradient to the south and southwest of the tank farm. Water levels will be measured and samples analyzed for volatile organics (aromatic and halogenated) and total dissolved solids, sulfate and chloride from these two new monitor wells and existing monitor wells MW9, MW10 and MW13 three times in year 1, two times in year 2, one time in year 3, with monitoring only as needed thereafter (Round 1 completed in April 1989).

5. An east-west ground water interceptor trench, about 12 feet deep, 3-feet wide, 160 feet long, backfilled with coarse gravel, will be constructed in the southwest area.

6. A two dual recovery pump system (i.e., each with a drawdown pump and skimmer pump in 2-feet diameter, 12-feet deep wells) will be installed in the interceptor trench.

7. An oil/water separator will treat ground water recovered from the interceptor trench. Free product will be stored on-site in the existing 2.4 million gallon storage tank. The water phase will be further treated by air stripping. After nutrients are added, the treated water will be used to recharge the shallow soils and the shallow aquifer to enhance the natural biodegradation.

8. Ground water from the oil/water separator (25 gpm capacity) will be treated by air stripping to remove the volatile organic components.

9. Treated water from the interceptor trench wells will be discharged to shallow large (2-3 feet in diameter) wells that will be constructed with a caisson drilling rig. These recharge wells will be located to the north and upgradient about 100 feet from the east-west interceptor trench. Treated ground waters and oxygen and nutrients will be injected into these wells to aid in flushing contaminants from this zone and to enhance biodegradation. A few recharge wells may be located immediately downgradient south-southeast of the 2.4 million gallon tank to handle any excess ground waters that have been pumped and treated. The recharge wells will be completed only in the shallow contaminated zone (about 12-feet deep). The total number of recharge wells is currently estimated at about 6. The exact number and locations will be determined after the interceptor trench has been constructed and on-site conditions are better defined. Additional methods of infiltration may be needed and could include sprinkling, shallow (1 to 2 feet deep) trenches or shallow ponds upgradient from the east-west interceptor trench.

10. Bioremediation will be implemented by adding nutrients and an oxygen source to the upgradient recharge wells. This will enhance the growth and activity of the current bacterial population to aid in contaminant degradation. Laboratory tests of the soils and ground water will be completed prior to system start-up to define the types and proportions of hydrocarbon degrading bacteria and the types and quantities of nutrients and oxygen necessary for efficient biodegradation.

    Surface soils between the recharge wells and interceptor trenches will be scarified to induce volatilization of gasoline contamination in the unsaturated zone. Soils excavated during trench and recharge well construction will be spread in shallow lifts in the same area to be scarified. Nutrients may be added to the upper soils to enhance biodegradation of the contaminants in this zone also.

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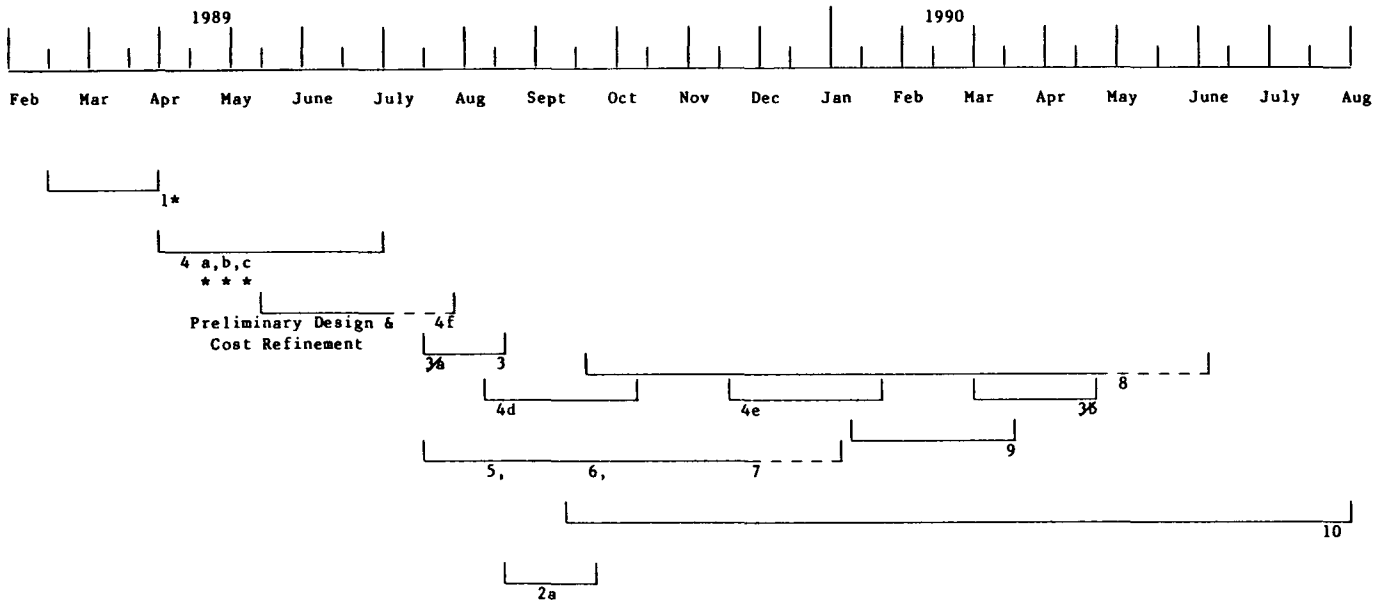
* Indicates already completed as per the original Phase I Plan (September 14, 1989).

TABLE 1

REVISED TIME SCHEDULE, AMENDED GROUND WATER REMEDIATION PLAN
FOR MAVERIK COUNTRY STORES, INC. (AUGUST 1989)
KIRTLAND, NEW MEXICO, REFINERY TANK FARM



No.	Components (1)
*1	Pipe Westside Ditch Flows
2a	Sludge Evaluation
2b	Sludge Removal/Disposal
~~3a~~	~~Backfill North-South Interceptor Trench, Partial~~
~~3b~~	~~Backfill North-South Interceptor Trench, Total~~
3	Utilize North-South Interceptor Trench
*4a	Install Two New Monitor Wells
*4b	Water Quality Monitoring Data Report, Round 1
*4c	Conduct Pump Test
4d	Water Quality Monitoring Data Report, Round 2
4e	Water Quality Monitoring Data Report, Round 3
4f	Refine Plan
5	Excavate East-West Interceptor Trench
6	Install Dual Recovery Pump System
7	Install Primary Product Recovery/Disposal System
8	Install Air Stripper System
9	Install Recharge Trench/System
~~10a~~	~~Install Pilot Scale Soil Vapor Recovery System~~
~~10b~~	~~Install Full Scale Soil Vapor Recovery System~~
10	Bioremediation, Including Laboratory Testing

(1) Components as defined in Amended (August 1989) Ground Water Remediation Plan for Maverik Country Stores, Inc., Kirtland, New Mexico Refinery Tank Farm. Times for completion reflect, where required, data collection, laboratory analysis, final design specifications, contract and equipment procurement, construction and start-up.

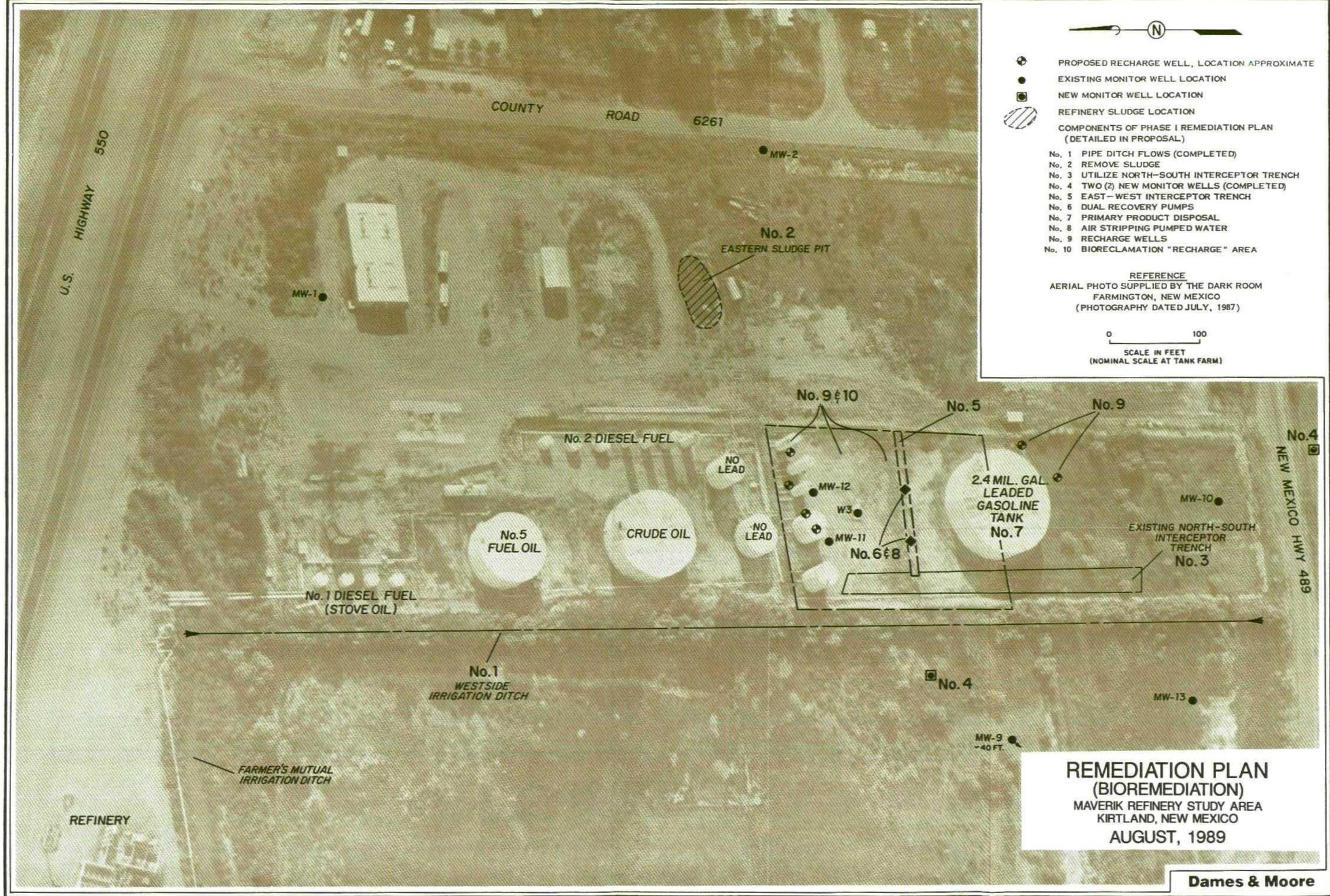
* Indicates work completed as of August 1989

_ _] Indicates time extension from original plan

/ Indicates deleted in the amended plan

DATE _____ CHECKED BY _____ DATE _____

FILE 1489-005-520S BY _____ DATE _____



PROPOSED RECHARGE WELL, LOCATION APPROXIMATE

EXISTING MONITOR WELL LOCATION

NEW MONITOR WELL LOCATION

REFINERY SLUDGE LOCATION

COMPONENTS OF PHASE I REMEDIATION PLAN
(DETAILED IN PROPOSAL)

- No. 1 PIPE DITCH FLOWS (COMPLETED)
- No. 2 REMOVE SLUDGE
- No. 3 UTILIZE NORTH–SOUTH INTERCEPTOR TRENCH
- No. 4 TWO (2) NEW MONITOR WELLS (COMPLETED)
- No. 5 EAST–WEST INTERCEPTOR TRENCH
- No. 6 DUAL RECOVERY PUMPS
- No. 7 PRIMARY PRODUCT DISPOSAL
- No. 8 AIR STRIPPING PUMPED WATER
- No. 9 RECHARGE WELLS
- No. 10 BIORECLAMATION "RECHARGE" AREA

REFERENCE
AERIAL PHOTO SUPPLIED BY THE DARK ROOM
FARMINGTON, NEW MEXICO
(PHOTOGRAPHY DATED JULY, 1987)

0 100
SCALE IN FEET
(NOMINAL SCALE AT TANK FARM)

REMEDIATION PLAN
(BIOREMEDIATION)

MAVERIK REFINERY STUDY AREA
KIRTLAND, NEW MEXICO

AUGUST, 1989

Dames & Moore

PLATE 1

46612 (11-82)

APPENDIX B

FIELD AND LABORATORY GROUND WATER QUALITY DATA SAMPLING AND ANALYSES AND QA/QC FOR ROUND 2 LONG-TERM REMEDIATION MONITORING, AND PRIOR ROUNDS 1, 2 AND 3 AND ROUND 1 LONG-TERM MONITORING

APPENDIX B

FIELD AND LABORATORY GROUND WATER QUALITY DATA SAMPLING AND ANALYSES AND QA/QC FOR ROUND 2 LONG-TERM REMEDIATION MONITORING, AND PRIOR ROUNDS 1, 2 AND 3 AND ROUND 1 LONG-TERM MONITORING

WATER QUALITY SAMPLING

The monitor wells sampled for the long-term remediation monitoring Round 1 (MW-9, MW-10, MW-13, MW-14 and MW-15) and the aquifer pump test well were purged with teflon and glass bailers as in all previous sampling rounds. Ground water samples were then collected, preserved and analyzed in accordance with EPA guidance. All samples were analyzed by Rocky Mountain Analytical Laboratory (RMAL) a division of ENSECO, Incorporated, a well known multi-state certified and EPA Contract Laboratory-Program laboratory in Arvada, Colorado. RMAL has conducted the laboratory analysis on all of the prior samples taken at the project site. Bottom samples from the wells were collected by lowering a teflon bailer equipped with an end ball valve to the bottom of the wells. Samples were collected after 3 to 5 casing volumes of water had been removed.

The drop pipe that had been installed in monitor well MW-13 prior to Round 2 sampling was also used during this sampling round. This is described in our February 1988 report. The drop pipe was installed after a free oil phase had been detected in MW-13 during Round 1 sampling. Such a phase was present only in monitor well MW-13 during the long-term Round 1 sampling.

The off-site soil and surface water samples were taken using the same glass jars and bottles that were then shipped directly to RMAL.

Sample bottles, with appropriate preservatives as detailed in RMAL's report, were shipped directly to the site by the laboratory. All samples were iced immediately after collection and shipped to RMAL on the day of collection via overnight courier. Chain-of-custody documentation was maintained.

LABORATORY ANALYSIS

RMAL conducted the analysis on the water quality samples for long-term remediation monitoring Round 1 and for all previous rounds. Analytical findings for the major inorganic and organic parameters for this round and previous sampling rounds for the five designated monitor wells are included in Table B-2. The data are presented in columns for comparative purposes. The detailed report from RMAL for Round 2 long-term monitoring and off-site soil and surface water analyses is also included in this appendix.

