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REPORTS

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STATUS REPORT
REMEDIATION WORK AND
ROUND 3 LONG-TERM GROUND WATER QUALITY
MONITORING DATA RESULTS
FOR MAVERIK REFINERY AND TANK FARM
KIRTLAND, NEW MEXICO
FOR MAVERIK COUNTRY STORES, INC.

DAMES & MOORE

DAMES & MOORE A PROFESSIONAL LIMITED PARTNERSHIP
127 SOUTH 500 EAST, SUITE 300, SALT LAKE CITY, UTAH 84102-1959 (801) 521-9255

February 21, 1990

Oil Conservation District
State Land Office Building
P.O. Box 2088
Old Santa Fe Trail
Santa Fe, New Mexico 87501

Attention: Mr. William Olson

Dear Bill:

Enclosed is a copy of "Status Report Remediation Work and Round 3 Long-Term Ground Water Quality Monitoring Data Results for Maverik Refinery And Tank Farm."

If you have any questions please do not hesitate to contact me.

Very truly yours,

DAMES & MOORE

Peter F. Olsen
Associate

Terry D. Vandell
Senior Hydrogeologist

PFO:fl

cc: William Call
Levi Todd
Mary Richardson
Vince Memmott
Dave Tomko

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EXECUTIVE SUMMARY

This report presents the status of the remediation work and the data results of the Round 3 long-term ground water quality monitoring at the Maverik Refinery and Tank Farm in Kirtland, New Mexico. This work was managed and conducted by Dames & Moore from November 1989 through January 1990.

The work as detailed in the remediation work plan (August 8, 1989) has been conducted in accordance with the estimated time schedule; however, this plan is currently under revision. The results of the bioremediation tests conducted by ENSR consultants indicate that enhanced bioremediation is feasible. However, a ground water withdrawal and disposal and sprinkling regime would maintain greater hydraulic control, be considerably simpler and result in more efficient remediation of both the saturated and unsaturated zones. Details of the modifications to the August 8, 1989 work plan will be submitted in about one month, following evaluation of additional on-site water quality analytical data obtained in January 1990.

The work detailed in this report includes a discussion of the additional remediation work not originally scheduled (on-site tank clean-out, the grouting of an abandoned well on-site, and additional on-site water quality sampling and analytical testing), and the Round 3 long-term ground water quality monitoring, sampling and analytical data evaluation.

The December 1989 ground water quality sampling and analysis conducted by the New Mexico Environmental Improvement Division (EID) and the Round 3 long-term ground water quality monitoring data results are similar to results obtained during Rounds 1 and 2. Results continue to indicate that the ground water quality off-site south of the refinery tank farm has not been impacted, and the ground water quality west and southwest of the refinery tank farm, although slightly impacted, has not degraded since monitoring began in 1987. The ground water quality continues to improve. 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, which limits 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.

STATUS REPORT
REMEDIATION WORK AND ROUND 3
LONG-TERM GROUND WATER QUALITY MONITORING DATA RESULTS
FOR MAVERIK REFINERY AND TANK FARM
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, 2 and 3 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 the monitor wells included in the long-term ground water quality monitoring program (monitor wells MW-9, MW-10 and MW-13), ground water quality data obtained in December 1989 by Bill Olson of the New Mexico Environmental Improvement Division (EID), the biodegradation feasibility study conducted by ENSR and documents of the tank clean-out have been included in this report. More detailed ground water quality data and contaminant evaluations are presented in previous Dames & Moore reports completed in 1988 and 1989 as referenced.

PURPOSE AND SCOPE

The work completed in December 1989 through January 1990 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 EID. In

addition, the on-site tanks were cleaned out, an on-site abandoned well was grouted, additional on-site ground water quality and sludge samples were obtained for laboratory analysis and soil borings were augered to better define the current extent of on-site subsurface contamination.

The work conducted to date, including this status report, completes components 1, 2a (in part), 4a, 4b, 4c, 4d and 4e and part of components 4f and 10 of the Phase I Remediation Plan for ground water remediation at the refinery and tank farm.

The work conducted since the November 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 included in Appendix B.
- Tank clean out was completed.
- An abandoned on-site well was grouted.
- Additional on-site ground water quality sampling and analytical testing were conducted.
- Additional on-site soil borings were augered and evaluated.
- On-site sludge sampling of the eastern sludge pit was conducted.
- Round 3 long-term ground 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

In the spring of 1989, product leakage from the spout of an above-ground tank at Maverik's refinery was observed by Bill Olson of the EID. As a result of this observation, the tank was removed and 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 was any product remaining in the tanks, and if so, the volumes and type(s) of product remaining and (2) if product was 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, a designated transporter, storer and treater of used oil, agreed to transport and recycle the product. All product removal and delivery was manifested. Correspondence detailing the work conducted and the shipping manifests are included in Appendix C. Waste product that was not reprocessed was disposed of in compliance with State of New Mexico and Federal Environmental Protection Agency (EPA) regulations. This will include the disposal to CSI in Denver, Colorado, of 20 drums of tank bottom sludge from a 3,000 barrel tank that had stove oil, and disposal of residual water from steam cleaning, to Mesa Oil, Inc. where it will be treated and then disposed of to the City of Albuquerque's wastewater treatment plant.

All of the tank piping was dismantled, drained and capped to prevent potential product leakage from the piping in the future.

WELL GROUTING

A 10-inch diameter steel cased well (designated as W-3) located on-site in the southwest corner of the tank farm was grouted on December 11, 1989. Grouting by Mo-Te Drilling, Inc., Farmington, New Mexico was conducted under Dames & Moore's supervision. The well had been previously sampled by Dames &

Moore in February 1988. Its depth was measured at 21 feet. Since the well extended below the contaminated zone and its construction was not known, the well was grouted to eliminate a potential pathway for contaminant migration to the underlying aquifer. The well was pressure grouted with a neat cement grout to ground surface.

ON-SITE GROUND WATER QUALITY SAMPLING

In addition to the long-term (Round 3) compliance ground water quality monitoring conducted in December 1989, ground water quality samples were collected from the southwest corner of the tank farm on January 16 and 17, 1990 from MW-11, MW-12, the eastern observation well (E-OW), the northern observation well (N-OW) and the north-south interceptor trench (Plate 2). Laboratory analytical tests for aromatic volatile organics (as per EPA Method 602), halogenated volatile organics (as per EPA Method 601) and sulfate analyses are currently being conducted by ENSECO-Rocky Mountain Analytical Laboratory in Arvada, Colorado. Field tests were conducted for pH, conductivity and dissolved oxygen.

The purpose in conducting these additional analyses is to better determine the current condition of the ground water quality on-site in the area where active ground water remediation is scheduled. No on-site ground water quality data had been collected since October 1988 at which time it appeared that the ground water quality on-site (specifically at MW-11 and MW-12) improved significantly over that measured in the first two sampling rounds of November 1987 and February 1988. The results of the first two sampling rounds are presented in our January 1989 report.

The results of the analysis of the January 1990 water quality samples are not yet available, but will be included in our forthcoming modified remediation plan.

ON-SITE SOIL BORINGS

Two boreholes were hand augered along the eastern and western edges of the southwestern corner of the tank farm to depths of 8.5 feet and 8 feet, respectively (Plate 2). The purpose for augering these boreholes was to better define the extent of subsurface contamination along the eastern and western boundaries of the area scheduled for remediation. Detailed boring logs and organic vapor readings taken with the HNu meter will be included as part of the forthcoming remediation plan. Both borings penetrated silty sand with interbedded gravel found at depths of about 1 to 2.25 feet. The saturated zone was encountered at 5 to 6 feet below ground surface and about 0.25-inches of free product was measured in the eastern boring and about 0.13-inches in the western boring. HNu readings which measured up to 200 ppm were observed in both borings at depths of about 5 feet in gray sands just above the water table.

ON-SITE SLUDGE SAMPLING

As per component 2a of the August 8, 1989 Ground Water Remediation Plan, two composited samples of sludge were taken from the eastern sludge pit and submitted to ENSECO - Rocky Mountain Analytical Laboratory for hazardous waste characterization tests. The two sludge samples were taken from the middle of the sludge pit near the eastern and western central portions. Composite samples were obtained to depths of about 5 feet, to the water table. The laboratory analyses include corrosivity (pH), reactivity and EP toxicity tests for the 8 RCRA metals. In addition, percentage oil and grease and total petroleum hydrocarbon tests are being conducted. These tests are being conducted to determine whether the sludge is hazardous. If it is not hazardous, it will probably be disposed of at CSI near Denver, Colorado. If it is hazardous, it will likely be disposed of at USPCI near Lake Point, Utah. The results of the tests are not yet available, but will be included in the forthcoming remediation plan.

LONG-TERM GROUND WATER QUALITY MONITORING, ROUND 3

The long-term ground water quality monitoring program agreed to by 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 dissolved solids, sulfate and chloride (Table 1). The field and laboratory water quality data for these selected monitor wells for Rounds 1, 2 and 3 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 presented in Appendix A.

INORGANIC CONSTITUENTS

The laboratory results for Rounds 1, 2 and 3 long-term ground water quality monitoring for the inorganic constituents are summarized in Table 2. These include data for total dissolved solids (TDS), sulfate (SO_4) and chloride (Cl). The data from Round 3 should probably be compared to the November 1987 Round 1 water quality data, since there was flow in the Farmers Mutual Irrigation Ditch during the November 1987 Round 1 sampling; although flows had ceased at the time of Round 3 sampling (December 12, 1989), they had continued into the early part of December. Ground waters would have probably still been impacted at this time.

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 shown a general decline since the first samples were taken in November 1987. The recent December 1989 concentrations for TDS, SO_4 and Cl at MW-10 were 910, 404 and 34 mg/l, respectively, as compared to the Round 1 concentrations of these constituents of 1,240, 568 and 46 mg/l, respectively. Similar-

ly, the December 1989 concentrations for TDS, SO_4 and Cl at MW-9 were 1,260, 638 and 38 mg/l, as compared to the Round 1 concentrations of 1,520, 863 and 43 mg/l, respectively.

The water quality in off-site MW-13 shows some improvement since Round 1, with current TDS, SO_4 and Cl concentrations of 3,580, 1,890 and 170 mg/l as compared to Round 1 concentrations of 3,700, 1,980 and 257 mg/l, respectively. Increased concentrations detected in MW-13 in Round 3 as compared to Round 2 long-term monitoring are believed to be due to the higher water table (0.35 feet versus 1.9 feet deep) and resultant flushing of the unsaturated zone. MW-13 is located in a known ground water discharge zone where evaporite deposits (reflecting mineralization of the ground water) can be observed on the ground surface.

The water quality off-site at MW-15 degraded slightly since Rounds 1 and 2, probably also as a result of the higher water table (0.77 feet versus 2.3 feet deep) and resultant flushing action.

The general reduction in the concentration of the inorganic constituents in the ground water at MW-9, MW-10 and MW-13 is believed to be due primarily to the 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 ditch waters tended to flush constituents out of the unsaturated zone and into the ground water.

The water quality in the five monitor wells (MW-9, 10, 13, 14 and 15) has generally improved since November 1987 and since April/May 1989 Round 1, when MW-14 and MW-15 were first sampled. The most significant decrease in TDS concentration has been observed in MW-14, where the recent TDS concentration measured 2,620 mg/l as compared to 6,140 mg/l measured initially in the Round 1 long-term monitoring.

ORGANIC CONSTITUENTS

The laboratory results for the constituents detected for the (December 1989) Round 3 and Rounds 1 and 2 long-term monitoring, and for the three previous rounds for the five organic constituents detected (halogenated and aromatic volatile organics) are presented in Table 3. The constituents that have been detected are 1-2 dichloroethane (1-2 DCA), total xylenes, ethylbenzene, toluene and benzene. The only parameter that has been detected consistently, although at very low concentrations, has been 1-2 DCA.

The concentrations of the organic contaminants at MW-10 (on-site) have decreased slightly, but are essentially the same as measured in previous sampling rounds. Only 1-2 DCA has been detected in all of the previous rounds, although the concentration is very low at 2.8 ug/l, well below 10 ug/l and 5 ug/l, the State of New Mexico and federal Environmental Protection Agency constituent concentrations for drinking water, respectively. Similar ground water quality trends are 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 and 3.4 ug/l in Rounds 2 and 3, respectively. None of the other organic constituents have been detected in any of the 5 monitor wells since the August 1989 Round 2 monitoring. No organic contaminants have been detected at MW-15, located off-site south of the tank farm and south of Highway 489.

The analytical data obtained by the New Mexico EID (Bill Olson) also confirms the recent results. The New Mexico Health Department's laboratory analyzed five monitor well water samples for halogenated and aromatic volatile organics. The only constituent detected was 1,2-DCA in MW-9, MW-10 and MW-14 at concentrations of 1.2 ug/l, 1.7 ug/l and 2.6 ug/l, respectively.

No organic parameters were detected in MW-6 and MW-11. This is significant in that 1,2-DCA was detected in 1987-1988 at MW-6 at concentrations ranging from 4.9 to 16 ug/l and in MW-11 at concentrations from 1.0 to 4.6 ug/l. These reductions in 1,2-DCA indicate that there currently is no ground water contamination from the tank farm at MW-6 (located about 1,000 feet off-site to the southwest and at MW-11 (located on-site in the deep aquifer.

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 biodegradation studies to date indicate that enhanced biodegradation in conjunction with ground water withdrawals and surface sprinkling of the pumped ground water would be effective for site remediation and on-site containment of contaminated ground waters. The modified ground water remediation plan that will include additional on-site ground water quality and eastern sludge pit characterization data should be completed in about one month.

- The water quality data from Rounds 1, 2 and 3 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 continue to be much lower in both Rounds 2 and 3, indicating that Round 1 data may have monitored the influence of natural ground water discharge. Very low concentrations of 1-2 DCA (2.6 and 3.4 ug/l) were detected off-site at MW-9 and MW-14. These concentrations are well below New Mexico and federal EPA drinking water quality standards. Any impacts to the ground waters at MW-9 and MW-14 from the refinery tank farm do not appear to be significant. All of the monitor well

data continue to indicate that off-site ground water contamination from the tank farm is not significant.

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.

Dames & Moore, November 1989. 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.

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 A)

TABLE 2

LABORATORY RESULTS FOR MAJOR IONS, ROUND 3
LONG-TERM MONITORING, (AND PRIOR ANALYTICAL DATA RESULTS)
FOR MAVERIK COUNTRY STORES, REFINERY TANK FARM, KIRTLAND, NEW MEXICO

Sample Site Designation(1)	TDS(3) (mg/1)					Sulfate(3) mg/1					Chloride(3) mg/1				
NM MCL	1,000					600					250				
EPA MCL	500		(Long-Term)			250		(Long-Term)			250		(Long-Term)		
Rounds	1	2	1	2	3	1	2	1	2	3	1	2	1	2	3
Wells															
On-Site															
MW10(3)	1,240*	2,725*	2,310*	990	910	568	1,640*	1,190*	470	404	46	191	146	45	34
Off-Site															
MW9(3)	1,520*	2,160*	1,420*	1,200*	1,260*	863*	1,510*	727*	624*	638*	43	81	39	37	38
MW13(3)	3,700*	1,850*	2,480*	2,660	3,580*	1,980*	920*	1,350*	1,350*	1,890*	257*	82	94	78	170
MW14(3)	-	-	6,140*	2,560*	2,620*	-	-	3,320*	1,360*	1,370*	-	-	406*	114	116
MW15(3)	-	-	2,360*	1,900*	2,940*	-	-	1,220*	1,030*	1,720*	-	-	178	139	204

Footnotes:
(1) Data from Rounds 1 and 2 and from Rounds 1, 2 and 3 long-term monitoring are presented for each sample site in subsequent columns, respectively.
- Indicates not analyzed
(2) (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)
(Round 1 Long-Term Monitoring, sampled April 27, 1989 and May 4, 1989)
(Round 2 Long-Term Monitoring, sampled August 10, 1989)
(Round 3 Long-Term Monitoring, Sampled December 12, 1989)
* Exceeds New Mexico MCL For Drinking Water.