Rounds 1 and 2 long-term remediation water quality analyses include a selected list of analytes based on those detected previously in wells in Rounds 1, 2 and 3 and as agreed to by the EID (September 14, 1988). RMAL conducted analyses for 24 halogenated volatile organics, 8 aromatic volatile organics and 3 inorganic constituents. The specific parameters are listed in Table 1 along with the analytical methods used. GC methods 601 and 602 were used to detect volatile organics.

The chromatograms for the 4 off-site soil samples analyzed for total chromatographable organics (TCO) and a "type" chromatogram for gasoline are included at the end of this Appendix. Analyses for TCO involved a methylene chloride extraction and subsequent analysis by capillary column gas chromatography with a flame ionization detector. This test is designed to detect the maximum concentration of hydrocarbons (which include refinery-related semivolatiles and additional non-hazardous aliphatic hydrocarbons). The type and concentration of common petroleum products (gasoline, stoddard solvent, jet fuel, kerosene, diesel, motor oil) can be defined if there is a good match. If a match to a specific petroleum product can be assigned, the product identification is then reported. The GC conditions measure compounds in the boiling point range of 100°C (212°F) to 500°C (932°F).

This extraction technique and GC analysis serve as a screen for semivolatile compounds and as mentioned, provide only an indication of the maximum concentration of the semivolatile compounds, since the concentration includes many other hydrocarbons. Details of the test are included in RMAL's report, "Section III, Analytical Results."

Results of the laboratory analyses for the 4 samples tested for TCO are summarized in Table B-2.

The sample analyses from OSS-1, OSS-3 and OSS-4 did not indicate any TCO at the detection limit of 1,700 ug/kg. This is consistent with the other data results in that no other organic parameters were detected in the soils at these sites.

A very low concentration of TCO of 2,600 ug/kg was detected at OSS-2, along the western end of Virginia Murray's drainage ditch along Highway 489. The final boiling points were low, at 100°C to 170°C and the chromatogram also indicated light end product, primarily in the C4 to C12 range, probably gasoline.

APPENDIX B

REPORT OF ANALYSES

TABLE B-1

SUMMARY OF FIELD DATA
FOR LONG-TERM GROUND WATER QUALITY
REMEDIATION MONITORING ROUNDS 1 AND 2

Well	Depth to Water[1] (From top of Casing, in ft)		Depth to Water (From Ground Surface, in ft.)		pH (pH units)	Conductivity umhos/cm	Temperature °C	Remarks[2]
	Round 1	Round 2	Round 1	Round 2	Round 1	Round 1	Round 1	
MW-9	4.40	3.7	2.77	1.7	7.04	2,000	14.8	Clear Water
MW-10	4.10	5.1	2.27	2.5	6.46	3,500	13.0	Silty
MW-13	2.1	3.2	1.9	1.9	8.06	2,500	16.0	Clear Water Very slow to recharge (about 24 hrs.)
MW-14	7.5	8.2	3.0	4.5	7.08	8,000	16.2	Clear Water
MW-15	5.0	5.8	1.0	2.3	6.45	3,500	14.2	Clear Water

(1) Round 1 Data collected April 27, 1989 and May 4, 1989.
Round 2 Data collected August 10, 1989, measured from top of casing.
(2) Round 2 remarks.

TABLE B-2

MAVERIK-KIRTLAND WATER QUALITY

SAMPLE IDENTIFICATION	MW-9	MW-9	MW-9	MW-9	MW-9
DATE SAMPLED	11-23-87	2-22-88	10-13-88	4-27-89	8-10-89
INORGANIC PARAMETERS (mg/L except as noted)					
Calcium (Ca)	324.0	396.0	*	*	*
Magnesium (Mg)	29.0	41.0	*	*	*
Sodium (Na)	146.0	357.0	*	*	*
Potassium (K)	< 5.0	< 5.0	*	*	*
Iron (Fe)	< .05	< .05	*	*	*
Manganese (Mn)	*	.110	*	*	*
Ammonia (as N)	< .1	< .1	*	*	*
Chloride (Cl)	43.0	81.0	*	39.0	37.0
Sulfate (SO4)	863.	1510.	*	727.	624.
Fluoride (F)	1.0	.8	*	*	*
Nitrate and Nitrite (as N)	< .1	< .1	*	*	*
Total Alkalinity	372.0	250.0	*	*	*
Bicarbonate Alkalinity	*	250.0	*	*	*
Carbonate Alkalinity	*	*	*	*	*
Bicarbonate (HCO3)	*	304.8	*	*	*
Carbonate (CO3)	*	*	*	*	*
FIELD AND LABORATORY MEASUREMENTS					
Temperature (Degrees C)	13.3	*	15.5	14.8	*
Field pH	7.11	7.08	6.52	7.04	*
Lab pH (units)	7.59	7.71	*	*	*
Field Conductivity (umhos/cm	1400.0	2200.0	1600.0	2000.0	*
Lab Conductivity (umhos/cm)	1850.0	3000.0	*	*	*
Total Dissolved Solids(mg/l)	1520.0	2160.0	*	1420.0	1200.0
VOLATILE ORGANICS DETECTED (ug/L)					
Benzene	< .50	< .50	< .50	< .50	< .50
Ethylbenzene	< .50	< .50	< .50	< .50	< .50
Toluene	< .50	< .50	< .50	< .50	< .50
m-Xylene	< .50	< .50	*	*	*
o,p-Xylene	< .50	< .50	*	*	*
Total Xylene	*	*	< .50	< 1.00	< 1.00
1,2 Dichloroethane	8.30	8.60	5.60	4.50	3.40
SEMIVOLATILE ORGANICS DETECTED (ug/L)					
Naphthalene	*	*	< 10.00	*	*
m & p-Cresol(s)	*	*	< 10.00	*	*
TOTAL ORGANIC LEAD (mg/L)					
Total Organic Lead	< .010	.004	*	*	*

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

TABLE B-2 (Continued-2)

MAVERIK-KIRTLAND WATER QUALITY

SAMPLE IDENTIFICATION	MW-10	MW-10	MW-10	MW-10	MW-10
DATE SAMPLED	11-23-87	2-23-88	10-12-88	4-27-89	8-10-89
INORGANIC PARAMETERS (mg/L except as noted)					
Calcium (Ca)	126.0	196.0	*	*	*
Magnesium (Mg)	22.0	41.0	*	*	*
Sodium (Na)	250.0	578.0	*	*	*
Potassium (K)	< 5.0	< 5.0	*	*	*
Iron (Fe)	< .05	< .05	*	*	*
Manganese (Mn)	*	5.200	*	*	*
Ammonia (as N)	< .1	< .1	*	*	*
Chloride (Cl)	46.0	191.0	*	146.0	45.0
Sulfate (SO4)	568.	1640.	*	1190.	470.
Fluoride (F)	.8	.7	*	*	*
Nitrate and Nitrite (as N)	< .1	< .1	*	*	*
Total Alkalinity	153.0	271.0	*	*	*
Bicarbonate Alkalinity	*	271.0	*	*	*
Carbonate Alkalinity	*	*	*	*	*
Bicarbonate (HCO3)	*	330.4	*	*	*
Carbonate (CO3)	*	*	*	*	*
FIELD AND LABORATORY MEASUREMENTS					
Temperature (Degrees C)	12.5	*	15.6	13.0	*
Field pH	7.66	8.22	6.25	6.46	*
Lab pH (units)	7.74	7.70	*	*	*
Field Conductivity (umhos/cm	1280.0	3600.0	1375.0	3500.0	*
Lab Conductivity (umhos/cm)	1640.0	3720.0	*	*	*
Total Dissolved Solids(mg/l)	1240.0	2725.0	*	2310.0	990.0
VOLATILE ORGANICS DETECTED (ug/L)					
Benzene	< .50	< .50	< .50	< .50	< .50
Ethylbenzene	< .50	< .50	< .50	< .50	< .50
Toluene	< .50	< .50	< .50	.52	< .50
m-Xylene	< .50	< .50	*	*	*
o,p-Xylene	< .50	< .50	*	*	*
Total Xylene	*	*	< .50	< 1.00	< 1.00
1,2 Dichloroethane	3.20	1.30	5.70	3.30	1.60
SEMIVOLATILE ORGANICS DETECTED (ug/L)					
Naphthalene	*	*	< 10.00	*	*
m & p-Cresol(s)	*	*	< 10.00	*	*
TOTAL ORGANIC LEAD (mg/L)					
Total Organic Lead	< .020	.009	*	*	*

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

TABLE B-2 (Continued-3)

MAVERIK-KIRTLAND WATER QUALITY

SAMPLE IDENTIFICATION	MW-13	MW-13	MW-13	MW-13	MW-13
DATE SAMPLED	11-27-87	2-24-88	10-12-88	5- 4-89	8-10-89
INORGANIC PARAMETERS (mg/L except as noted)					
Calcium (Ca)	364.0	219.0	*	*	*
Magnesium (Mg)	105.0	47.0	*	*	*
Sodium (Na)	666.0	370.0	*	*	*
Potassium (K)	24.0	< 5.0	*	*	*
Iron (Fe)	.39	.12	*	*	*
Manganese (Mn)	*	1.900	*	*	*
Ammonia (as N)	.5	.5	*	*	*
Chloride (Cl)	257.0	82.0	*	94.0	78.0
Sulfate (SO4)	1980.	920.	*	1350.	1350.
Fluoride (F)	1.0	.8	*	*	*
Nitrate and Nitrite (as N)	.3	< .1	*	*	*
Total Alkalinity	419.0	581.0	*	*	*
Bicarbonate Alkalinity	*	581.0	*	*	*
Carbonate Alkalinity	*	*	*	*	*
Bicarbonate (HCO3)	*	708.4	*	*	*
Carbonate (CO3)	*	*	*	*	*
FIELD AND LABORATORY MEASUREMENTS					
Temperature (Degrees C)	8.1	*	18.3	16.0	*
Field pH	8.14	8.36	7.51	8.06	*
Lab pH (units)	7.89	8.11	*	*	*
Field Conductivity (umhos/cm	2300.0	2600.0	4350.0	2500.0	*
Lab Conductivity (umhos/cm)	4300.0	2650.0	*	*	*
Total Dissolved Solids(mg/l)	3700.0	1850.0	*	2480.0	2660.0
VOLATILE ORGANICS DETECTED (ug/L)					
Benzene	< .50	< .50	< .50	< .50	< .50
Ethylbenzene	.54	< .50	< .50	< .50	< .50
Toluene	< .50	< .50	< .50	< .50	< .50
m-Xylene	1.40	1.10	*	*	*
o,p-Xylene	.83	.58	*	*	*
Total Xylene	*	*	< .50	< 1.00	< 1.00
1,2 Dichloroethane	< 1.00	1.90	1.90	7.40	6.00
SEMIVOLATILE ORGANICS DETECTED (ug/L)					
Naphthalene	*	*	< 10.00	*	*
m & p-Cresol(s)	*	*	< 10.00	*	*
TOTAL ORGANIC LEAD (mg/L)					
Total Organic Lead	< .010	< .004	*	*	*

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

TABLE B-2 (Continued-4)

MAVERIK-KIRTLAND WATER QUALITY

SAMPLE IDENTIFICATION	MW-14	MW-14
DATE SAMPLED	4-27-89	8-10-89
INORGANIC PARAMETERS (mg/L except as noted)		
Calcium (Ca)	*	*
Magnesium (Mg)	*	*
Sodium (Na)	*	*
Potassium (K)	*	*
Iron (Fe)	*	*
Manganese (Mn)	*	*
Ammonia (as N)	*	*
Chloride (Cl)	406.0	114.0
Sulfate (SO4)	3320.	1360.
Fluoride (F)	*	*
Nitrate and Nitrite (as N)	*	*
Total Alkalinity	*	*
Bicarbonate Alkalinity	*	*
Carbonate Alkalinity	*	*
Bicarbonate (HCO3)	*	*
Carbonate (CO3)	*	*
FIELD AND LABORATORY MEASUREMENTS		
Temperature (Degrees C)	16.2	*
Field pH	7.08	*
Lab pH (units)	*	*
Field Conductivity (umhos/cm	8000.0	*
Lab Conductivity (umhos/cm)	*	*
Total Dissolved Solids(mg/l)	6140.0	2560.0
VOLATILE ORGANICS DETECTED (ug/L)		
Benzene	< .50	< .50
Ethylbenzene	< .50	< .50
Toluene	1.10	< .50
m-Xylene	*	*
o,p-Xylene	*	*
Total Xylene	3.20	< 1.00
1,2 Dichloroethane	< 1.00	3.20
TOTAL ORGANIC LEAD (mg/L)		
Total Organic Lead	*	*

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

TABLE B-2 (Continued-5)

MAVERIK-KIRTLAND WATER QUALITY

SAMPLE IDENTIFICATION	MW-15	MW-15
DATE SAMPLED	4-27-89	8-10-89
INORGANIC PARAMETERS (mg/L except as noted)		
Calcium (Ca)	*	*
Magnesium (Mg)	*	*
Sodium (Na)	*	*
Potassium (K)	*	*
Iron (Fe)	*	*
Manganese (Mn)	*	*
Ammonia (as N)	*	*
Chloride (Cl)	178.0	139.0
Sulfate (SO4)	1220.	1030.
Fluoride (F)	*	*
Nitrate and Nitrite (as N)	*	*
Total Alkalinity	*	*
Bicarbonate Alkalinity	*	*
Carbonate Alkalinity	*	*
Bicarbonate (HCO3)	*	*
Carbonate (CO3)	*	*
FIELD AND LABORATORY MEASUREMENTS		
Temperature (Degrees C)	14.2	*
Field pH	6.45	*
Lab pH (units)	*	*
Field Conductivity (umhos/cm	3500.0	*
Lab Conductivity (umhos/cm)	*	*
Total Dissolved Solids(mg/l)	2360.0	1900.0
VOLATILE ORGANICS DETECTED (ug/L)		
Benzene	< .50	< .50
Ethylbenzene	< .50	< .50
Toluene	< .50	< .50
m-Xylene	*	*
o,p-Xylene	*	*
Total Xylene	< 1.00	< 1.00
1,2 Dichloroethane	< 1.00	< 1.00
TOTAL ORGANIC LEAD (mg/L)		
Total Organic Lead	*	*

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

TABLE B-2 (Continued-6)

MAVERIK-KIRTLAND SURFACE WATER

SAMPLE IDENTIFICATION		OSSW1
DATE SAMPLED		8-10-89
VOLATILE ORGANICS DETECTED (ug/L)		
Benzene	<	.50
Ethylbenzene	<	.50
Toluene	<	.50
Total Xylene	<	1.00
1,2 Dichloroethane		1.30

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

TABLE B-2 (Continued-7)

MAVERIK-KIRTLAND SURFACE WATER

SAMPLE IDENTIFICATION		OSSW2
DATE SAMPLED		8-10-89
VOLATILE ORGANICS DETECTED (ug/L)		
Benzene	<	.50
Ethylbenzene	<	.50
Toluene	<	.50
Total Xylene	<	1.00
1,2 Dichloroethane	<	1.00

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

TABLE B-2 (Continued-8)

MAVERIK-KIRTLAND SOIL CHEMISTRY

SAMPLE IDENTIFICATION	OSS1
DATE SAMPLED	8-10-89
VOLATILE ORGANICS DETECTED (ug/Kg)	
Benzene	< 50.
Ethylbenzene	< 50.
Toluene	< 50.
Total Xylenes	< 100.
TOTAL CHROMATOGRAPHABLE ORGANICS (ug/Kg)	
TCO	< 1700.

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

TABLE B-2 (Continued-9)

MAVERIK-KIRTLAND SOIL CHEMISTRY

SAMPLE IDENTIFICATION		OSS2
DATE SAMPLED		8-10-89
VOLATILE ORGANICS DETECTED (ug/Kg)		
Benzene	<	50.
Ethylbenzene	<	50.
Toluene	<	50.
Total Xylenes	<	100.
TOTAL CHROMATOGRAPHABLE ORGANICS (ug/Kg)		
TCO		2600.

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

TABLE B-2 (Continued-10)

MAVERIK-KIRTLAND SOIL CHEMISTRY

SAMPLE IDENTIFICATION	OSS3
DATE SAMPLED	8-10-89
VOLATILE ORGANICS DETECTED (ug/Kg)	
Benzene	< 50.
Ethylbenzene	< 50.
Toluene	< 50.
Total Xylenes	< 100.
TOTAL CHROMATOGRAPHABLE ORGANICS (ug/Kg)	
TCO	< 1700.

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

TABLE B-2 (Continued-11)

MAVERIK-KIRTLAND SOIL CHEMISTRY

SAMPLE IDENTIFICATION		OSS4
DATE SAMPLED		8-10-89
VOLATILE ORGANICS DETECTED (ug/Kg)		
Benzene	<	50.
Ethylbenzene	<	50.
Toluene	<	50.
Total Xylenes	<	100.
TOTAL CHROMATOGRAPHABLE ORGANICS (ug/Kg)		
TCO	<	1700.

<: Parameter value is less than given detection limits
*: Parameter was not analyzed.

TABLE B-2 (Continued-12)

MAVERIK-KIRTLAND SOIL CHEMISTRY

SAMPLE IDENTIFICATION		OSS5
DATE SAMPLED		8-10-89
VOLATILE ORGANICS DETECTED (ug/Kg)		
Benzene	<	50.
Ethylbenzene	<	50.
Toluene	<	50.
Total Xylenes	<	100.
TOTAL CHROMATOGRAPHABLE ORGANICS (ug/Kg)		
TCO		*

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

Rocky Mountain
Analytical Laboratory

Enseco

October 10, 1989

Mr. Pete Olsen
Dames & Moore
250 East Broadway
Suite 200
Salt Lake City, UT 84111

Dear Mr. Olsen:

Enclosed is the report for 11 samples we received at Enseco-Rocky Mountain Analytical Laboratory on August 11 and August 12, 1989.

Included with the report is a quality control summary.

Please call if you have any questions.

Sincerely,

Charlie D. Mamrak
Technical Manager

CDM/heg
Enclosures

RMAL #006113

Enseco Incorporated
4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Fax: 303/431-7171

I. OVERVIEW

On August 11 and August 12, 1989, Enseco-Rocky Mountain Analytical Laboratory received 11 samples from Dames & Moore.

This report presents the analytical results as well as supporting information to aid in the evaluation and interpretation of the data and is arranged in the following order:

I. Overview
II. Sample Description Information/Analytical Test Requests
III. Analytical Results
IV. Quality Control Report

Standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. All laboratory QC samples analyzed in conjunction with the samples in this project were within established control limits.

II. SAMPLE DESCRIPTION INFORMATION/ANALYTICAL TEST REQUESTS

Sample Description Information

The Sample Description Information lists all of the samples received in this project together with the internal laboratory identification number assigned for each sample. Each project received at Enseco - RMAL is assigned a unique six digit number. Samples within the project are numbered sequentially. The laboratory identification number is a combination of the six digit project code and the sample sequence number.

Also given in the Sample Description Information is the Sample Type (matrix), Date of Sampling (if known) and Date of Receipt at the laboratory.

Analytical Test Requests

The Analytical Test Requests lists the analyses that were performed on each sample. The Custom Test column indicates where tests have been modified to conform to the specific requirements of this project.

III. ANALYTICAL RESULTS

The analytical results for this project are presented in the following data tables. Each data table includes sample identification information, and when available and appropriate, dates sampled, received, authorized, prepared and analyzed. The authorization data is the date when the project was defined by the client such that laboratory work could begin. The date prepared is typically the date an extraction or digestion was initiated. For volatile organic compounds in water, the date prepared is the date the screening of the sample was performed.

Data sheets contain a listing of the parameters measured in each test, the analytical results and the Enseco reporting limit. Reporting limits are adjusted to reflect dilution of the sample, when appropriate. Solid and waste samples are reported on an "as received" basis, i.e. no correction is made for moisture content.

Enseco-RMAL is no longer routinely blank-correcting analytical data. Uncorrected analytical results are reported, along with associated blank results, for all organic and metals analyses. Analytical results and blank results are reported for conventional inorganic parameters as specified in the method. This policy is described in detail in the Enseco Incorporated Quality Assurance Program Plan for Environmental Chemical Monitoring, Revision 3.3, April, 1989.

In addition, surrogate recovery data is presented for all GC/MS analyses. The surrogate recovery is an indication of the affect of the sample matrix on the performance of the method. The results from the Standard Enseco QA/QC Program, which generates data which are independent of matrix effects, is given in Section IV.

The analytical data reported are subject to the following limitations of the analytical methodology:

Chromatography

Methods 601 and 8010

a) Dichlorodifluoromethane (Freon 12) and vinyl chloride coelute under the specified analytical conditions. All data are reported as a combined value for the two compounds.

b) Dibromochloromethane, cis-1,3-dichloropropene and 1,1,2-trichloroethane are unresolved. The three compounds are reported as a single combined value.

c) Tetrachloroethene and 1,1,2,2-tetrachloroethane coelute and are reported as a combined result.

Total Chromatographable Organics

Total Chromatographable Organics (TCO) were determined from a methylene chloride extraction and subsequent analysis by capillary column gas chromatography with a flame ionization detector (GC/FID). The TCO result was based on the entire area under the chromatogram as compared to the response to eicosane. The detection limit is based on the response of diesel.

The pattern of the FID chromatogram (fingerprint) was compared to fingerprints of various petroleum products. If, on the judgement of the analyst, the fingerprint of the sample matched the fingerprint of a petroleum product, the concentration of the product was also reported. If components of a particular product were present, but the complexity of the overall chromatogram was such that it could not be reliably determined if the product was or was not present, then, the result for that product contains the following statement: "Primary components of this product were detected in the sample. Due to the overall complexity of the chromatogram, reliable identification of this product cannot be achieved."

In addition to reporting a TCO value, the results contain boiling point information. This boiling point range represents the range of 80 to 90 percent of the compounds detected in the sample.

ANALYTICAL TEST REQUESTS
for
Dames and Moore

Lab ID: 006113	Group Code	Analysis Description	Custom Test?
0001 - 0004	A	Benzene, Toluene, Ethyl Benzene and Xylenes (BTX)	N
		Total Petroleum Hydrocarbons (TPH)	N
		Prep - Hydrocarbons by GC	N
0006 - 0008, 0011 - 0012	B	Halogenated Volatile Organics	N
		Aromatic Volatile Organics	N
		Total Dissolved Solids (TDS)	N
		Sulfate, Ion Chromatography	N
		Chloride, Ion Chromatography	N
0009 - 0010	C	Halogenated Volatile Organics	N
		Aromatic Volatile Organics	N
0005	D	Benzene, Toluene, Ethyl Benzene and Xylenes (BTX)	N

SAMPLE DESCRIPTION INFORMATION
for
Dames and Moore

Lab ID	Client ID	Matrix	Sampled Date	Sampled Time	Received Date
006113-0001-SA	OSS1	SOIL	10 AUG 89	09:00	11 AUG 89
006113-0002-SA	OSS2	SOIL	09 AUG 89	14:00	11 AUG 89
006113-0003-SA	OSS3	SOIL	09 AUG 89	14:30	11 AUG 89
006113-0004-SA	OSS4	SOIL	09 AUG 89	15:00	11 AUG 89
006113-0005-SA	OSS5	SOIL	09 AUG 89	13:00	11 AUG 89
006113-0006-SA	MW15	AQUEOUS	10 AUG 89	11:00	11 AUG 89
006113-0007-SA	MW14	AQUEOUS	10 AUG 89	11:30	11 AUG 89
006113-0008-SA	MW9	AQUEOUS	10 AUG 89	12:00	11 AUG 89
006113-0009-SA	OSSW2	AQUEOUS	10 AUG 89	12:20	11 AUG 89
006113-0010-SA	OSSW1	AQUEOUS	10 AUG 89	12:40	11 AUG 89
006113-0011-SA	MW10	AQUEOUS	10 AUG 89	13:20	11 AUG 89
006113-0012-SA	MW13	AQUEOUS	10 AUG 89	17:00	12 AUG 89

Rocky Mountain
Analytical Laboratory

Enseco

ANALYTICAL RESULTS

FOR

DAMES & MOORE

ENSECO-RMAL NO. 006113

OCTOBER 10, 1989

Reviewed by: _____
Charlie D. Mamrak

Enseco Incorporated
4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Fax: 303/431-7171

Enseco

Benzene, Toluene, Ethyl Benzene and Xylenes (BTX)

Method 8020

Client Name: Dames and Moore
Client ID: OSS1
Lab ID: 006113-0001-SA Enseco ID: 1048580
Matrix: SOIL Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Wet wt. Units	Reporting Limit
Benzene	ND	ug/kg	50
Toluene	ND	ug/kg	50
Ethyl benzene	ND	ug/kg	50
Total xylenes	ND	ug/kg	100

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

ANALYTICAL RESULTS FOR TOTAL CHROMATOGRAPHABLE ORGANICS

Client Name: Dames & Moore
Client ID: OSS1
Laboratory ID: 006113-0001-SA Enseco ID: 1048580
Matrix: Soil Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Analyzed: 11 SEP 89

	Value	Units	Detection Limit
Total Chromatographable Organics	ND	ug/kg	1700
Initial Boiling Point*	-	°C	-
Final Boiling Point*	-	°C	-
Gasoline	ND	ug/kg	17000
Jet Fuel	ND	ug/kg	17000
Kerosene	ND	ug/kg	17000
Diesel	ND	ug/kg	17000
Motor Oil	ND	ug/kg	170000

* The initial and final boiling points define the range of compounds detected. The method is capable of detecting compounds between 100°C and 470°C.

** Primary components of this product were detected in the sample. Due to the overall complexity of the chromatogram, reliable identification of this product cannot be achieved.

Enseco

Benzene, Toluene, Ethyl Benzene and Xylenes (BTX)

Method 8020

Client Name: Dames and Moore
Client ID: OSS2
Lab ID: 006113-0002-SA Enseco ID: 1048581
Matrix: SOIL Sampled: 09 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Wet wt. Units	Reporting Limit
Benzene	ND	ug/kg	50
Toluene	ND	ug/kg	50
Ethyl benzene	ND	ug/kg	50
Total xylenes	ND	ug/kg	100

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

ANALYTICAL RESULTS FOR TOTAL CHROMATOGRAPHABLE ORGANICS

Client Name: Dames & Moore
Client ID: OSS2
Laboratory ID: 006113-0002-SA Enseco ID: 1048581
Matrix: Soil Sampled: 09 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Analyzed: 11 SEP 89

	Value	Units	Detection Limit
Total Chromatographable Organics	2600	ug/kg	1700
Initial Boiling Point*	150	°C	-
Final Boiling Point*	150	°C	-
Gasoline	ND	ug/kg	17000
Jet Fuel	ND	ug/kg	17000
Kerosene	ND	ug/kg	17000
Diesel	ND	ug/kg	17000
Motor Oil	ND	ug/kg	170000

* The initial and final boiling points define the range of compounds detected. The method is capable of detecting compounds between 100°C and 470°C.

** Primary components of this product were detected in the sample. Due to the overall complexity of the chromatogram, reliable identification of this product cannot be achieved.

Enseco

Benzene, Toluene, Ethyl Benzene and Xylenes (BTX)

Method 8020

Client Name: Dames and Moore
Client ID: OSS3
Lab ID: 006113-0003-SA Enseco ID: 1048582
Matrix: SOIL Sampled: 09 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Wet wt. Units	Reporting Limit
Benzene	ND	ug/kg	50
Toluene	ND	ug/kg	50
Ethyl benzene	ND	ug/kg	50
Total xylenes	ND	ug/kg	100

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

ANALYTICAL RESULTS FOR TOTAL CHROMATOGRAPHABLE ORGANICS

Client Name: Dames & Moore
Client ID: OSS3
Laboratory ID: 006113-0003-SA Enseco ID: 1048582
Matrix: Soil Sampled: 09 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Analyzed: 11 SEP 89

	Value	Units	Detection Limit
Total Chromatographable Organics	ND	ug/kg	1700
Initial Boiling Point*	-	°C	-
Final Boiling Point*	-	°C	-
Gasoline	ND	ug/kg	17000
Jet Fuel	ND	ug/kg	17000
Kerosene	ND	ug/kg	17000
Diesel	ND	ug/kg	17000
Motor Oil	ND	ug/kg	170000

* The initial and final boiling points define the range of compounds detected. The method is capable of detecting compounds between 100°C and 470°C.

** Primary components of this product were detected in the sample. Due to the overall complexity of the chromatogram, reliable identification of this product cannot be achieved.

Enseco

Benzene, Toluene, Ethyl Benzene and Xylenes (BTX)

Method 8020

Client Name: Dames and Moore
Client ID: OSS4
Lab ID: 006113-0004-SA Enseco ID: 1048583
Matrix: SOIL Sampled: 09 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 22 AUG 89

Parameter	Result	Wet wt. Units	Reporting Limit
Benzene	ND	ug/kg	50
Toluene	ND	ug/kg	50
Ethyl benzene	ND	ug/kg	50
Total xylenes	ND	ug/kg	100

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

ANALYTICAL RESULTS FOR TOTAL CHROMATOGRAPHABLE ORGANICS

Client Name: Dames & Moore
Client ID: OSS4
Laboratory ID: 006113-0004-SA Enseco ID: 1048583
Matrix: Soil Sampled: 09 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Analyzed: 11 SEP 89

	Value	Units	Detection Limit
Total Chromatographable Organics	ND	ug/kg	1700
Initial Boiling Point*	-	°C	-
Final Boiling Point*	-	°C	-
Gasoline	ND	ug/kg	17000
Jet Fuel	ND	ug/kg	17000
Kerosene	ND	ug/kg	17000
Diesel	ND	ug/kg	17000
Motor Oil	ND	ug/kg	170000

* The initial and final boiling points define the range of compounds detected. The method is capable of detecting compounds between 100°C and 470°C.