TABLE 3

LABORATORY RESULTS FOR DETECTED ORGANIC CONSTITUENTS, ROUND 3 LONG-TERM MONITORING
(AND PRIOR ANALYTICAL DATA RESULTS)
FOR MAVERIK COUNTRY STORES, REFINERY TANK FARM, KIRTLAND, NEW MEXICO
(Round 3 Long-Term Monitoring, Sampled December 12, 1989)
(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)			10,000(3)			(Long-Term)			700(3)			(Long-Term)			2,000(3)			(long-Term)			5			(Long-Term)		
Rounds	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Wells																														
On-Site																														
MW10(2)	3.2	1.3	5.7	3.3	1.6	2.8	<0.50	<0.50	<0.50	<1.0	<1.0	<1.0	<0.50	<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	<0.50	<0.50
Off-Site																														
MW9(2)	8.3	8.6	5.6	4.5	3.4	2.6	<0.50	<0.50	<0.50	<1.0	<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	<0.50	<0.50	<0.50
MW13(2)	<1	1.9	1.9	7.4	6.0	<1.0	2.23	1.68	<0.50	<1.0	<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	<0.50	<0.50	<0.50
MW14(2)	-	-	-	<1.0	3.2	3.4	-	-	-	3.2	<1.0	<1.0	-	-	-	<0.50	<0.50	<0.50	-	-	-	1.1	<0.50	<0.50	-	-	-	<0.50	<0.50	<0.50
MW15(2)	-	-	-	<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	-	<0.50	<0.50	<0.50	-	-	-	<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 consecutive columns.
(2) Constituents for long-term monitoring, from designated wells as indicated.
(3) EPA proposed MCL's and MCLG's (May 22, 1989).
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

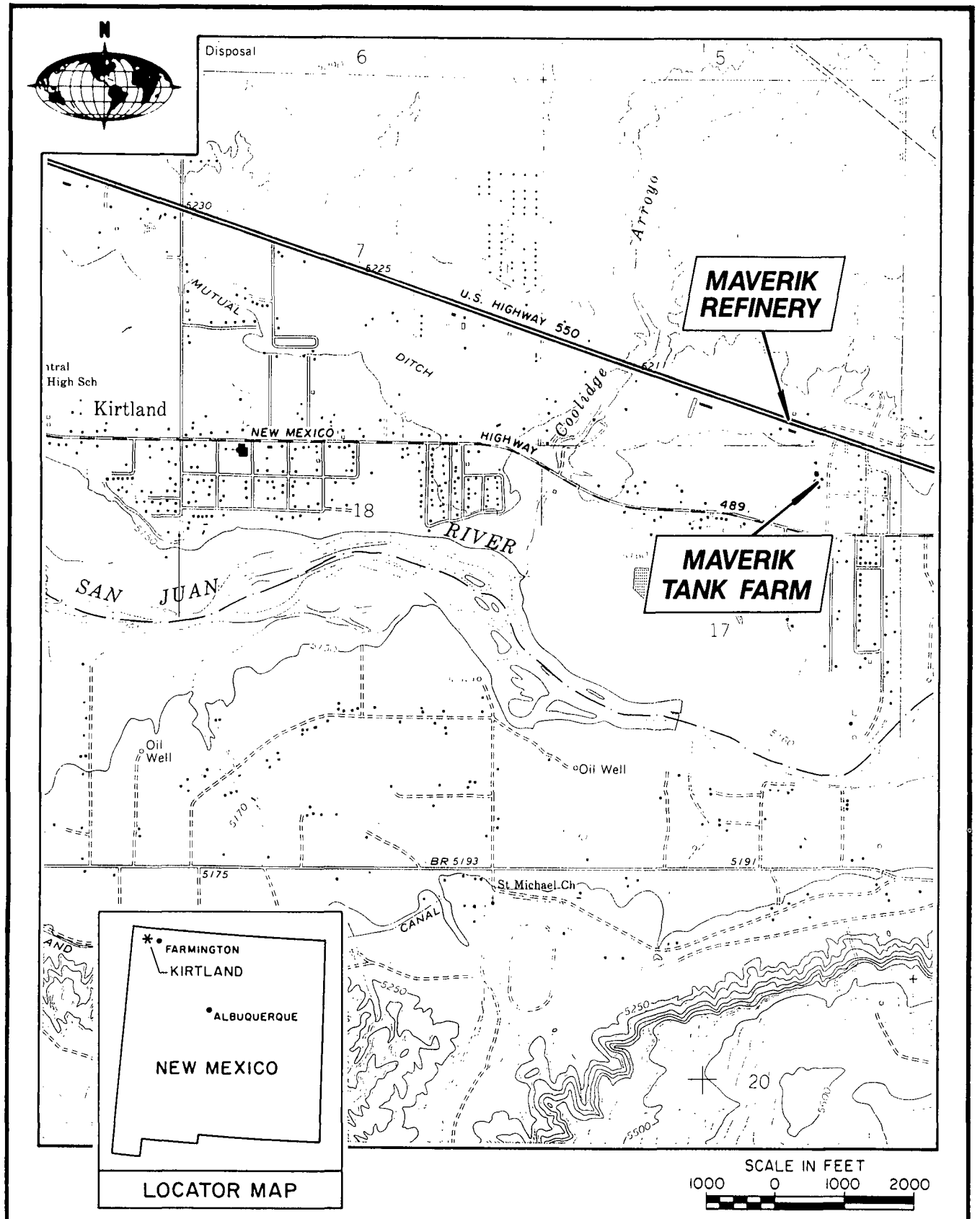
CHARACTERISTICS OF ORGANIC COMPOUNDS DETECTED
LONG-TERM REMEDIATION MONITORING

	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.