** Primary components of this product were detected in the sample. Due to the overall complexity of the chromatogram, reliable identification of this product cannot be achieved.

Enseco

Benzene, Toluene, Ethyl Benzene and Xylenes (BTX)

Method 8020

Client Name: Dames and Moore
Client ID: OSS5
Lab ID: 006113-0005-SA Enseco ID: 1048584
Matrix: SOIL Sampled: 09 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 22 AUG 89

Parameter	Result	Wet wt. Units	Reporting Limit
Benzene	ND	ug/kg	50
Toluene	ND	ug/kg	50
Ethyl benzene	ND	ug/kg	50
Total xylenes	ND	ug/kg	100

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW15
Lab ID: 006113-0006-SA Enseco ID: 1048586
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethyl benzene	ND	ug/L	0.50
Total xylenes	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	0.50
1,4-Dichlorobenzene	ND	ug/L	0.50
1,2-Dichlorobenzene	ND	ug/L	0.50

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Halogenated Volatile Organics

Enseco

Method 601

id Moore

006-SA Enseco ID: 1048586
Sampled: 10 AUG 89 Received: 11 AUG 89
9 Prepared: NA Analyzed: 21 AUG 89

	Result	Units	Reporting Limit
	ND	ug/L	5.0
	ND	ug/L	5.0
	ND	ug/L	1.0
	ND	ug/L	5.0
	ND	ug/L	5.0
	ND	ug/L	0.50
	ND	ug/L	0.50
	ND	ug/L	0.50
	ND	ug/L	0.50
	ND	ug/L	1.0
	ND	ug/L	1.0
	ND	ug/L	0.50
	ND	ug/L	0.50
	ND	ug/L	1.0
	ND	ug/L	1.0
ene	ND	ug/L	1.0
	ND	ug/L	0.50
	ND	ug/L	1.0
e	ND	ug/L	2.0
	ND	ug/L	1.0
)	ND	ug/L	2.0
	ND	ug/L	5.0
ane	ND	ug/L	1.0
	ND	ug/L	0.50
	ND	ug/L	2.0

ullivan Approved By: Barbara Sullivan

Enseco

General Inorganics

Client Name: Dames and Moore
Client ID: MW15
Lab ID: 006113-0006-SA Enseco ID: 1048586
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	139	mg/L	3	300.0	NA	06 SEP 89
Sulfate	1030	mg/L	5	300.0	NA	06 SEP 89
Total Dissolved Solids	1900	mg/L	10	160.1	NA	15 AUG 89

N.D. = Not Detected
N.A. = Not Applicable

Reported By: Jennifer Franzen Approved By: Tammy Bailey

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW14
Lab ID: 006113-0007-SA Enseco ID: 1048587
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethyl benzene	ND	ug/L	0.50
Total xylenes	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	0.50
1,4-Dichlorobenzene	ND	ug/L	0.50
1,2-Dichlorobenzene	ND	ug/L	0.50

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW15
Lab ID: 006113-0006-SA Enseco ID: 1048586
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
1,2-Dichloroethene (cis/trans)	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2-Trichloro-2,2, 1-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Chlorodibromomethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW14
Lab ID: 006113-0007-SA Enseco ID: 1048587
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
1,2-Dichloroethene (cis/trans)	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2-Trichloro-2,2, 1-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	3.2	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Chlorodibromomethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

General Inorganics

Client Name: Dames and Moore
Client ID: MW14
Lab ID: 006113-0007-SA Enseco ID: 1048587
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	114	mg/L	3	300.0	NA	06 SEP 89
Sulfate	1360	mg/L	5	300.0	NA	06 SEP 89
Total Dissolved Solids	2560	mg/L	10	160.1	NA	15 AUG 89

N.D. = Not Detected
N.A. = Not Applicable

Reported By: Jennifer Franzen Approved By: Tammy Bailey

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW9
Lab ID: 006113-0008-SA Enseco ID: 1048588
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethyl benzene	ND	ug/L	0.50
Total xylenes	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	0.50
1,4-Dichlorobenzene	ND	ug/L	0.50
1,2-Dichlorobenzene	ND	ug/L	0.50

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW9
Lab ID: 006113-0008-SA Enseco ID: 1048588
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
1,2-Dichloroethene (cis/trans)	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2-Trichloro-2,2, 1-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	3.4	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Chlorodibromomethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

General Inorganics

Client Name: Dames and Moore
Client ID: MW9
Lab ID: 006113-0008-SA Enseco ID: 1048588
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	37	mg/L	3	300.0	NA	06 SEP 89
Sulfate	624	mg/L	5	300.0	NA	06 SEP 89
Total Dissolved Solids	1200	mg/L	10	160.1	NA	15 AUG 89

N.D. = Not Detected
N.A. = Not Applicable

Reported By: Jennifer Franzen Approved By: Tammy Bailey

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: OSSW2
Lab ID: 006113-0009-SA Enseco ID: 1048589
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethyl benzene	ND	ug/L	0.50
Total xylenes	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	0.50
1,4-Dichlorobenzene	ND	ug/L	0.50
1,2-Dichlorobenzene	ND	ug/L	0.50

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: OSSW2
Lab ID: 006113-0009-SA Enseco ID: 1048589
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
1,2-Dichloroethene (cis/trans)	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2-Trichloro-2,2, 1-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Chlorodibromomethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: OSSW1
Lab ID: 006113-0010-SA Enseco ID: 1048590
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethyl benzene	ND	ug/L	0.50
Total xylenes	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	0.50
1,4-Dichlorobenzene	ND	ug/L	0.50
1,2-Dichlorobenzene	ND	ug/L	0.50

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: OSSW1
Lab ID: 006113-0010-SA Enseco ID: 1048590
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
1,2-Dichloroethene (cis/trans)	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2-Trichloro-2,2, 1-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	1.3	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Chlorodibromomethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW10
Lab ID: 006113-0011-SA Enseco ID: 1048591
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethyl benzene	ND	ug/L	0.50
Total xylenes	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	0.50
1,4-Dichlorobenzene	ND	ug/L	0.50
1,2-Dichlorobenzene	ND	ug/L	0.50

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW10
Lab ID: 006113-0011-SA Enseco ID: 1048591
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
1,2-Dichloroethene (cis/trans)	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2-Trichloro-2,2, 1-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	1.6	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Chlorodibromomethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

General Inorganics

Client Name: Dames and Moore
Client ID: MW10
Lab ID: 006113-0011-SA Enseco ID: 1048591
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 11 AUG 89
Authorized: 11 AUG 89 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	45	mg/L	3	300.0	NA	06 SEP 89
Sulfate	470	mg/L	5	300.0	NA	06 SEP 89
Total Dissolved Solids	990	mg/L	10	160.1	NA	15 AUG 89

N.D. = Not Detected
N.A. = Not Applicable

Reported By: Jennifer Franzen Approved By: Tammy Bailey

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW13
Lab ID: 006113-0012-SA Enseco ID: 1048620
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 12 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethyl benzene	ND	ug/L	0.50
Total xylenes	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	0.50
1,4-Dichlorobenzene	ND	ug/L	0.50
1,2-Dichlorobenzene	ND	ug/L	0.50

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW13
Lab ID: 006113-0012-SA Enseco ID: 1048620
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 12 AUG 89
Authorized: 11 AUG 89 Prepared: NA Analyzed: 21 AUG 89

Parameter	Result	Units	Reporting Limit
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
1,2-Dichloroethene (cis/trans)	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2-Trichloro-2,2, 1-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	6.0	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Chlorodibromomethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0

N.D. = Not Detected
N.A. = Not Applicable

Reported By: William Sullivan Approved By: Barbara Sullivan

Enseco

General Inorganics

Client Name: Dames and Moore
Client ID: MW13
Lab ID: 006113-0012-SA Enseco ID: 1048620
Matrix: AQUEOUS Sampled: 10 AUG 89 Received: 12 AUG 89
Authorized: 11 AUG 89 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	78	mg/L	3	300.0	NA	06 SEP 89
Sulfate	1350	mg/L	5	300.0	NA	06 SEP 89
Total Dissolved Solids	2660	mg/L	10	160.1	NA	15 AUG 89

N.D. = Not Detected
N.A. = Not Applicable

Reported By: Jennifer Franzen Approved By: Tammy Bailey

IV. QUALITY CONTROL REPORT

The Enseco laboratories operate under a vigorous QA/QC program designed to ensure the generation of scientifically valid, legally defensible data by monitoring every aspect of laboratory operations. Routine QA/QC procedures include the use of approved methodologies, independent verification of analytical standards, use of duplicate Laboratory Control Samples to assess the precision and accuracy of the methodology on a routine basis, and a rigorous system of data review.

In addition, the Enseco laboratories maintain a comprehensive set of certifications from both state and federal governmental agencies which require frequent analyses of blind audit samples. Enseco - Rocky Mountain Analytical Laboratory is certified by the EPA under the EPA/CLP program for both Organic and Inorganic analyses, under the USATHAMA (U.S. Army) program, by the Army Corps of Engineers, and the states of Colorado, New Jersey, New York, Utah, and Florida, among others.

The standard laboratory QC package is designed to:

1) establish a strong, cost-effective QC program that ensures the generation of scientifically valid, legally defensible data

2) assess the laboratory's performance of the analytical method using control limits generated with a well-defined matrix

3) establish clear-cut guidelines for acceptability of analytical data so that QC decisions can be made immediately at the bench, and

4) provide a standard set of reportables which assures the client of the quality of his data.

The Enseco QC program is based upon monitoring the precision and accuracy of an analytical method by analyzing a set of Duplicate Control Samples (DCS) at frequent, well-defined intervals. Each DCS is a well-characterized matrix which is spiked with target compounds at 5-100 times the reporting limit, depending upon the methodology being monitored. The purpose of the DCS is not to duplicate the sample matrix, but rather to provide an interference-free, homogeneous matrix from which to gather data to establish control limits. These limits are used to determine whether data generated by the laboratory on any given day is in control.

Control limits for accuracy (percent recovery) are based on the average, historical percent recovery +/- 3 standard deviation units. Control limits for precision (relative percent difference) range from 0 (identical duplicate DCS results) to the average, historical relative percent difference + 3 standard deviation units. These control limits are fairly narrow based on the consistency of the matrix being monitored and are updated on a quarterly basis.

For each batch of samples analyzed, an additional control measure is taken in the form of a Single Control Sample (SCS). The SCS consists of a control matrix that is spiked with surrogate compounds appropriate to the method being used. In cases where no surrogate is available, (e.g., metals or conventional analyses) a single DCS serves as the control sample. An SCS is prepared for each sample lot for which the DCS pair are not analyzed. The recovery of the SCS is charted in exactly the same manner as described for the DCS, and provides a daily check on the performance of the method.

Accuracy for DCS and SCS is measured by Percent Recovery.

$$\% \text{ Recovery} = \frac{\text{Measured Concentration}}{\text{Actual Concentration}} \times 100$$

Precision for DCS is measured by Relative Percent Difference (RPD).

$$\text{RPD} = \frac{|\ \text{Measured Concentration DCS1} - \text{Measured Concentration DCS2}\ |}{(\text{Measured Concentration DCS1} + \text{Measured Concentration DCS2})/2} \times 100$$

All samples analyzed concurrently by the same test are assigned the same QC lot number. Projects which contain numerous samples, analyzed over several days, may have multiple QC lot numbers associated with each test. The QC information which follows includes a listing of the QC lot numbers associated with each of the samples reported, DCS and SCS (where applicable) recoveries from the QC lots associated with the samples, and control limits for these lots. The QC data is reported by test code, in the order that the tests are reported in the analytical results section of this report.

QC LOT ASSIGNMENT REPORT
Volatile Organics by GC

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
006113-0001-SA	SOIL	8020-S	21 AUG 89-H	21 AUG 89-H
006113-0002-SA	SOIL	8020-S	21 AUG 89-H	21 AUG 89-H
006113-0003-SA	SOIL	8020-S	21 AUG 89-H	21 AUG 89-H
006113-0004-SA	SOIL	8020-S	21 AUG 89-H	21 AUG 89-H
006113-0005-SA	SOIL	8020-S	21 AUG 89-H	21 AUG 89-H
006113-0006-SA	AQUEOUS	601-A	21 AUG 89-P	21 AUG 89-P
006113-0006-SA	AQUEOUS	602-A	21 AUG 89-P	21 AUG 89-P
006113-0007-SA	AQUEOUS	601-A	21 AUG 89-P	21 AUG 89-P
006113-0007-SA	AQUEOUS	602-A	21 AUG 89-P	21 AUG 89-P
006113-0008-SA	AQUEOUS	601-A	21 AUG 89-P	21 AUG 89-P
006113-0008-SA	AQUEOUS	602-A	21 AUG 89-P	21 AUG 89-P
006113-0009-SA	AQUEOUS	601-A	21 AUG 89-P	21 AUG 89-P
006113-0009-SA	AQUEOUS	602-A	21 AUG 89-P	21 AUG 89-P
006113-0010-SA	AQUEOUS	601-A	21 AUG 89-P	21 AUG 89-P
006113-0010-SA	AQUEOUS	602-A	21 AUG 89-P	21 AUG 89-P
006113-0011-SA	AQUEOUS	601-A	21 AUG 89-P	21 AUG 89-P
006113-0011-SA	AQUEOUS	602-A	21 AUG 89-P	21 AUG 89-P
006113-0012-SA	AQUEOUS	601-A	21 AUG 89-P	21 AUG 89-P
006113-0012-SA	AQUEOUS	602-A	21 AUG 89-P	21 AUG 89-P

DUPLICATE CONTROL SAMPLE REPORT
Volatile Organics by GC

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	Measured AVG	Accuracy Average(%) DCS	Accuracy Average(%) Limits	Precision (RPD) DCS	Precision (RPD) Limit
Category: 8020-S Matrix: SOIL QC Lot: 21 AUG 89-H Concentration Units: ug/kg								
Benzene	500	455	444	450	90	77-123	2.4	20
Toluene	500	466	455	460	92	77-123	2.4	20
Chlorobenzene	500	504	493	498	100	77-123	2.2	20
Ethyl benzene	500	489	476	482	97	77-123	2.7	20
Total xylenes	500	494	483	488	98	77-123	2.3	20
1,3-Dichlorobenzene	500	518	511	514	103	77-123	1.4	20
Category: 601-A Matrix: AQUEOUS QC Lot: 21 AUG 89-P Concentration Units: ug/L								
1,1-Dichloroethane	5.0	4.57	4.54	4.56	91	80-130	0.7	20
Chloroform	5.0	4.22	4.10	4.16	83	80-120	2.9	20
Bromodichloromethane	10	6.72	6.75	6.74	67	80-120	0.4	20
Trichloroethene	5.0	3.83	3.86	3.84	77	70-120	0.8	20
Chlorobenzene	5.0	5.05	4.85	4.95	99	80-120	4.0	20
Category: 602-A Matrix: AQUEOUS QC Lot: 21 AUG 89-P Concentration Units: ug/L								
Benzene	5.0	5.08	5.18	5.13	103	75-115	1.9	20
Toluene	5.0	5.17	5.39	5.28	106	75-115	4.2	20
Chlorobenzene	5.0	5.40	5.57	5.48	110	75-115	3.1	20
Ethyl benzene	5.0	5.99	5.58	5.78	116	75-115	7.1	20
Total xylenes	5.0	4.59	4.78	4.68	94	75-115	4.1	20
1,3-Dichlorobenzene	5.0	5.68	5.65	5.66	113	75-115	0.5	20

Calculations are performed before rounding to avoid round-off errors in calculated results.

SINGLE CONTROL SAMPLE REPORT
Volatile Organics by GC

Analyte	Concentration Spiked	Concentration Measured	Accuracy(%) SCS	Accuracy(%) Limits
Category: 8020-S				
Matrix: SOIL				
QC Lot: 21 AUG 89-H QC Run: 21 AUG 89-H				
Concentration Units: ug/kg				
a,a,a-Trifluorotoluene	500	596	119	20-160
Category: 601-A				
Matrix: AQUEOUS				
QC Lot: 21 AUG 89-P QC Run: 21 AUG 89-P				
Concentration Units: ug/L				
Bromochloromethane	30.0	25.8	86	20-160
Category: 602-A				
Matrix: AQUEOUS				
QC Lot: 21 AUG 89-P QC Run: 21 AUG 89-P				
Concentration Units: ug/L				
a,a,a-Trifluorotoluene	30.0	32.4	108	20-160

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT
Volatile Organics by GC

Analyte	Result	Units	Reporting Limit
Test: 8020-BTEX-			
Matrix: SOIL			
QC Lot: 21 AUG 89-H QC Run: 21 AUG 89-H			
Benzene	ND	ug/kg	50
Toluene	ND	ug/kg	50
Ethyl benzene	ND	ug/kg	50
Total xylenes	ND	ug/kg	100
Test: 8020-BTEX-			
Matrix: SOIL			
QC Lot: 21 AUG 89-H QC Run: 21 AUG 89-H			
Benzene	ND	ug/kg	50
Toluene	ND	ug/kg	50
Ethyl benzene	ND	ug/kg	50
Total xylenes	ND	ug/kg	100
Test: 601-A			
Matrix: AQUEOUS			
QC Lot: 21 AUG 89-P QC Run: 21 AUG 89-P			
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
1,2-Dichloroethene (cis/trans)	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2-Trichloro-2,2, 1-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Chlorodibromomethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0

METHOD BLANK REPORT
Volatile Organics by GC (cont.)

Analyte	Result	Units	Reporting Limit
Test: 601-A Matrix: AQUEOUS QC Lot: 21 AUG 89-P QC Run: 21 AUG 89-P			
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0
Test: 602-AP Matrix: AQUEOUS QC Lot: 21 AUG 89-P QC Run: 21 AUG 89-P			
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethyl benzene	ND	ug/L	0.50
Total xylenes	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	0.50
1,4-Dichlorobenzene	ND	ug/L	0.50
1,2-Dichlorobenzene	ND	ug/L	0.50
Test: 601-A Matrix: AQUEOUS QC Lot: 21 AUG 89-P QC Run: 21 AUG 89-P			
Chloromethane	ND	ug/L	5.0
Bromomethane	ND	ug/L	5.0
Vinyl chloride	ND	ug/L	1.0
Chloroethane	ND	ug/L	5.0
Methylene chloride	ND	ug/L	5.0
1,1-Dichloroethene	ND	ug/L	0.50
1,1-Dichloroethane	ND	ug/L	0.50
1,2-Dichloroethene (cis/trans)	ND	ug/L	0.50
Chloroform	ND	ug/L	0.50
1,1,2-Trichloro-2,2, 1-trifluoroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	0.50
Carbon tetrachloride	ND	ug/L	0.50

METHOD BLANK REPORT
Volatile Organics by GC (cont.)

Analyte	Result	Units	Reporting Limit
Test: 601-A			
Matrix: AQUEOUS			
QC Lot: 21 AUG 89-P QC Run: 21 AUG 89-P			
Bromodichloromethane	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Trichloroethene	ND	ug/L	0.50
Chlorodibromomethane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	2.0
1,1,2-Trichloroethane	ND	ug/L	1.0
EDB (1,2-Dibromoethane)	ND	ug/L	2.0
Bromoform	ND	ug/L	5.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	2.0
Test: 602-AP			
Matrix: AQUEOUS			
QC Lot: 21 AUG 89-P QC Run: 21 AUG 89-P			
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethyl benzene	ND	ug/L	0.50
Total xylenes	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	0.50
1,4-Dichlorobenzene	ND	ug/L	0.50
1,2-Dichlorobenzene	ND	ug/L	0.50

QC LOT ASSIGNMENT REPORT
Wet Chemistry Analysis and Preparation

Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK)
006113-0006-SA	AQUEOUS	TDS-A	15 AUG 89-A	15 AUG 89-A
006113-0006-SA	AQUEOUS	SO4-IC-A	06 SEP 89-A	
006113-0006-SA	AQUEOUS	CL-IC-A	06 SEP 89-A	
006113-0007-SA	AQUEOUS	TDS-A	15 AUG 89-A	15 AUG 89-A
006113-0007-SA	AQUEOUS	SO4-IC-A	06 SEP 89-A	
006113-0007-SA	AQUEOUS	CL-IC-A	06 SEP 89-A	
006113-0008-SA	AQUEOUS	TDS-A	15 AUG 89-A	15 AUG 89-A
006113-0008-SA	AQUEOUS	SO4-IC-A	06 SEP 89-A	
006113-0008-SA	AQUEOUS	CL-IC-A	06 SEP 89-A	
006113-0011-SA	AQUEOUS	TDS-A	15 AUG 89-A	15 AUG 89-A
006113-0011-SA	AQUEOUS	SO4-IC-A	06 SEP 89-A	
006113-0011-SA	AQUEOUS	CL-IC-A	06 SEP 89-A	
006113-0012-SA	AQUEOUS	TDS-A	15 AUG 89-A	15 AUG 89-A
006113-0012-SA	AQUEOUS	SO4-IC-A	06 SEP 89-B	
006113-0012-SA	AQUEOUS	CL-IC-A	06 SEP 89-B	

DUPLICATE CONTROL SAMPLE REPORT
Wet Chemistry Analysis and Preparation

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	Measured AVG	Accuracy Average(%) DCS	Accuracy Limits	Precision (RPD) DCS	Precision Limit
Category: TDS-A Matrix: AQUEOUS QC Lot: 15 AUG 89-A Concentration Units: mg/L								
Total Dissolved Solids	1070	1020	1020	1020	95	90-110	0.0	10
Category: SO4-IC-A Matrix: AQUEOUS QC Lot: 06 SEP 89-A Concentration Units: mg/L								
Sulfate	200	202	210	206	103	75-125	3.9	20
Category: CL-IC-A Matrix: AQUEOUS QC Lot: 06 SEP 89-A Concentration Units: mg/L								
Chloride	100	99.4	103	101	101	75-125	3.6	20
Category: SO4-IC-A Matrix: AQUEOUS QC Lot: 06 SEP 89-B Concentration Units: mg/L								
Sulfate	200	201	203	202	101	75-125	1.0	20
Category: CL-IC-A Matrix: AQUEOUS QC Lot: 06 SEP 89-B Concentration Units: mg/L								
Chloride	100	97.5	98.0	97.8	98	75-125	0.5	20

Calculations are performed before rounding to avoid round-off errors in calculated results.

METHOD BLANK REPORT
Wet Chemistry Analysis and Preparation

Analyte	Result	Units	Reporting Limit
Test: TDS-BAL-A			
Matrix: AQUEOUS			
QC Lot: 15 AUG 89-A QC Run: 15 AUG 89-A			
Total Dissolved Solids	ND	mg/L	10

Rocky Mountain Analytical Laboratory
4955 Yarrow Street, Arvada, CO 80002 (303) 421-6611

A DIVISION OF
ENSECO
INCORPORATED

08/12/89

Peter Olsen
Dames and Moore
Suite 200
250 East Broadway
Salt Lake City, UT 84111

Dear Dr. Olsen:

This is to acknowledge that we received your 12 samples at our laboratory. They have been assigned our lab project number 006113. Enclosed is a sample description form indicating our sample numbers and your corresponding identifications and a copy of the Chain of Custody. In addition to the sample descriptions, this form also provides you with sample disposition information.

As a service to you, Enseco Incorporated will dispose of and/or store samples as designated by you for a nominal fee; or, return the sample to you at no charge.

A Final Disposition Form will accompany the final report which will reflect the current disposition status of the samples. A change in sample disposition status can be made on this form and mailed back to Enseco within thirty (30) days. A sample disposition status of "PENDING" requires you to select a sample disposition option of either STORE, DISPOSE, or RETURN within thirty (30) days or the samples will be shipped back to your report mailing address.

If you have any questions regarding your project or need additional sample bottles please contact me.

Sincerely,

Jeanne Howbert
Project Coordinator

Rocky Mountain Analytical Lab

08/12/89

SAMPLE DESCRIPTION INFORMATION

for

Dames and Moore

RMA Sample No.	Sample Description	Sample Type	Date Sampled	Date Received	Sample Disposal
*006113-0001-SA	OSS1	SOIL	08/10/89	08/11/89	PENDING
*006113-0002-SA	OSS2	SOIL	08/09/89	08/11/89	PENDING
*006113-0003-SA	OSS3	SOIL	08/09/89	08/11/89	PENDING
*006113-0004-SA	OSS4	SOIL	08/09/89	08/11/89	PENDING
*006113-0005-SA	OSS5	SOIL	08/09/89	08/11/89	PENDING
*006113-0006-SA	MW15	AQUEOUS	08/10/89	08/11/89	PENDING
*006113-0007-SA	MW14	AQUEOUS	08/10/89	08/11/89	PENDING
*006113-0008-SA	MW9	AQUEOUS	08/10/89	08/11/89	PENDING
*006113-0009-SA	OSSW2	AQUEOUS	08/10/89	08/11/89	PENDING
*006113-0010-SA	OSSW1	AQUEOUS	08/10/89	08/11/89	PENDING
*006113-0011-SA	MW10	AQUEOUS	08/10/89	08/11/89	PENDING
*006113-0012-SA	MW13	AQUEOUS	08/10/89	08/12/89	PENDING

* = Receipt of this new sample is acknowledged by this letter

Enseco - Rocky Mountain Analytical

4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Facsimile: 303/431-7171

Attn: Jeannie Hauthart

CHAIN OF CUSTODY

No.

Enseco Client: Damas & Moore/MAVERIK
Project: 14819 005 5302
Sampling Co.: Damas & Moore
Sampling Site: Kirtland, New Mexico
Team Leader: Terry Vandall

SAMPLE SAFE™ CONDITIONS

1. Packed by: TDVandall Seal #
2. Seal Intact Upon Receipt by Sampling Co.: (Yes) No
3. Condition of Contents: OK
4. Sealed for Shipping by: ENSECO
5. Initial Contents Temp.: 4 °C Seal #
6. Sampling Status: Done Continuing Until 8-11-89
7. Seal Intact Upon Receipt by Laboratory: (Yes) No
8. Contents Temperature Upon Receipt by Lab: 16 °C
9. Condition of Contents:

	Date	Time	Sample ID/Description	Sample Type	No. Containers	Analysis Parameters	Remarks
6113			All Soils				
01	8-10-89	9:00 Am	0552/V. Murray E-W Ditch, Hwy 489, E. End	Soil	1	BTEX, TCO	
02	8-9-89	2:00 pm	0552/V. Murray E-W Ditch, Hwy 489, W. End	Soil	1	BTEX, TCO	
03	8-9-89	2:30 pm	0553/V. Murray N-S Dith, S. End	Soil	1	BTEX, TCO	
04	8-9-89	3:00 pm	0554/V. Murray's E-W Ditch, East End	Soil	1	BTEX, TCO	
05	8-9-89	1:00 pm	0555/Refinery South Sample at Seep	Soil	1	BTEX	

CUSTODY TRANSFERS PRIOR TO SHIPPING

	Relinquished by: (signed)	Received by: (signed)	Date	Time
1	TDVandell	FedEXpress	8-10-89	4:00PM
2				
3				

SHIPPING DETAILS

Delivered to Shipper by: TDVandell
Method of Shipment: Fed Xpress Airbill #
Received for Lab: RMac Signed: Date/Time 8-11-89 0800
Enseco Project No. 6113

White and Pink Copies to Lab Yellow to Sampler

SS-001

Enseco - Rocky Mountain Analytical

4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Facsimile: 303/431-7171

Attn: Jeannie Hawbert

CHAIN OF CUSTODY

No.

Enseco Client: Dames & Moore/Maverik
Project: 14819-005-530 2
Sampling Co.: Dames & Moore
Sampling Site: Kirtland New Mexico
Team Leader: Teny Vandell

SAMPLE SAFE™ CONDITIONS

1. Packed by: T D Vandell — Seal #
2. Seal Intact Upon Receipt by Sampling Co.: (Yes) No
3. Condition of Contents: OK
4. Sealed for Shipping by: Teny Vandell
5. Initial Contents Temp.: 4 °C — Seal #
6. Sampling Status: Done — Continuing Until 8-11-89
7. Seal Intact Upon Receipt by Laboratory: Yes No
8. Contents Temperature Upon Receipt by Lab: 46 °C
9. Condition of Contents:

	Date	Time	Sample ID/Description (All Water Samples)	Sample Type	No. Containers	Analysis Parameters	Remarks
07	8-10-89	11 00 AM	MW 15 / Monitor well Water	Water	3-40 mil	601, 602	Very Silty Water
					1-500 mil Poly	TDS, SO4, Cl	Sample
07	8-10-89	11 30 AM	MW 14 / Monitor well Water	Water	3-40 mil	601, 602	Silty Sample
					1-500 mil Poly	TDS, SO4, Cl	
08	8-10-89	12 00 PM	MW 9 / M well Water	Water	3-40 mil	601, 602	
					1-500 mil Poly	TDS, SO4, Cl	
09	8-10-89	12 20 PM	OSSW 2 / N. Murray E-W Ditch, E. end at Hwy 489	Surface Water	3-40 mil	601, 602	
10	8-10-89	12 40 PM	OSSW 1 / E-W Ditch At	S. Water	3-40 mil	601, 602	very Silty
11	8-10-89	1 20 PM	MW 10 / M. well Water	G. Water	3-40 mil	601, 602	
					1-500 mil Poly	TDS, SO4, Cl	

CUSTODY TRANSFERS PRIOR TO SHIPPING

	Relinquished by: (signed)	Received by: (signed)	Date	Time
1	T D Vandell	Fed Express	8-10-89	4 00 PM
2				
3				

SHIPPING DETAILS

Delivered to Shipper by:
Method of Shipment: — Airbill #
Received for Lab: RMA — Signed: — Date/Time 8-11-89 0800
Enseco Project No. 6113

White and Pink Copies to Lab — Yellow to Sampler

SS-001

Enseco - Rocky Mountain Analytical

4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611 Facsimile: 303/431-7171

CHAIN OF CUSTODY

No.