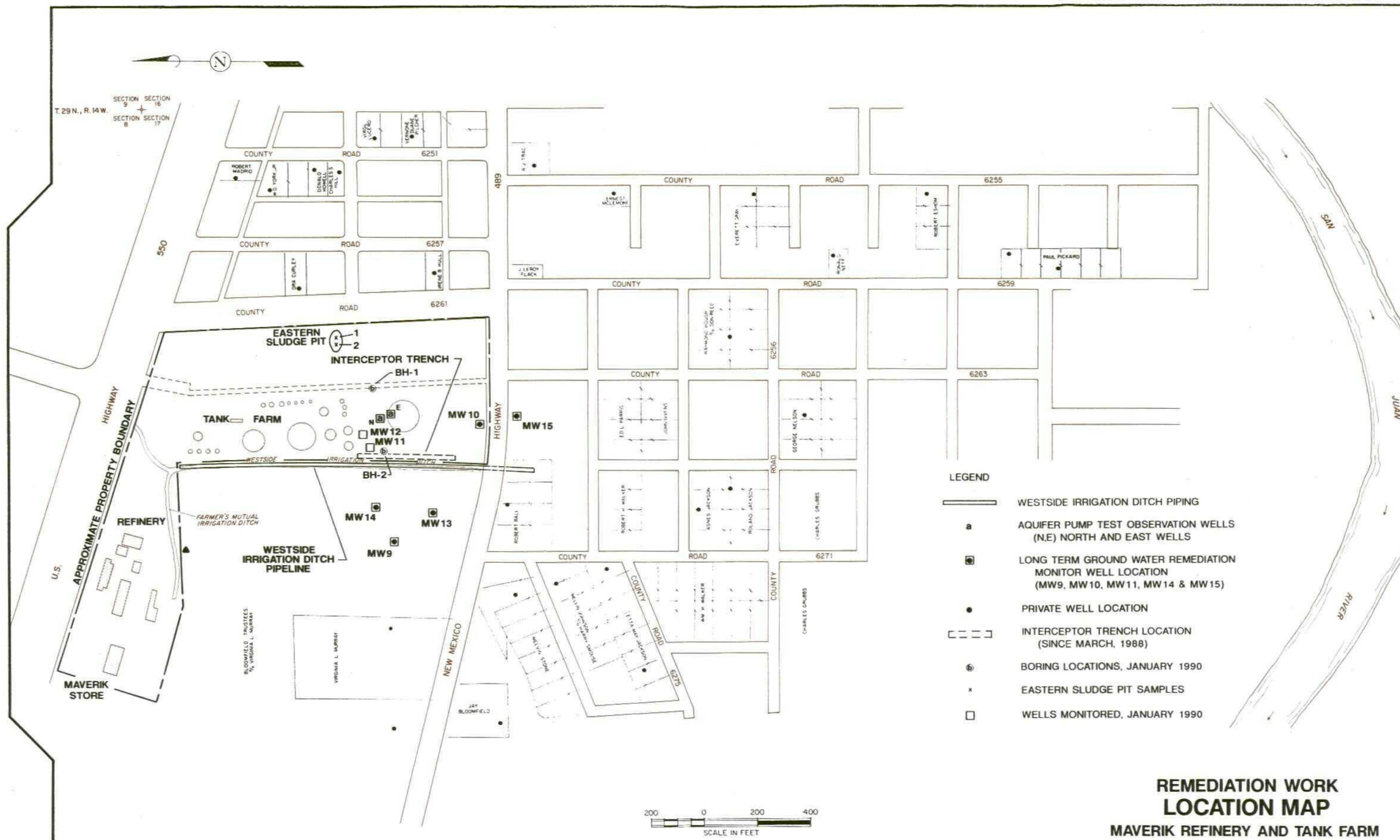
VICINITY MAP

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

Dames & Moore

PLATE 1

FILE 11819-005-031 DATE 12-7-87 BY ____ CHECKED BY ____ DATE ____



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.

REMEDIATION WORK
LOCATION MAP
MAVERIK REFINERY AND TANK FARM
KIRTLAND, NEW MEXICO
(JANUARY 1990)

Dames & Moore

PLATE 2

APPENDIX A

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

APPENDIX A

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

WATER QUALITY SAMPLING

The monitor wells sampled for long-term remediation monitoring Round 3 (MW-9, MW-10, MW-13, MW-14 and MW-15) were purged with a teflon bailer, 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 casing volumes of water had been removed. Water level data and the results of the field water quality analytical tests are presented in Table A-1.

The drop pipe that had been installed in monitor well MW-13 prior to Round 2 sampling (as described in our February 1988 report), was also used during this sampling round. The drop pipe was installed after a free oil phase had been detected in MW-13 during Round 1 sampling.

Sample bottles with appropriate preservatives (as detailed in RMAL's report), were shipped directly to the site by the laboratory. All water 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

Analytical results from RMAL for the major inorganic and organic parameters for this round and previous sampling rounds for the five designated monitor wells are included in Table A-2. The data are presented in columns for comparative purposes. The detailed report from RMAL for Round 3 long-term monitoring is also included in this appendix.

The water quality analyses for long-term monitoring 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.

APPENDIX A

REPORT OF ANALYSES

TABLE A-1

SUMMARY OF FIELD DATA
FOR LONG-TERM GROUND WATER QUALITY
REMEDIATION MONITORING ROUNDS 1, 2 AND 3(1)

Well	Depth to Water (From Ground Surface, in ft.)			pH (pH units)		Conductivity umhos/cm		Temperature °C		Remarks(2)
	Round 1	Round 2	Round 3	Round 1	Round 3	Round 1	Round 3	Round 1	Round 3	
MW-9	2.77	1.7	0.90	7.04	7.58	2,000	1,600	14.8	-	Silty
MW-10	2.27	2.5	1.20	6.46	7.48	3,500	1,350	13.0	-	Silty
MW-13	1.9	1.9	0.35	8.06	7.60	2,500	5,100	16.0	-	Initially frozen, silty Very slow to recharge (about 24 hrs.)
MW-14	3.0	4.5	1.58	7.08	7.40	8,000	3,350	16.2	-	Initially silty, Cleared
MW-15	1.0	2.3	0.77	6.45	7.27	3,500	2,500	14.2	-	Initially Rusty, Cleared but silty

(1) Round 1 Data collected April 27, 1989 and May 4, 1989.
Round 2 Data collected August 10, 1989, measured from top of casing.
Round 3 Data collected December 11, 12, 1989.
(2) Round 3 remarks.
- Not tested

Note: No field tests were conducted during Round 2 sampling.

TABLE A-2

MAVERIK-KIRTLAND WATER QUALITY

SAMPLE IDENTIFICATION	MW-9	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	12-12-89
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	38.0
Sulfate (SO4)	863.	1510.	*	727.	624.	638.
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	1260.0
VOLATILE ORGANICS DETECTED (ug/L)						
Benzene	< .50	< .50	< .50	< .50	< .50	< .50
Ethylbenzene	< .50	< .50	< .50	< .50	< .50	< .50
Toluene	< .50	< .50	< .50	< .50	< .50	< .50
m-Xylene	< .50	< .50	*	*	*	*
o,p-Xylene	< .50	< .50	*	*	*	*
Total Xylene	*	*	< .50	< 1.00	< 1.00	< 1.00
1,2 Dichloroethane	8.30	8.60	5.60	4.50	3.40	2.60
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 A-2 (Continued-2)

MAVERIK-KIRTLAND WATER QUALITY

SAMPLE IDENTIFICATION	MW-10	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	12-12-89
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	34.0
Sulfate (SO4)	568.	1640.	*	1190.	470.	404.
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	910.0
VOLATILE ORGANICS DETECTED (ug/L)						
Benzene	< .50	< .50	< .50	< .50	< .50	< .50
Ethylbenzene	< .50	< .50	< .50	< .50	< .50	< .50
Toluene	< .50	< .50	< .50	.52	< .50	< .50
m-Xylene	< .50	< .50	*	*	*	*
o,p-Xylene	< .50	< .50	*	*	*	*
Total Xylene	*	*	< .50	< 1.00	< 1.00	< 1.00
1,2 Dichloroethane	3.20	1.30	5.70	3.30	1.60	2.80
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 A-2 (Continued-3)

MAVERIK-KIRTLAND WATER QUALITY

SAMPLE IDENTIFICATION	MW-13	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	12-12-89
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	170.0
Sulfate (SO4)	1980.	920.	*	1350.	1350.	1890.
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	3580.0
VOLATILE ORGANICS DETECTED (ug/L)						
Benzene	< .50	< .50	< .50	< .50	< .50	< .50
Ethylbenzene	.54	< .50	< .50	< .50	< .50	< .50
Toluene	< .50	< .50	< .50	< .50	< .50	< .50
m-Xylene	1.40	1.10	*	*	*	*
o,p-Xylene	.83	.58	*	*	*	*
Total Xylene	*	*	< .50	< 1.00	< 1.00	< 1.00
1,2 Dichloroethane	< 1.00	1.90	1.90	7.40	6.00	< 1.00
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 A-2 (Continued-4)

MAVERIK-KIRTLAND WATER QUALITY

SAMPLE IDENTIFICATION	MW-14	MW-14	MW-14
DATE SAMPLED	4-27-89	8-10-89	12-12-89
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	116.0
Sulfate (SO4)	3320.	1360.	1370.
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	2620.0
VOLATILE ORGANICS DETECTED (ug/L)			
Benzene	< .50	.50	.50
Ethylbenzene	< .50	.50	.50
Toluene	1.10	< .50	< .50
m-Xylene	*	*	*
o,p-Xylene	*	*	*
Total Xylene	3.20	1.00	1.00
1,2 Dichloroethane	< 1.00	3.20	3.40
TOTAL ORGANIC LEAD (mg/L)			
Total Organic Lead	*	*	*

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

TABLE A-2 (Continued-5)

MAVERIK-KIRTLAND WATER QUALITY

SAMPLE IDENTIFICATION	MW-15	MW-15	MW-15
DATE SAMPLED	4-27-89	8-10-89	12-12-89
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	204.0
Sulfate (SO4)	1220.	1030.	1720.
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	2940.0
VOLATILE ORGANICS DETECTED (ug/L)			
Benzene	< .50	< .50	< .50
Ethylbenzene	< .50	< .50	< .50
Toluene	< .50	< .50	< .50
m-Xylene	*	*	*
o,p-Xylene	*	*	*
Total Xylene	< 1.00	< 1.00	< 1.00
1,2 Dichloroethane	< 1.00	< 1.00	< 1.00
TOTAL ORGANIC LEAD (mg/L)			
Total Organic Lead	*	*	*

<: Parameter value is less than given detection limits

*: Parameter was not analyzed.