Attn: _____

Enseco Client: Dames & Moore / Maverik Kirtland NM
Project: 14819-005-5302
Sampling Co.: Dames & Moore
Sampling Site: Kirtland, NM
Team Leader: TDVandell

SAMPLE SAFE™ CONDITIONS

1. Packed by: TDV Seal # _____
2. Seal Intact Upon Receipt by Sampling Co.: (Yes) No
3. Condition of Contents: OK
4. Sealed for Shipping by: TDV
5. Initial Contents Temp.: 4 °C Seal # _____
6. Sampling Status: (Done) Continuing Until _____
7. Seal Intact Upon Receipt by Laboratory: Yes No
8. Contents Temperature Upon Receipt by Lab: _____ °C
9. Condition of Contents: _____

	Date	Time	Sample ID/Description	Sample Type	No. Containers	Analysis Parameters	Remarks
12	8-10-89	5°° pm	~~Monitor well~~ MW 13/Monitor well	Groundwater	3 40 ml	601, 602	Silty water
			MW 13	"	1 Sandpty	TDS, SO4, Cl	" "

CUSTODY TRANSFERS PRIOR TO SHIPPING

	Relinquished by: (signed)	Received by: (signed)	Date	Time
1	TDVandell	Fed Xpress	8-11-89	8°° AM
2				
3				

SHIPPING DETAILS

Delivered to Shipper by: TDVandell
Method of Shipment: Fed Xpress Airbill #: _____
Received for Lab: RMAL Signed: Joseph Ginacchi Date/Time 8-12-89 0845
Enseco Project No. 613

White and Pink Copies to Lab Yellow to Sampler

SS-001

EXTRACTABLE ORGANICS WORKSHEET

Project No.: 6113
Page 1 of 1

Analyte: HVO
Matrix: SOIL
CH_2Cl_2 Brand B&J Lot No. AV453
Exchange Solvent —
Brand — Lot No. —

QC Lot: —
QC Run: —
LIMS Test Code: P-TPH-FID-3

Surrogate: —
Date Made:
Made by:
Conc.:
Verif. #:
Amount Added:
Date Added:
By:
Witness:

Spike: —
Date Made:
Made By:
Conc.:
Verif. #:
Amount Added:
Date Added:
By:
Witness:

Sample No.	Amt. Ext. grams	Init pH	Adj. pH	Date Ext.	Ext. By	Volume of Solvent Used	Volume of Solvent Rec. (mL)	Date Conc.	Conc. By	Final Volume	Solvent	Cleanup or Split?
01	30.22	—	—	8-23-89	mg	300 mL	~275	8-31-89	TB!	10.0 mL	CH_2Cl_2	NO
02	30.06	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
03	30.21											
04	*10.21											
BLK 8/23	—											

Comments: * SEE ANOMALY SHEET.

Reviewed By: RPO 9/1/89

NMA - - - - -

GC CONDITIONS									DETECTION CONDITIONS							
COL. NO.	PHASE	INJ. °C	HOLD °C	TIME min	RATE °C/min	FINAL °C	FINAL min	FLOW cc/min	CAR PRESS psig	TYPE	ATTEN	SENS. RANGE	TEMP °C	MASS RANGE	SCAN TIME (sec)	DATA FILENAME	ANALYST
	RTx5	280	40	3	8	325 340	24			FID					METH SEQ DATA	M:A\B 222 K:V 254 K:A\B 254	

COMMENTS

autosampler position	sample description	sample no.	date	Xpol/vol	inj. vol.	old comment	int. std added	run no.	disk / tape file	comments	analyst
1	[redacted] Alph cal std	26/co	9/11/89		2µL					K:A\BV254 1	DV
2	[redacted] 6285 BL										
3	[redacted] -01										
4	[redacted] 6284 -01										
5	[redacted] 01 DH										
6	[redacted] -02										
7	6282 01 [redacted] -02 DH										
8	0.2 [redacted] 6315 01										
9	[redacted] Alph cal std	27/23									
10	6288 BL [redacted] 6315 02										
11	-01 [redacted] 03										
12	-02 [redacted] 04										
13	-03 [redacted] 05										
14	-04 [redacted] 6301 01										
15	-05 [redacted] 102										

Full Range: 1 millivolts

Name: GASOLINE 100 ug/ml

```
* ****  INTERNAL STANDARD TABLE  *****
* ********** 09-11-1989 16:20:34 Version 4.1 **********
* Sample Name: ALIPH CK STD 20PPM/ALIPH CK STD 20PPM
                                        Data File: M:AV2541
* Date: 09-11-1989 15:19:16 Method: M:AV222  09-06-1989 16:5e:3e  #  136
* Interface: 1   Cycle#:  1    Operator DGV Channel#: 0     Vial#: N.A.
* Starting Peak Width:  4   Threshold: .4  Area Threshold: 600
*****************************************************************
Starting Delay:  2.00                    Ending retention time:   32.00
Area reject:  +/- 10                     One sample per:  0.400 sec.
Amount injected:  1.00                   Dilution factor:  1.00
Internal Standard Amounts:  1
Sample Weight:  1.000000
```

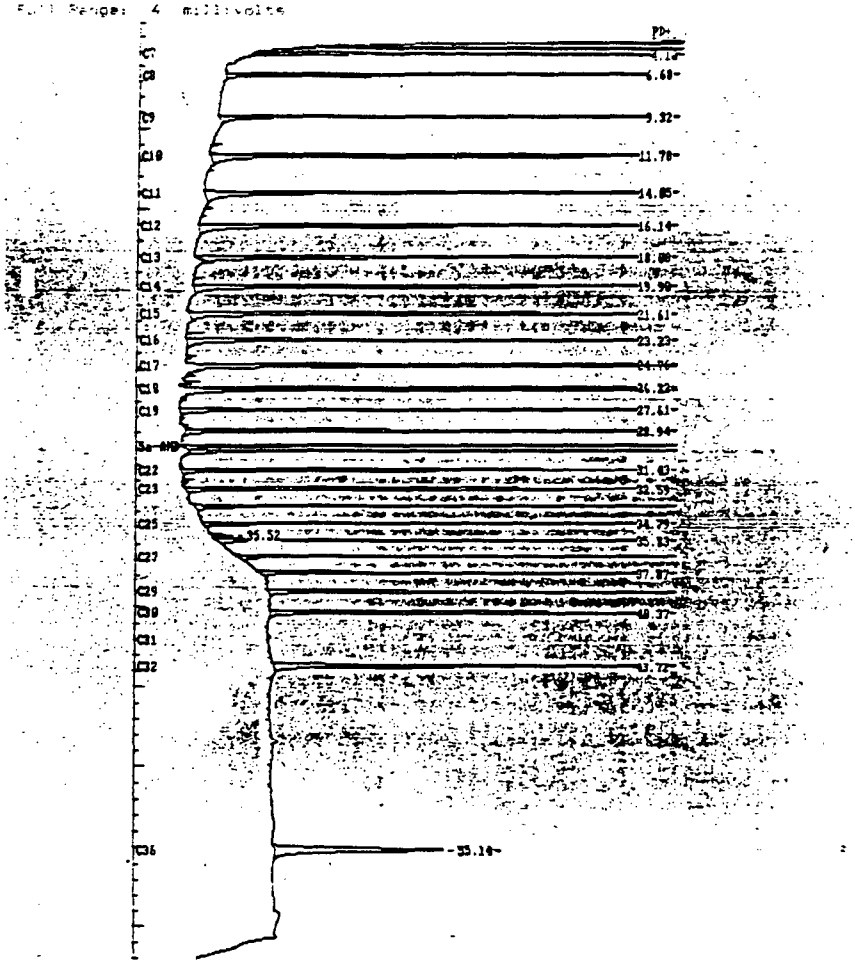
PI	RET. TIME	PEAK NAME	CONCENTRATION in ug/ml	NORMALIZED CONC	AREA	HEIGHT	AREA/ HEIGHT RL	RET PEAK	INT.STD PEAK	% DELTA RET TIME	CONC/AREA
	2.758		0.0000	0.000000	8594074	869122	9.9 1		28		9.8672E-10
	3.222		0.0000	0.000000	42.00	2548	2.6 1		28		9.8672E-10
	3.715		0.0000	0.000000	116447	41916	2.8 1		28		9.8672E-10
4	4.857 C7		46.6184	3.262470	83933	28263	3.0 1	0	28	-.1622	5.5784E-04
	6.677 C8		46.1935	3.373221	87955	26955	3.3 1	0	28	-.2902	5.4793E-04
	9.316 C9		46.9982	3.429523	92844	26794	3.4 1	0	28	0	5.3225E-04
7	11.782 C10		49.6884	3.472221	87461	23639	3.7 1	0	28	.1132	5.6728E-04
	14.847 C11		50.8882	3.561221	89977	22653	4.0 1	0	28	0	5.6614E-04
	16.137 C12		51.7404	3.618821	90272	23901	3.8 1	0	28	0	5.7612E-04
10	18.888 C13		54.3943	3.727721	94998	23726	4.0 1	0	28	.1111	5.7082E-04
11	19.856 C14		51.8686	3.636421	92566	23594	3.9 1	0	28	.0674	5.6054E-04
1	21.611 C15		52.5592	3.678721	102589	27944	3.7 1	0	28	0	5.0738E-04
13	23.222 C16		52.4186	3.668921	92779	25618	3.6 1	0	28	0	5.6498E-04
14	24.766 C17		47.4848	3.322252	84278	22187	3.8 1	0	28	0	5.5875E-04
1	24.868 PRISTANE		50.6479	3.544921	78018	23572	3.3 1	0	28	0	7.2851E-04
1	26.228 C18		52.3735	3.665721	99417	27528	3.6 1	0	28	0	5.7924E-04
17	26.375 PHYTANE		52.7686	3.692381	77558	22246	3.5 1	0	28	0	6.8027E-04
18	27.614 C19		55.2228	3.865121	100312	28763	3.5 1	0	28	0	5.5858E-04
1	28.941 C20		52.4661	3.672221	84631	24033	3.5 1	0	28	0	6.1994E-04
20	29.885 5a-ANDROSTANE		1.0000	0.000000	181345	27994	6.4 1	0	28	0	5.5672E-06
21	30.202 C21		56.1669	3.931221	86994	25534	3.4 1	0	28	0	6.4564E-04
2	30.426 C22		55.5457	3.887821	73957	21891	3.3 1	0	28	0	7.5075E-04
2	32.592 C23		54.5626	3.819721	71998	20626	3.5 1	0	28	0	7.5792E-04
24	33.711 C24		54.2238	3.796221	58917	16519	3.6 1	0	28	.0397	9.2053E-04
25	34.799 C25		52.9816	3.645221	54574	15411	3.5 1	0	28	0	9.5422E-04
2	35.526		0.0000	0.000000	766	176	4.3 1		28		9.8672E-10
27	35.826 C26		58.8489	3.557921	48537	13553	3.6 1	0	28	0	1.0474E-03
28	36.827 C27		43.8291	3.067721	42264	11861	3.6 1	0	28	0	1.0378E-03
2	37.871 C28		45.6798	3.197121	39874	9955	4.0 1	0	28	0	1.2715E-03
3	39.858 C29		56.1881	3.931221	35675	7466	4.8 1	0	28	0	1.4866E-03
31	40.571 C30		43.7751	3.064321	34951	6186	5.7 1	0	28	0	1.2514E-03
3	43.721 C32		51.1861	3.582621	36664	3697	8.5 1	0	28	0	1.6564E-03
3	45.138 C34		52.4584	3.671721	25384	1349	17.5 1	0	28	.0121	2.0434E-03

TOTAL AMOUNT = 1429.7346

PEAKS NOT FOUND IN THIS RUN .

NAME	ADJUSTED RET.TIME.	REFERENCE PEAK
C1	42.00	C01

Areas, times, and heights stored in: M:A.DS41.ATB
Data file = M:AV2541.PKS Printed on 09-11-1989 at 16:21:42
Start time: 2.00 min. Stop time: 45.00 min. Offset: 0 m.
Full Range: 4 millivolts



***** INTERNAL STANDARD TABLE *****

```
* ****************** 09-11-1989 18:51:15 Version 4.1 ************************
* Sample Name: [redacted]/6285 01  100%          Data File: M:AV2543          *
* Date: 09-11-1989 17:47:26 Method: M:AV222  09-06-1989 16:56:32  #  138     *
* Interface: 1   Cycle#:  3    Operator DGV Channel#: 0    Vial#: N.A.       *
* Starting Peak Width:  4   Threshold: .4  Area Threshold: 800               *
******************************************************************************
Starting Delay:    2.00                    Ending retention time:   62.00
Area reject:        10                     One sample per    0.402 sec.
Amount injected:         1.00              Dilution factor:          1.00
Internal Standard Amount:  1
Sample Weight:           1.000000
```

9/12 [initials]

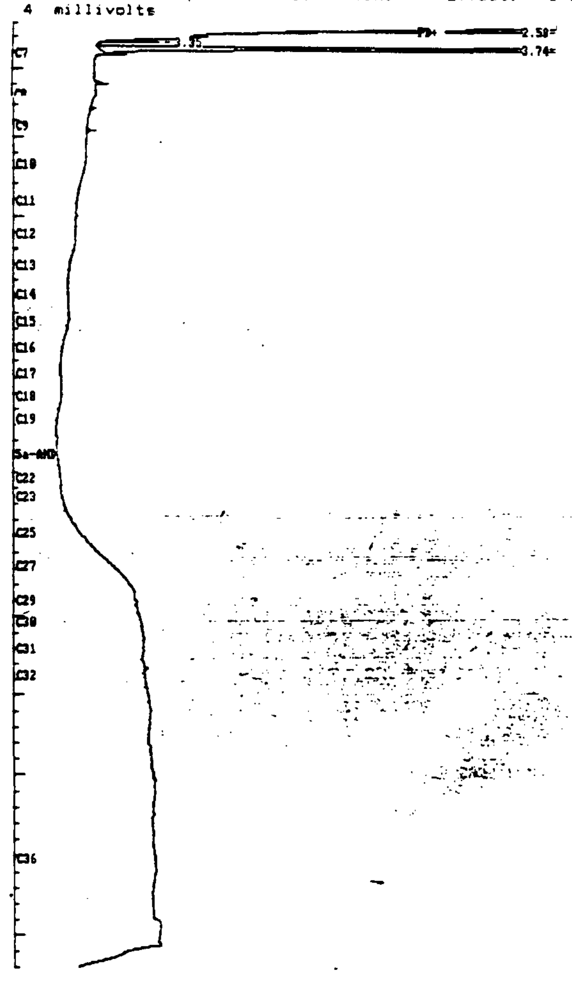
PEAK N	RET TIME	PEAK NAME	CONCENTRATION in ug/ml	NORMALIZED CONC	AREA	HEIGHT	AREA/ HEIGHT BL	REF PEAK	INT.STD PEAK	% DELTA RET TIME	CONC/AREA
1	2.576		0.0000	0.0000%	3858	2223	1.7 1				0.0000E+00
2	3.353		0.0000	0.0000%	1362	438	3.1 1				0.0000E+00
3	3.725		0.0000	0.0000%	1047293	347750	3.0 1				0.0000E+00