Rocky Mountain
Analytical Laboratory

Enseco

January 3, 1990

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

Dear Dr. Olsen:

Enclosed is the report for five aqueous samples we received at Enseco-Rocky Mountain Analytical Laboratory on December 13, 1989.

Included with the report is a quality control summary.

Please call if you have any questions.

Sincerely,

Randall Thompson
Program Administrator

Reviewed by:

Craig Huff
Program Administrator

RT/CH/lw
Enclosures

RMAL #007832

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

Rocky Mountain
Analytical Laboratory

Enseco

ANALYTICAL RESULTS

FOR

DAMES AND MOORE

ENSECO-RMAL NO. 007832

JANUARY 3, 1990

Reviewed by:

Randall Thompson

Craig Huff

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

I. OVERVIEW

On December 13, 1989, Enseco-Rocky Mountain Analytical Laboratory received five aqueous samples from Dames and 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

Sample 007832-0005 was originally analyzed for TDS within its holding time but due to a poor TDS/conductance ratio, the sample was reanalyzed. The data from this second analysis is considered more accurate and has been reported. This second analysis took place one day outside of the 7 day holding stated in Enseco's QAPP.

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.

SAMPLE DESCRIPTION INFORMATION
for
Dames and Moore

Lab ID	Client ID	Matrix	Sampled Date	Sampled Time	Received Date
007832-0001-SA	MW15	AQUEOUS	12 DEC 89	08:00	13 DEC 89
007832-0002-SA	MW14	AQUEOUS	12 DEC 89	09:30	13 DEC 89
007832-0003-SA	MW10	AQUEOUS	12 DEC 89	12:00	13 DEC 89
007832-0004-SA	MW9	AQUEOUS	12 DEC 89	10:15	13 DEC 89
007832-0005-SA	MW13	AQUEOUS	12 DEC 89	11:00	13 DEC 89

ANALYTICAL TEST REQUESTS
for
Dames and Moore

Lab ID: 007832	Group Code	Analysis Description	Custom Test?
0001 - 0005	A	Halogenated Volatile Organics	N
		Aromatic Volatile Organics	N
		Total Dissolved Solids (TDS)	N
		Sulfate, Ion Chromatography	N
		Chloride, Ion Chromatography	N

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.

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW15
Lab ID: 007832-0001-SA Enseco ID: 1062596
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW14
Lab ID: 007832-0002-SA Enseco ID: 1062597
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW10
Lab ID: 007832-0003-SA Enseco ID: 1062599
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 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	2.8	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW9
Lab ID: 007832-0004-SA Enseco ID: 1062600
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 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	2.6	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW13
Lab ID: 007832-0005-SA Enseco ID: 1062602
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW15
Lab ID: 007832-0001-SA Enseco ID: 1062596
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW14
Lab ID: 007832-0002-SA Enseco ID: 1062597
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW10
Lab ID: 007832-0003-SA Enseco ID: 1062599
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW9
Lab ID: 007832-0004-SA Enseco ID: 1062600
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW13
Lab ID: 007832-0005-SA Enseco ID: 1062602
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

General Inorganics

Client Name: Dames and Moore
Client ID: MW15
Lab ID: 007832-0001-SA
Enseco ID: 1062596
Matrix: AQUEOUS
Sampled: 12 DEC 89
Received: 13 DEC 89
Authorized: 13 DEC 89
Prepared: See Below
Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	204	mg/L	3	300.0	NA	18 DEC 89
Sulfate	1720	mg/L	5	300.0	NA	18 DEC 89
Total Dissolved Solids	2940	mg/L	10	160.1	NA	18 DEC 89

ND = Not detected
NA = Not applicable

Reported By: Pam Rosas

Approved By: Kimberly Conroy

Enseco

General Inorganics

Client Name: Dames and Moore
Client ID: MW14
Lab ID: 007832-0002-SA
Enseco ID: 1062597
Matrix: AQUEOUS
Sampled: 12 DEC 89
Received: 13 DEC 89
Authorized: 13 DEC 89
Prepared: See Below
Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	116	mg/L	3	300.0	NA	18 DEC 89
Sulfate	1370	mg/L	5	300.0	NA	18 DEC 89
Total Dissolved Solids	2620	mg/L	10	160.1	NA	18 DEC 89

ND = Not detected
NA = Not applicable

Reported By: Pam Rosas

Approved By: Kimberly Conroy

General Inorganics

Client Name: Dames and Moore
Client ID: MW10
Lab ID: 007832-0003-SA Enseco ID: 1062599
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	34	mg/L	3	300.0	NA	18 DEC 89
Sulfate	404	mg/L	5	300.0	NA	18 DEC 89
Total Dissolved Solids	910	mg/L	10	160.1	NA	18 DEC 89

ND = Not detected
NA = Not applicable

Reported By: Pam Rosas Approved By: Kimberly Conroy

Enseco

General Inorganics

Client Name: Dames and Moore
Client ID: MW9
Lab ID: 007832-0004-SA
Enseco ID: 1062600
Matrix: AQUEOUS
Sampled: 12 DEC 89
Received: 13 DEC 89
Authorized: 13 DEC 89
Prepared: See Below
Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	38	mg/L	3	300.0	NA	18 DEC 89
Sulfate	638	mg/L	5	300.0	NA	18 DEC 89
Total Dissolved Solids	1260	mg/L	10	160.1	NA	18 DEC 89

ND = Not detected
NA = Not applicable

Reported By: Pam Rosas

Approved By: Kimberly Conroy

Enseco

General Inorganics

Client Name: Dames and Moore
Client ID: MW13
Lab ID: 007832-0005-SA
Enseco ID: 1062602
Matrix: AQUEOUS
Sampled: 12 DEC 89
Received: 13 DEC 89
Authorized: 13 DEC 89
Prepared: See Below
Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	170	mg/L	3	300.0	NA	18 DEC 89
Sulfate	1890	mg/L	5	300.0	NA	18 DEC 89
Total Dissolved Solids	3580	mg/L	10	160.1	NA	20 DEC 89

ND = Not detected
NA = Not applicable

Reported By: Pam Rosas

Approved By: Kimberly Conroy

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).

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

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)
007832-0001-SA	AQUEOUS	601-A	15 DEC 89-L	15 DEC 89-L
007832-0001-SA	AQUEOUS	602-A	15 DEC 89-L	15 DEC 89-L
007832-0002-SA	AQUEOUS	601-A	15 DEC 89-L	15 DEC 89-L
007832-0002-SA	AQUEOUS	602-A	15 DEC 89-L	15 DEC 89-L
007832-0003-SA	AQUEOUS	601-A	15 DEC 89-L	15 DEC 89-L
007832-0003-SA	AQUEOUS	602-A	15 DEC 89-L	15 DEC 89-L
007832-0004-SA	AQUEOUS	601-A	15 DEC 89-L	15 DEC 89-L
007832-0004-SA	AQUEOUS	602-A	15 DEC 89-L	15 DEC 89-L
007832-0005-SA	AQUEOUS	601-A	15 DEC 89-L	15 DEC 89-L
007832-0005-SA	AQUEOUS	602-A	15 DEC 89-L	15 DEC 89-L