TOTAL AMOUNT = 0.0000

PEAKS NOT FOUND IN THIS RUN

NAME	ADJUSTED RET.TIME.	REFERENCE PEAK
C7	4.10	5a-ANDROSTANE
C8	6.69	5a-ANDROSTANE
C9	9.32	5a-ANDROSTANE
C10	11.77	5a-ANDROSTANE
C11	14.03	5a-ANDROSTANE
C12	16.12	5a-ANDROSTANE
C13	18.06	5a-ANDROSTANE
C14	19.88	5a-ANDROSTANE
C15	21.60	5a-ANDROSTANE
C16	23.21	5a-ANDROSTANE
C17	24.75	5a-ANDROSTANE
PRISTANE	24.85	5a-ANDROSTANE
C18	26.21	5a-ANDROSTANE
PHYTANE	26.36	5a-ANDROSTANE
C19	27.60	5a-ANDROSTANE
C20	28.93	5a-ANDROSTANE
5a-ANDROSTANE	29.87	5a-ANDROSTANE
C21	30.20	5a-ANDROSTANE
C22	31.41	5a-ANDROSTANE
C23	32.58	C23
C24	33.70	5a-ANDROSTANE
C25	34.78	5a-ANDROSTANE
C26	35.81	5a-ANDROSTANE
C27	36.81	5a-ANDROSTANE
C28	37.85	5a-ANDROSTANE
C29	39.02	5a-ANDROSTANE
C30	40.34	5a-ANDROSTANE
C31	42.00	C31
C32	43.70	5a-ANDROSTANE
C36	55.13	5a-ANDROSTANE

```
Areas, times, and heights stored in: K:AV2543.ATB
Data File = K:AV2543.PTS  Printed on 09-11-1989 at 18:52:00
Start time:     2.00 min.  Stop time:   62.00 min.     Offset:     0 mv.
Full Range:  4  millivolts
```



INTERNAL STANDARD TABLE

09-11-1989 20:05:34 Version 4.1

Sample Name: [redacted]/6286 01 100% Data File: K:AV2544

Date: 09-11-1989 19:01:32 Method: M:AV222 09-06-1989 16:56:32 # 138

Interface: 1 Cycle#: 4 Operator DGV Channel#: 0 Vial#: N.A.

Starting Peak Width: 4 Threshold: .4 Area Threshold: 800

Starting Delay: 2.00 Ending retention time: 62.00

Area reject: 10 One sample per 0.402 sec.

Amount injected: 1.00 Dilution factor: 1.00

Internal Standard Amounts: 1

Sample Weight: 1.000000

PEAK #	RET TIME	PEAK NAME	CONCENTRATION in ug/ml	NORMALIZED CONC	AREA	HEIGHT	AREA/ HEIGHT	BL	REF PEAK	INT.STD PEAK	% DELTA RET TIME	CONC/AREA
1	2.576		0.0000	0.0000%	3833	2222	1.7	1				0.0000E+00
	3.353		0.0000	0.0000%	1362	443	3.2	1				0.0000E+00
	3.735		0.0000	0.0000%	917501	303118	3.0	1				0.0000E+00
4	8.968		0.0000	0.0000%	32458	7833	4.1	1				0.0000E+00
	18.965		0.0000	0.0000%	1868	258	4.2	1				0.0000E+00

TOTAL AMOUNT = 0.0000

File: K:AV2541

PEAKS NOT FOUND IN THIS RUN

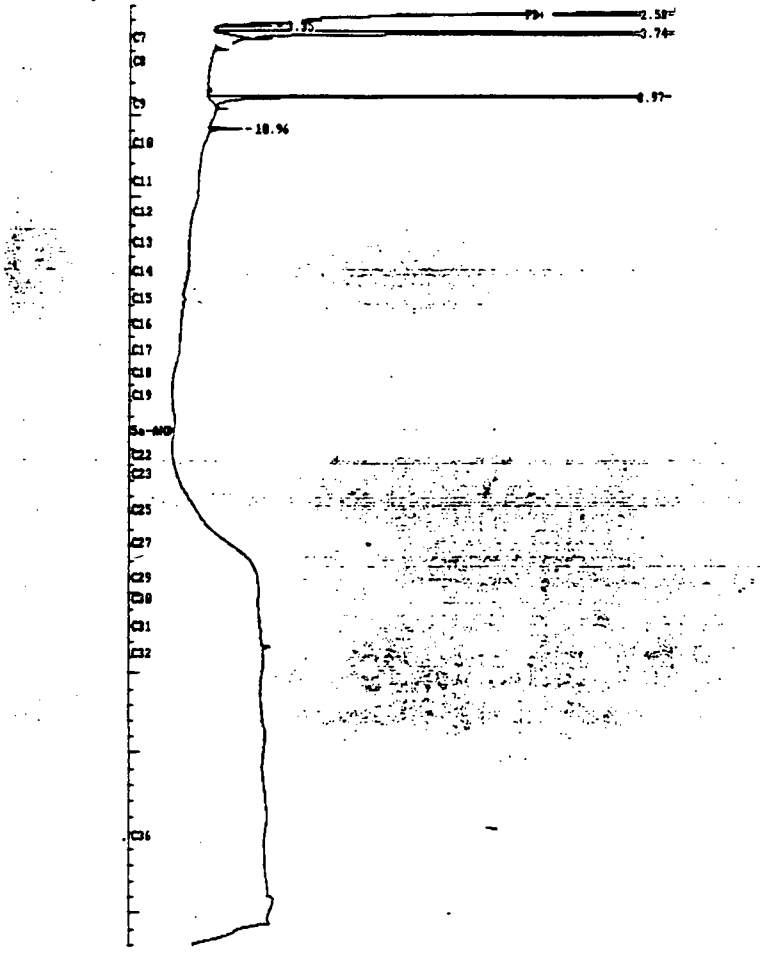
NAME	ADJUSTED RET TIME	REFERENCE PEAK
C7	4.101	5a-ANDROSTANE
C8	6.69	5a-ANDROSTANE
C9	9.32	5a-ANDROSTANE
C10	11.77	5a-ANDROSTANE
C11	14.03	5a-ANDROSTANE
C12	16.12	5a-ANDROSTANE
C13	18.06	5a-ANDROSTANE
C14	19.88	5a-ANDROSTANE
C15	21.60	5a-ANDROSTANE
C16	23.21	5a-ANDROSTANE
C17	24.75	5a-ANDROSTANE
PRISTANE	24.85	5a-ANDROSTANE
C18	26.21	5a-ANDROSTANE
PHYTANE	26.36	5a-ANDROSTANE
C19	27.60	5a-ANDROSTANE
C20	28.93	5a-ANDROSTANE
5a-ANDROSTANE	29.87	5a-ANDROSTANE
C21	30.20	5a-ANDROSTANE
C22	31.41	5a-ANDROSTANE
C23	32.58	C23
C24	33.70	5a-ANDROSTANE
C25	34.78	5a-ANDROSTANE
C26	35.81	5a-ANDROSTANE
C27	36.81	5a-ANDROSTANE
C28	37.85	5a-ANDROSTANE
C29	39.02	5a-ANDROSTANE
C30	40.34	5a-ANDROSTANE
C31	42.00	C31
C32	43.70	5a-ANDROSTANE
C36	55.13	5a-ANDROSTANE

Areas, times, and heights stored in: K:AV2544.ATB

Data File = K:AV2544.FTS Printed on 09-11-1989 at 20:06:19

Start time: 2.00 min. Stop time: 62.00 min. Offset: 0 mv.

Full Range: 4 millivolts



***** INTERNAL STANDARD TABLE *****

********** 09-11-1989 21:20:20 Version 4.1 **********

* Sample Name: [redacted]/6286 @1DU 100% Data File: I:AV2545 *

* Date: 09-11-1989 20:16:08 Method: M:AV222 09-06-1989 16:56:32 # 138 *

* Interface: 1 Cycle#: 5 Operator DGV Channel#: 0 Vial#: N.A. *

* Starting Peak Width: 4 Threshold: .4 Area Threshold: 800 *

****

Starting Delay: 2.00 Ending retention time: 62.00

Area reject: 10 One sample per 0.402 sec.

Amount injected: 1.00 Dilution factor: 1.00

Internal Standard Amount: 1

Sample Weight: 1.000000

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PEAK #	RET TIME	PEAK NAME	CONCENTRATION in ug/ml	NORMALIZED CONC	AREA	AREA/ HEIGHT	HEIGHT	BL	REF PEAK	INT.STD PEAK	% DELTA RET TIME	CONC/AREA
1	2.576		0.0000	0.00000	4687	2237	2.1	1				0.0000E+00
	2.717		0.0000	0.00000	1592	452	3.5	1				0.0000E+00
	3.368		0.0000	0.00000	1355	432	3.1	1				0.0000E+00
4	3.742		0.0000	0.00000	1046378	345882	3.0	1				0.0000E+00

TOTAL AMOUNT = 0.0000

PEAKS NOT FOUND IN THIS RUN

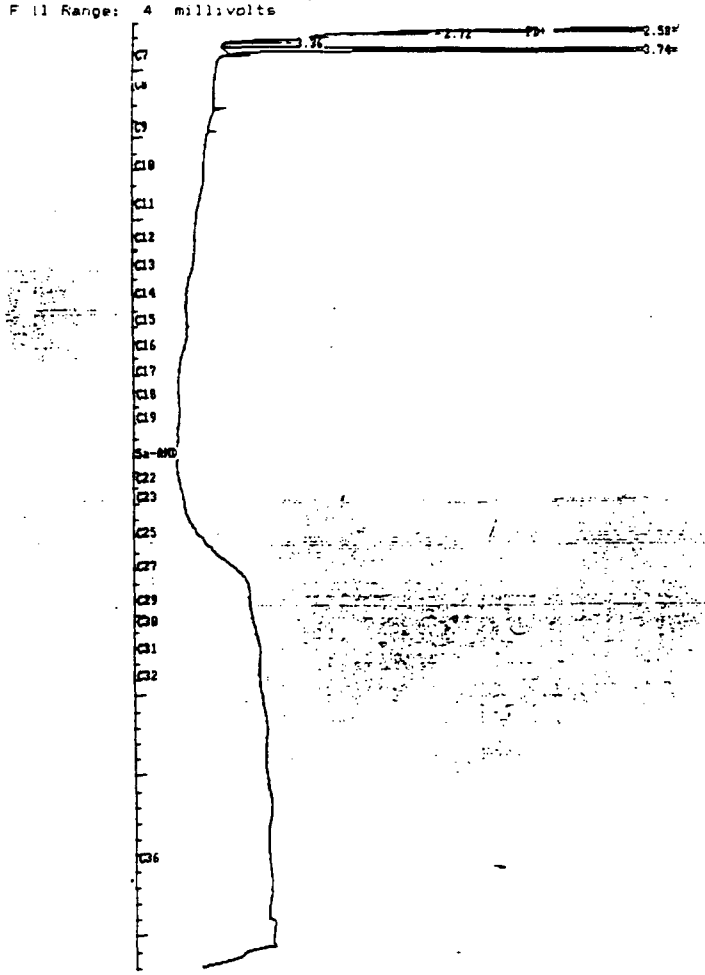
NAME	ADJUSTED RET.TIME.	REFERENCE PEAK
C	4.10	5a-ANDROSTANE
C8	6.69	5a-ANDROSTANE
C	9.32	5a-ANDROSTANE
C 1	11.77	5a-ANDROSTANE
C11	14.03	5a-ANDROSTANE
C12	16.12	5a-ANDROSTANE
C 3	18.06	5a-ANDROSTANE
C.4	19.88	5a-ANDROSTANE
C15	21.60	5a-ANDROSTANE
C 6	23.21	5a-ANDROSTANE
C 7	24.75	5a-ANDROSTANE
PRISTANE	24.85	5a-ANDROSTANE
C18	26.21	5a-ANDROSTANE
PL TANE	26.36	5a-ANDROSTANE
C.9	27.60	5a-ANDROSTANE
C20	28.93	5a-ANDROSTANE
5 -ANDROSTANE	29.87	5a-ANDROSTANE
C.	30.20	5a-ANDROSTANE
C22	31.41	5a-ANDROSTANE
C23	32.58	C23
C 4	33.70	5a-ANDROSTANE
C25	34.78	5a-ANDROSTANE
C26	35.81	5a-ANDROSTANE
C 7	36.81	5a-ANDROSTANE
C.8	37.85	5a-ANDROSTANE
C29	39.02	5a-ANDROSTANE
C30	40.34	5a-ANDROSTANE
C 1	42.00	C31
C32	43.70	5a-ANDROSTANE
C36	55.13	5a-ANDROSTANE

Areas, times, and heights stored in: K:AV2545.ATB

Data File = K:AV2545.FTS Printed on 09-11-1989 at 21:21:02

Start time: 2.00 min. Stop time: 62.00 min. Offset: 0 mv.