DUPLICATE CONTROL SAMPLE REPORT
Volatile Organics by GC

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	AVG	Accuracy Average(%) DCS	Accuracy Limits	Precision (RPD) DCS	Precision Limit
Category: 601-A Matrix: AQUEOUS QC Lot: 15 DEC 89-L Concentration Units: ug/L								
1,1-Dichloroethane	5.0	5.36	5.07	5.22	104	80-130	5.6	20
Chloroform	5.0	6.07	5.44	5.76	115	80-120	11	20
Bromodichloromethane	10	10.3	9.25	9.76	98	80-120	10	20
Trichloroethene	5.0	4.41	4.12	4.26	85	70-120	6.8	20
Chlorobenzene	5.0	5.76	5.21	5.48	110	80-120	10	20
Category: 602-A Matrix: AQUEOUS QC Lot: 15 DEC 89-L Concentration Units: ug/L								
Benzene	5.0	4.76	4.55	4.66	93	75-115	4.5	20
Toluene	5.0	5.14	4.74	4.94	99	75-115	8.1	20
Chlorobenzene	5.0	5.58	5.13	5.36	107	75-115	8.4	20
Ethylbenzene	5.0	5.60	5.12	5.36	107	75-115	9.0	20
Xylenes (total)	5.0	5.40	4.82	5.11	102	75-115	11	20
1,3-Dichlorobenzene	5.0	5.31	4.73	5.02	100	75-115	12	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: 601-A Matrix: AQUEOUS QC Lot: 15 DEC 89-L QC Run: 15 DEC 89-L Concentration Units: ug/L				
Bromochloromethane	30.0	32.8	109	20-160
Category: 602-A Matrix: AQUEOUS QC Lot: 15 DEC 89-L QC Run: 15 DEC 89-L Concentration Units: ug/L				
a,a,a-Trifluorotoluene	30.0	32.2	107	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: 601-A			
Matrix: AQUEOUS			
QC Lot: 15 DEC 89-L QC Run: 15 DEC 89-L			
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
Test: 602-AP			
Matrix: AQUEOUS			
QC Lot: 15 DEC 89-L QC Run: 15 DEC 89-L			
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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)
007832-0001-SA	AQUEOUS	TDS-A	18 DEC 89-A	18 DEC 89-A
007832-0001-SA	AQUEOUS	SO4-IC-A	18 DEC 89-M	-
007832-0001-SA	AQUEOUS	CL-IC-A	18 DEC 89-M	-
007832-0002-SA	AQUEOUS	TDS-A	18 DEC 89-A	18 DEC 89-A
007832-0002-SA	AQUEOUS	SO4-IC-A	18 DEC 89-M	-
007832-0002-SA	AQUEOUS	CL-IC-A	18 DEC 89-M	-
007832-0003-SA	AQUEOUS	TDS-A	18 DEC 89-A	18 DEC 89-A
007832-0003-SA	AQUEOUS	SO4-IC-A	18 DEC 89-M	-
007832-0003-SA	AQUEOUS	CL-IC-A	18 DEC 89-M	-
007832-0004-SA	AQUEOUS	TDS-A	18 DEC 89-A	18 DEC 89-A
007832-0004-SA	AQUEOUS	SO4-IC-A	18 DEC 89-M	-
007832-0004-SA	AQUEOUS	CL-IC-A	18 DEC 89-M	-
007832-0005-SA	AQUEOUS	TDS-A	20 DEC 89-A	20 DEC 89-A
007832-0005-SA	AQUEOUS	SO4-IC-A	18 DEC 89-M	-
007832-0005-SA	AQUEOUS	CL-IC-A	18 DEC 89-M	-

DUPLICATE CONTROL SAMPLE REPORT
Wet Chemistry Analysis and Preparation

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	AVG	Accuracy Average(%) DCS	Accuracy Limits	Precision (RPD) DCS	Precision Limit
Category: TDS-A Matrix: AQUEOUS QC Lot: 18 DEC 89-A Concentration Units: mg/L								
Total Dissolved Solids	1200	1170	1150	1160	97	90-110	1.7	10
Category: SO4-IC-A Matrix: AQUEOUS QC Lot: 18 DEC 89-M Concentration Units: mg/L								
Sulfate	200	196	204	200	100	93-107	4.0	20
Category: CL-IC-A Matrix: AQUEOUS QC Lot: 18 DEC 89-M Concentration Units: mg/L								
Chloride	100	95.6	100	97.8	98	92-108	4.5	20
Category: TDS-A Matrix: AQUEOUS QC Lot: 20 DEC 89-A Concentration Units: mg/L								
Total Dissolved Solids	1210	1200	1170	1180	98	90-110	2.5	10

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: 18 DEC 89-A QC Run: 18 DEC 89-A			
Total Dissolved Solids	ND	mg/L	10
Test: TDS-BAL-A Matrix: AQUEOUS QC Lot: 20 DEC 89-A QC Run: 20 DEC 89-A			
Total Dissolved Solids	ND	mg/L	10

Rocky Mountain
Analytical Laboratory

Enseco

January 3, 1990

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

Dear Dr. Olsen:

Enclosed is the report for five aqueous samples we received at Enseco-Rocky Mountain Analytical Laboratory on December 13, 1989.

Included with the report is a quality control summary.

Please call if you have any questions.

Sincerely,

Randall Thompson
Program Administrator

Reviewed by:

Craig Huff
Program Administrator

RT/CH/lw
Enclosures

RMAL #007832

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

Rocky Mountain
Analytical Laboratory

Enseco

ANALYTICAL RESULTS

FOR

DAMES AND MOORE

ENSECO-RMAL NO. 007832

JANUARY 3, 1990

Reviewed by:

Randall Thompson

Craig Huff

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

I. OVERVIEW

On December 13, 1989, Enseco-Rocky Mountain Analytical Laboratory received five aqueous samples from Dames and 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

Sample 007832-0005 was originally analyzed for TDS within its holding time but due to a poor TDS/conductance ratio, the sample was reanalyzed. The data from this second analysis is considered more accurate and has been reported. This second analysis took place one day outside of the 7 day holding stated in Enseco's QAPP.

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.

ANALYTICAL TEST REQUESTS
for
Dames and Moore

Lab ID: 007832	Group Code	Analysis Description	Custom Test?
0001 - 0005	A	Halogenated Volatile Organics	N
		Aromatic Volatile Organics	N
		Total Dissolved Solids (TDS)	N
		Sulfate, Ion Chromatography	N
		Chloride, Ion Chromatography	N

SAMPLE DESCRIPTION INFORMATION
for
Dames and Moore

Lab ID	Client ID	Matrix	Sampled Date	Sampled Time	Received Date
007832-0001-SA	MW15	AQUEOUS	12 DEC 89	08:00	13 DEC 89
007832-0002-SA	MW14	AQUEOUS	12 DEC 89	09:30	13 DEC 89
007832-0003-SA	MW10	AQUEOUS	12 DEC 89	12:00	13 DEC 89
007832-0004-SA	MW9	AQUEOUS	12 DEC 89	10:15	13 DEC 89
007832-0005-SA	MW13	AQUEOUS	12 DEC 89	11:00	13 DEC 89

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW15
Lab ID: 007832-0001-SA Enseco ID: 1062596
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW15
Lab ID: 007832-0001-SA Enseco ID: 1062596
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

General Inorganics

Client Name: Dames and Moore
Client ID: MW15
Lab ID: 007832-0001-SA Enseco ID: 1062596
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	204	mg/L	3	300.0	NA	18 DEC 89
Sulfate	1720	mg/L	5	300.0	NA	18 DEC 89
Total Dissolved Solids	2940	mg/L	10	160.1	NA	18 DEC 89

ND = Not detected
NA = Not applicable

Reported By: Pam Rosas Approved By: Kimberly Conroy

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW14
Lab ID: 007832-0002-SA Enseco ID: 1062597
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW14
Lab ID: 007832-0002-SA Enseco ID: 1062597
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

General Inorganics

Client Name: Dames and Moore
Client ID: MW14
Lab ID: 007832-0002-SA Enseco ID: 1062597
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	116	mg/L	3	300.0	NA	18 DEC 89
Sulfate	1370	mg/L	5	300.0	NA	18 DEC 89
Total Dissolved Solids	2620	mg/L	10	160.1	NA	18 DEC 89

ND = Not detected
NA = Not applicable

Reported By: Pam Rosas Approved By: Kimberly Conroy

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW13
Lab ID: 007832-0005-SA Enseco ID: 1062602
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW13
Lab ID: 007832-0005-SA Enseco ID: 1062602
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

General Inorganics

Client Name: Dames and Moore
Client ID: MW13
Lab ID: 007832-0005-SA Enseco ID: 1062602
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	170	mg/L	3	300.0	NA	18 DEC 89
Sulfate	1890	mg/L	5	300.0	NA	18 DEC 89
Total Dissolved Solids	3580	mg/L	10	160.1	NA	20 DEC 89

ND = Not detected
NA = Not applicable

Reported By: Pam Rosas Approved By: Kimberly Conroy

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW10
Lab ID: 007832-0003-SA Enseco ID: 1062599
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW10
Lab ID: 007832-0003-SA Enseco ID: 1062599
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 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	2.8	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

General Inorganics

Client Name: Dames and Moore
Client ID: MW10
Lab ID: 007832-0003-SA Enseco ID: 1062599
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	34	mg/L	3	300.0	NA	18 DEC 89
Sulfate	404	mg/L	5	300.0	NA	18 DEC 89
Total Dissolved Solids	910	mg/L	10	160.1	NA	18 DEC 89

ND = Not detected
NA = Not applicable

Reported By: Pam Rosas Approved By: Kimberly Conroy

Enseco

Aromatic Volatile Organics

Method 602

Client Name: Dames and Moore
Client ID: MW9
Lab ID: 007832-0004-SA Enseco ID: 1062600
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 89

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

Enseco

Halogenated Volatile Organics

Method 601

Client Name: Dames and Moore
Client ID: MW9
Lab ID: 007832-0004-SA Enseco ID: 1062600
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: NA Analyzed: 15 DEC 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	2.6	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

ND = Not detected
NA = Not applicable

Reported By: William Sullivan Approved By: Stephanie Boehnke

General Inorganics

Client Name: Dames and Moore
Client ID: MW9
Lab ID: 007832-0004-SA Enseco ID: 1062600
Matrix: AQUEOUS Sampled: 12 DEC 89 Received: 13 DEC 89
Authorized: 13 DEC 89 Prepared: See Below Analyzed: See Below

Parameter	Result	Units	Reporting Limit	Analytical Method	Prepared Date	Analyzed Date
Chloride	38	mg/L	3	300.0	NA	18 DEC 89
Sulfate	638	mg/L	5	300.0	NA	18 DEC 89
Total Dissolved Solids	1260	mg/L	10	160.1	NA	18 DEC 89

ND = Not detected
NA = Not applicable

Reported By: Pam Rosas Approved By: Kimberly Conroy

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).

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

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)
007832-0001-SA	AQUEOUS	601-A	15 DEC 89-L	15 DEC 89-L
007832-0001-SA	AQUEOUS	602-A	15 DEC 89-L	15 DEC 89-L
007832-0002-SA	AQUEOUS	601-A	15 DEC 89-L	15 DEC 89-L
007832-0002-SA	AQUEOUS	602-A	15 DEC 89-L	15 DEC 89-L
007832-0003-SA	AQUEOUS	601-A	15 DEC 89-L	15 DEC 89-L
007832-0003-SA	AQUEOUS	602-A	15 DEC 89-L	15 DEC 89-L
007832-0004-SA	AQUEOUS	601-A	15 DEC 89-L	15 DEC 89-L
007832-0004-SA	AQUEOUS	602-A	15 DEC 89-L	15 DEC 89-L
007832-0005-SA	AQUEOUS	601-A	15 DEC 89-L	15 DEC 89-L
007832-0005-SA	AQUEOUS	602-A	15 DEC 89-L	15 DEC 89-L

DUPLICATE CONTROL SAMPLE REPORT
Volatile Organics by GC

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	AVG	Accuracy Average(%) DCS	Accuracy Limits	Precision (RPD) DCS	Precision Limit
Category: 601-A Matrix: AQUEOUS QC Lot: 15 DEC 89-L Concentration Units: ug/L								
1,1-Dichloroethane	5.0	5.36	5.07	5.22	104	80-130	5.6	20
Chloroform	5.0	6.07	5.44	5.76	115	80-120	11	20
Bromodichloromethane	10	10.3	9.25	9.76	98	80-120	10	20
Trichloroethene	5.0	4.41	4.12	4.26	85	70-120	6.8	20
Chlorobenzene	5.0	5.76	5.21	5.48	110	80-120	10	20
Category: 602-A Matrix: AQUEOUS QC Lot: 15 DEC 89-L Concentration Units: ug/L								
Benzene	5.0	4.76	4.55	4.66	93	75-115	4.5	20
Toluene	5.0	5.14	4.74	4.94	99	75-115	8.1	20
Chlorobenzene	5.0	5.58	5.13	5.36	107	75-115	8.4	20
Ethylbenzene	5.0	5.60	5.12	5.36	107	75-115	9.0	20
Xylenes (total)	5.0	5.40	4.82	5.11	102	75-115	11	20
1,3-Dichlorobenzene	5.0	5.31	4.73	5.02	100	75-115	12	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	Measured	Accuracy(%) SCS	Limits
Category: 601-A Matrix: AQUEOUS QC Lot: 15 DEC 89-L QC Run: 15 DEC 89-L Concentration Units: ug/L				
Bromochloromethane	30.0	32.8	109	20-160
Category: 602-A Matrix: AQUEOUS QC Lot: 15 DEC 89-L QC Run: 15 DEC 89-L Concentration Units: ug/L				
a,a,a-Trifluorotoluene	30.0	32.2	107	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: 601-A			
Matrix: AQUEOUS			
QC Lot: 15 DEC 89-L QC Run: 15 DEC 89-L			
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
Test: 602-AP			
Matrix: AQUEOUS			
QC Lot: 15 DEC 89-L QC Run: 15 DEC 89-L			
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethylbenzene	ND	ug/L	0.50
Xylenes (total)	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)
007832-0001-SA	AQUEOUS	TDS-A	18 DEC 89-A	18 DEC 89-A
007832-0001-SA	AQUEOUS	SO4-IC-A	18 DEC 89-M	-
007832-0001-SA	AQUEOUS	CL-IC-A	18 DEC 89-M	-
007832-0002-SA	AQUEOUS	TDS-A	18 DEC 89-A	18 DEC 89-A
007832-0002-SA	AQUEOUS	SO4-IC-A	18 DEC 89-M	-
007832-0002-SA	AQUEOUS	CL-IC-A	18 DEC 89-M	-
007832-0003-SA	AQUEOUS	TDS-A	18 DEC 89-A	18 DEC 89-A
007832-0003-SA	AQUEOUS	SO4-IC-A	18 DEC 89-M	-
007832-0003-SA	AQUEOUS	CL-IC-A	18 DEC 89-M	-
007832-0004-SA	AQUEOUS	TDS-A	18 DEC 89-A	18 DEC 89-A
007832-0004-SA	AQUEOUS	SO4-IC-A	18 DEC 89-M	-
007832-0004-SA	AQUEOUS	CL-IC-A	18 DEC 89-M	-
007832-0005-SA	AQUEOUS	TDS-A	20 DEC 89-A	20 DEC 89-A
007832-0005-SA	AQUEOUS	SO4-IC-A	18 DEC 89-M	-
007832-0005-SA	AQUEOUS	CL-IC-A	18 DEC 89-M	-

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 (RPD) Limit
Category: TDS-A Matrix: AQUEOUS QC Lot: 18 DEC 89-A Concentration Units: mg/L								
Total Dissolved Solids	1200	1170	1150	1160	97	90-110	1.7	10
Category: SO4-IC-A Matrix: AQUEOUS QC Lot: 18 DEC 89-M Concentration Units: mg/L								
Sulfate	200	196	204	200	100	93-107	4.0	20
Category: CL-IC-A Matrix: AQUEOUS QC Lot: 18 DEC 89-M Concentration Units: mg/L								
Chloride	100	95.6	100	97.8	98	92-108	4.5	20
Category: TDS-A Matrix: AQUEOUS QC Lot: 20 DEC 89-A Concentration Units: mg/L								
Total Dissolved Solids	1210	1200	1170	1180	98	90-110	2.5	10

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: 18 DEC 89-A QC Run: 18 DEC 89-A			
Total Dissolved Solids	ND	mg/L	10
Test: TDS-BAL-A Matrix: AQUEOUS QC Lot: 20 DEC 89-A QC Run: 20 DEC 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

12/13/89

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 5 samples at our laboratory. They have been assigned our lab project number 007832. 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,

Randall Thompson
Program Administrator

Rocky Mountain Analytical Labor

12/13/89

SAMPLE DESCRIPTION INFORMATION

for

Dames and Moore

Sample No.	Sample Description	Sample Type	Date Sampled	Date Received	Sample Disposal
*007832-0001-SA	MW15	AQUEOUS	12/12/89	12/13/89	PENDING
*007832-0002-SA	MW14	AQUEOUS	12/12/89	12/13/89	PENDING
*007832-0003-SA	MW10	AQUEOUS	12/12/89	12/13/89	PENDING
*007832-0004-SA	MW9	AQUEOUS	12/12/89	12/13/89	PENDING
*007832-0005-SA	MW13	AQUEOUS	12/12/89	12/13/89	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

CHAIN OF CUSTODY

No.