Full Range: 4 millivolts



```
* *****   INTERNAL STANDARD TABLE   *****
* ********** 09-11-1989 22:35:19 Version 4.1 **********
* Sample Name: [redacted]&286 @2   100%      Data File: K:AV2546
* Date: 09-11-1989 21:30:30 Method: M:AV222  09-06-1989 16:56:22  #  138
* Interface: 1   Cycle#:  6   Operator DGV Channel#: @   Vial#: N.A.
* Starting Peak Width:  4   Threshold: .4  Area Threshold: 800
```

Starting Delay: 2.00 — Ending retention time: 62.00
Area reject: 10 — One sample per 0.400 sec.
Amount injected: 1.00 — Dilution factor: 1.00
Internal Standard Amount: 1
Sample Weight: 1.000000

4/12
DV

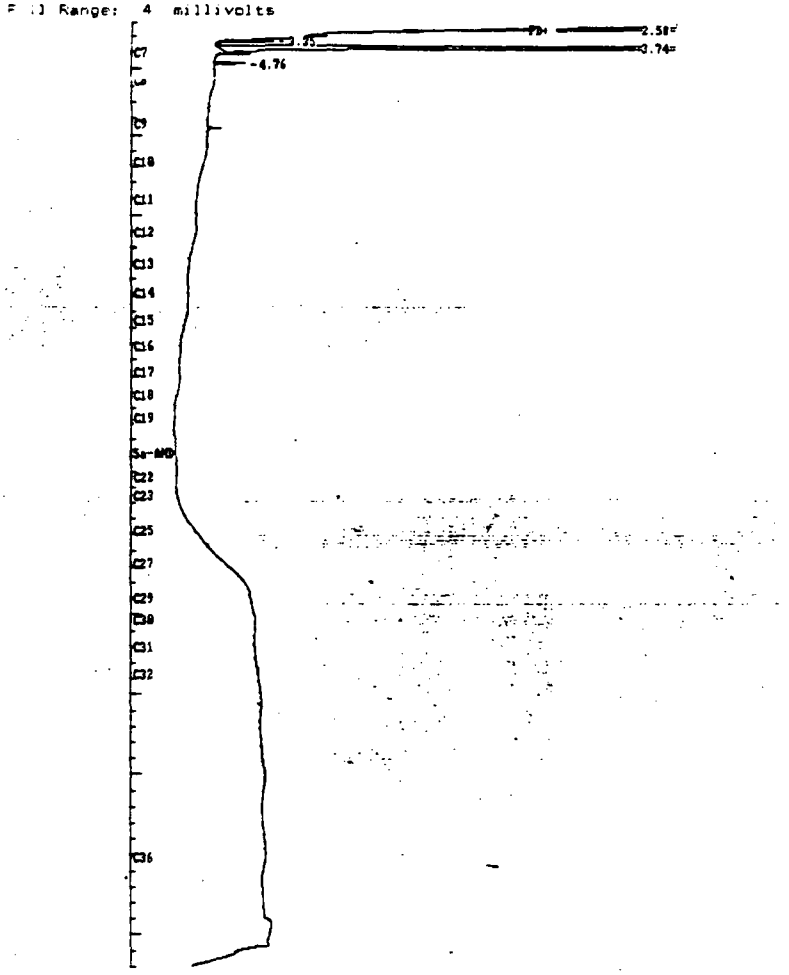
PEAK #	RET. TIME	PEAK NAME	CONCENTRATION in ug/ml	NORMALIZED CONC	AREA	HEIGHT	AREA/ HEIGHT RL	REF PEAK	INT.STD PEAK	% DELTA RET TIME	CONC/AREA
1	2.576		0.0000	0.0000%	5259	2413	2.2 1				0.0000E+00
	3.353		0.0000	0.0000%	1291	405	3.2 1				0.0000E+00
	3.735		0.0000	0.0000%	1109473	378526	3.0 1				0.0000E+00
4	4.760		0.0000	0.0000%	912	256	3.6 1				0.0000E+00

TOTAL AMOUNT = 0.0000

PEAKS NOT FOUND IN THIS RUN

NAME	ADJUSTED RET.TIME.	REFERENCE PEAK
C	4.10	5α-ANDROSTANE
C8	6.69	5α-ANDROSTANE
C9	9.32	5α-ANDROSTANE
C 0	11.77	5α-ANDROSTANE
C11	14.03	5α-ANDROSTANE
C12	16.12	5α-ANDROSTANE
C 3	18.06	5α-ANDROSTANE
C 4	19.88	5α-ANDROSTANE
C15	21.60	5α-ANDROSTANE
C16	23.21	5α-ANDROSTANE
C 7	24.75	5α-ANDROSTANE
PRISTANE	24.85	5α-ANDROSTANE
C18	26.21	5α-ANDROSTANE
PHYTANE	26.36	5α-ANDROSTANE
C 9	27.60	5α-ANDROSTANE
C20	28.93	5α-ANDROSTANE
5α-ANDROSTANE	29.87	5α-ANDROSTANE
C 1	30.20	5α-ANDROSTANE
C22	31.41	5α-ANDROSTANE
C23	32.58	C23
C 4	33.70	5α-ANDROSTANE
C25	34.78	5α-ANDROSTANE
C26	35.81	5α-ANDROSTANE
C27	36.81	5α-ANDROSTANE
C 8	37.85	5α-ANDROSTANE
C29	39.02	5α-ANDROSTANE
C30	40.34	5α-ANDROSTANE
C 1	42.00	C31
C32	43.70	5α-ANDROSTANE
C36	55.13	5α-ANDROSTANE

Areas, times, and heights stored in: K:AV2546.ATB
Data File = K:AV2546.FTS Printed on 09-11-1989 at 22:36:09
Start time: 2.00 min. Stop time: 62.00 min. Offset: 0 mv.
Full Range: 4 millivolts



```
* *****   INTERNAL STANDARD TABLE   *****
* ********** 09-12-1989 02:18:10 Version 4.1 **********
* Sample Name: ALIPH CK STD 20PPM/ALIPH CK STD 20PPM
                                        Data File: K:AV2549
* Date: 09-12-1989 01:13:04 Method: M:AV222  09-06-1989 16:56:32  #  138
* Interface: 1   Cycles:  9    Operator DBV Channel#: 0    Vial#: N.A.
* Starting Peak Width:  4   Threshold: .4  Area Threshold: 800
*****************************************************************
Starting Delay:    2.00                    Ending retention time:    62.00
Area reject:       10                      One sample per   0.402 sec.
Amount injected:        1.00               Dilution factor:         1.00
Internal Standard Amount:  1
Sample Weight:          1.000000
```

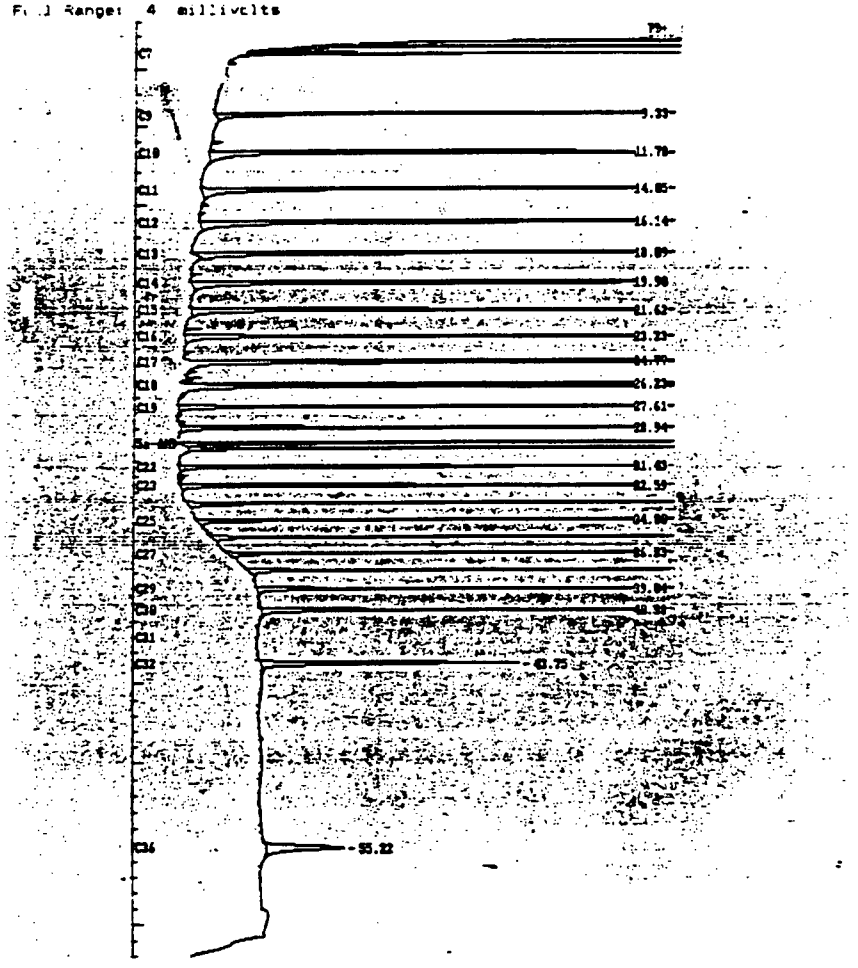
PEAK #	RET. TIME	PEAK NAME	CONCENTRATION in ug/ml	NORMALIZED CONC	AREA	AREA/ HEIGHT	HEIGHT BL	REF PEAK	INT.STD PEAK	% DELTA RET TIME	CONC/AREA
1	2.777		0.0007	0.00072	853622	579959	9.7 1		20		1.0222E-09
	3.347		0.0000	0.00000	6844	2316	2.6 1		20		1.0222E-09
3	3.729		0.0001	0.00002	113964	41135	2.8 1		20		1.0222E-09
4	4.184 C7		47.0009	3.54522	81481	28123	2.9 1	0	20	0	5.7638E-04
	6.683 C8		45.5559	3.65471	85428	25961	3.3 1	0	20	-.188	5.6828E-04
	9.359 C9		48.8369	3.67762	88456	25688	3.4 1	0	20	0	5.5212E-04
7	11.782 C10		50.4433	3.79842	85759	22763	3.8 1	0	20	.1138	5.8828E-04
8	14.847 C11		51.2584	3.85982	87365	21573	4.0 1	0	20	0	5.8712E-04
	16.144 C12		52.3944	3.94532	94452	22552	4.2 1	0	20	.1241	5.6559E-04
10	16.887 C13		51.3788	3.86861	93391	22353	4.2 1	0	20	.1462	5.5816E-04
11	19.982 C14		52.7829	3.96452	98453	22712	4.3 1	0	20	.1818	5.5118E-04
1	21.618 C15		54.6479	3.86981	1827338	27896	3.8 1	0	20	0	5.2688E-04
1	23.232 C16		53.7466	4.04711	91712	24593	3.7 1	0	20	0	5.8864E-04
14	24.767 C17		46.6986	3.51582	68877	20772	3.3 1	0	20	.0597	7.6977E-04
1	26.867 PRISTANE		51.8154	3.84153	88319	22784	3.9 1	0	20	.0839	7.4673E-04
1	26.227 C18		53.8479	3.99411	88348	26384	3.3 1	0	20	0	6.0839E-04
17	26.375 PHYTANE		53.4782	4.02632	75881	21717	3.5 1	0	20	0	7.0531E-04
18	27.614 C19		56.8586	4.21971	98186	27565	3.6 1	0	20	0	5.7866E-04
1	28.941 C20		52.2846	3.93162	81213	22878	3.5 1	0	20	0	6.4381E-04
2	29.885 5a-ANDROSTANE		1.0000	0.00002	97729	26772	3.7 1	0	20	0	1.0222E-05
21	30.214 C21		56.8253	4.14322	82186	22986	3.6 1	0	20	0	6.7013E-04
2	31.426 C22		53.7229	4.04561	68922	18888	3.7 1	0	20	0	7.7954E-04
2	32.592 C23		50.9826	3.83581	64516	17482	3.7 1	0	20	0	7.8998E-04
24	33.718 C24		48.6331	3.66212	58483	13588	3.7 1	0	20	0	8.6316E-04
25	34.797 C25		44.6247	3.36472	44548	11885	3.7 1	0	20	0	1.0017E-03
2	35.855 C26		42.2888	3.17771	38899	10895	3.8 1	0	20	0	1.1076E-03
2.	36.833 C27		33.8936	2.55222	31984	8369	3.8 1	0	20	0	1.0624E-03
28	37.878 C28		38.6978	2.91392	28363	6394	4.4 1	0	20	0	1.3643E-03
2	39.444 C29		36.8965	2.86872	25878	4599	5.5 1	0	20	0	1.5194E-03
3	48.384 C30		30.5653	2.29781	23768	3733	6.4 1	0	20	0	1.2834E-03
31	43.754 C31		36.2718	2.73132	19275	2858	9.4 1	0	20	.1226	1.8818E-03
32	55.218 C36		32.5579	2.45161	12874	626	19.3 1	0	20	.1579	2.6964E-03

TOTAL AMOUNT = 1328.6239

PEAKS NOT FOUND IN THIS RUN

NAME	ADJUSTED RET.TIME.	REFERENCE PEAK
C31	42.00	C31

Areas, times, and heights stored in: K:AV2549.ATB
Data File = K:AV2549.FTS Printed on 09-12-1989 at 02:19:13
Start time: 2.00 min. Stop time: 62.00 min. Offset: 0 mv
Full Range: 4 millivolts



INTERNAL STANDARD TABLE

09-11-1989 17:39:41 Version 4.1

Sample Name: [redacted]/6285 BL 100% Data File: K:AV2542

Date: 09-11-1989 16:33:16 Method: M:AV222 09-06-1989 16:56:32 # 138

Interface: 1 Cycle#: 2 Operator DGV Channel#: 0 Vial#: N.A.

Starting Peak Width: 4 Threshold: .4 Area Threshold: 800

Starting Delay: 2.00 Ending retention time: 62.00

Area reject: 10 One sample per 0.402 sec.

Amount injected: 1.00 Dilution factor: 1.00

Internal Standard Amount: 1

Sample Weight: 1.000000

4/12 DV

PEAK #	RET TIME	PEAK NAME	CONCENTRATION in ug/ml	NORMALIZED CONC	AREA	AREA/ HEIGHT	HEIGHT RL	RET PEAK	INT.STD PEAK	% DELTA RET TIME	CONC/AREA
1	2.578		0.0000	0.00000	4010	2235	1.8 1				0.0000E+00
2	3.353		0.0000	0.00000	1268	391	3.2 1				0.0000E+00
3	3.735		0.0000	0.00000	1098371	348233	3.9 1				0.0000E+00
4	4.754		0.0000	0.00000	2169	614	3.5 1				0.0000E+00

TOTAL AMOUNT = 0.0000

PEAKS NOT FOUND IN THIS RUN

NAME	ADJUSTED RET.TIME	REFERENCE PEAK
C7	4.18	5a-ANDROSTANE
C8	6.69	5a-ANDROSTANE
C9	9.32	5a-ANDROSTANE
C10	11.77	5a-ANDROSTANE
C11	14.03	5a-ANDROSTANE
C12	16.12	5a-ANDROSTANE
C13	18.06	5a-ANDROSTANE
C14	19.88	5a-ANDROSTANE
C15	21.60	5a-ANDROSTANE
C16	23.21	5a-ANDROSTANE
C17	24.75	5a-ANDROSTANE
PRISTANE	24.85	5a-ANDROSTANE
C18	26.21	5a-ANDROSTANE
PHYTANE	26.36	5a-ANDROSTANE
C19	27.60	5a-ANDROSTANE
C20	28.93	5a-ANDROSTANE
5a-ANDROSTANE	29.87	5a-ANDROSTANE
C21	30.20	5a-ANDROSTANE
C22	31.41	5a-ANDROSTANE
C23	32.58	C23
C24	33.70	5a-ANDROSTANE
C25	34.78	5a-ANDROSTANE
C26	35.81	5a-ANDROSTANE
C27	36.81	5a-ANDROSTANE
C28	37.85	5a-ANDROSTANE
C29	39.02	5a-ANDROSTANE
C30	40.34	5a-ANDROSTANE
C31	42.00	C31
C32	43.70	5a-ANDROSTANE
C36	55.13	5a-ANDROSTANE

Areas, times, and heights stored in: K:AV2542.ATB

Data File = K:AV2542.PTS Printed on 09-11-1989 at 17:40:26

Start time: 2.00 min. Stop time: 62.00 min. Offset: 0 mv.

Full Range: 4 millivolts