Attn: Jeannie Haubert

Enseco Client Dames & Moore #14819-005-5302
Project Maverik Country Store Inc., Kirtland, NM
Sampling Co. Dames & Moore
Sampling Site Maverik Refinery Tank Farm, Kirtland, NM
Team Leader Terry Vandell

SAMPLE SAFE™ CONDITIONS

1. Packed by: Terry Vandell Seal # _____
2. Seal Intact Upon Receipt by Sampling Co.: (Yes) No
3. Condition of Contents: Intact
4. Sealed for Shipping by: Enseco / Dames & Moore
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
12/12/89	8:00 AM	MW15 / Ground Water	Water	3 - 40 mil	601, 602	Rust in Water - Silty Samples
				1 - 500 mil, poly	TDS, SO4, Cl	Initially Silty - Clear Samples
12/12/89	9:30 AM	MW 14 / Ground Water	Water	3 - 40 mil	601, 602	
				1 - 500 mil, poly	TDS, SO4, Cl	
12/12/89	12:00 PM	MW 10 / Ground Water	Water	3 - 40 mil	601, 602	
				1 - 500 mil, poly	TDS, SO4, Cl	
12/12/89	10:15 AM	MW 9 / Ground Water	Water	3 - 40 mil	601, 602	Silty Samples -
				1 - 500 mil, poly	TDS, SO4, Cl	
12/12/89	1:00 AM	MW 13 / Ground Water	Water	3 - 40 mil	601, 602	Initially Foreign in Standpipe
				1 - 500 mil, poly	TDS, SO4, Cl	Silty Samples

CUSTODY TRANSFERS PRIOR TO SHIPPING

	Relinquished by: (signed)	Received by: (signed)	Date	Time
1	JD Vandell	Federal Express	12/12/89	
2				
3				

SHIPPING DETAILS

Delivered to Shipper by: TERRY D. VANDELL
Method of Shipment: Federal Express Airbill # _____
Received for Lab: _____ Signed: _____ Date/Time _____
Enseco Project No. _____

White and Pink Copies to Lab Yellow to Sampler

SS-001

New Mexico Health and Environment Department

GARREY CARRUTHERS
Governor

DENNIS BOYD
Secretary

MICHAEL J. BURKHART
Deputy Secretary

RICHARD MITZELFELT
Director

January 31, 1990

Terry D. Vandell
Dames and Moore
250 East Broadway, Suite 200
Salt Lake City, Utah 84111-2480

Dear Ms. Vandell

Enclosed you will find the New Mexico Environmental Improvement Division's laboratory results from the December 13, 1989 sampling of selected monitor wells at the Maverick Refinery and Tank Farm in Kirtland, N.M. Included are the results for monitor wells MW-6, MW-9, MW-10, MW-11 and MW-14. Low levels of 1,2 Dichloroethane (EDC) were observed in the samples taken from monitor wells MW-9, MW-10 and MW-14.

Also included are the results of the blind field blank designated as monitor well MW-FB1. The field blank was prepared by filling a sample vial from a field decontaminated bailer containing deionized water. Because the deionized water was obtained from a deionizer connected to a chlorinated Santa Fe city water supply, low levels of trihalomethanes, consistent with those found in Santa Fe city water, were observed in the field blank. If you have any questions regarding the analyses or if I can be of any assistance, please call me at (505)827-2899.

Sincerely,

William Olson
Hydrologist
Ground Water/Technical Support

Enclosures

xc: William Call, Maverick Country Stores, Inc.
Stuart Castle, Ground Water Bureau Chief
Bill Bartels, Technical Support Program Manager
Dave Tomko, EID Farmington Office

— ENVIRONMENTAL IMPROVEMENT DIVISION —
Harold Runnels Building
1190 St. Francis Dr.
Santa Fe, New Mexico 87503

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

9541 WPLL

DR89-1974-C

REPORT TO: William Olson, Attn: Ground Water Bureau
N.M. Environmental Improvement Div.
1190, Saint Francis Dr.
Santa Fe, N.M. 87503

S.L.D. No. OR-_____
DATE REC. 12-15-89
PRIORITY 3
PHONE(S): 827-2799

COLLECTION CITY: Kirtland ; COUNTY: San Juan

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) |8|9|1|2|1|3|1|3|1|0|

LOCATION CODE: (Township-Range-Section-Tracts) |_|_|+|_|_|+|_|_|+|_|_| (10N06E24342)

USER CODE: |5|5|7|3|0| SUBMITTER: Olson CODE: |G|G|O|

SAMPLE TYPE: WATER [X] SOIL [ ], FOOD [ ], OTHER: _____

This form accompanies 2 Septum Vials, _____ Glass Jugs, and/or _____ _____

Samples were preserved as follows:

- [ ] NP: No Preservation; Sample stored at room temperature.
- [X] P-Ice Sample stored in an ice bath (Not Frozen).
- [ ] P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- [ ] P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

I.C. JAN 23 1990 GROUND WATER BUREAU

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- [ ] (753) Aliphatic Headspace (1-5 Carbons)
- [X] (754) Aromatic & Halogenated Purgeables
- [ ] (765) Mass Spectrometer Purgeables
- [ ] (766) Trihalomethanes
- [ ] (774) SDWA VOC's I (8 Regulated +)
- [ ] (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- [ ] _____
- [ ] _____

EXTRACTABLE SCREENS

- [ ] (751) Aliphatic Hydrocarbons
- [ ] (755) Base/Neutral Extractables
- [ ] (758) Herbicides, Chlorophenoxy acid
- [ ] (759) Herbicides, Triazines
- [ ] (760) Organochlorine Pesticides
- [ ] (761) Organophosphate Pesticides
- [ ] (767) Polychlorinated Biphenyls (PCB's)
- [ ] (764) Polynuclear Aromatic Hydrocarbons
- [ ] (762) SDWA Pesticides & Herbicides

Remarks: _____

FIELD DATA:

pH=_____; Conductivity=_____umho/cm at _____°C; Chlorine Residual=_____mg/l

Dissolved Oxygen=_____mg/l; Alkalinity=_____mg/l; Flow Rate_____ ____/____

Depth to water _____ft.; Depth of well_____ft.; Perforation Interval _____-_____ft.; Casing:_____

Sampling Location, Methods and Remarks (i.e. odors, etc.)

Carbon Refinery - MW-6

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): _____ Method of Shipment to the Lab: hand

CHAIN OF CUSTODY

I certify that this sample was transferred from _____ to _____

at (location) _____ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed [ ] OR Seals Intact: Yes [ ] No [ ]

Signatures _____ _____

STATE OF NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT
SCIENTIFIC LABORATORY DIVISION
700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

December 28, 1989

ANALYTICAL REPORT
SLD Accession No. OR-89-1974

Distribution
(■) Submitter
(※) SLD Files

To: Ground Water Bureau
Environmental Improvement Division
1190 St. Francis Dr.
Santa Fe, 87503

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A purgeable water sample submitted to this laboratory on December 15, 1989**

DEMOGRAPHIC DATA

COLLECTION *LOCATION*

On: 13-Dec-89 *By:* Ols . . .
At: 13:00 hrs. *In/Near:* Kirtland

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable Screen

Parameter	Value	Note	MDL	Units
Halogenated Purgeables (33)	0.00	N	0.50	ppb
Aromatic Purgeables (6)	0.00	N	0.50	ppb

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed ☒; Intact: No ☐, Yes ☐ & Broken By: _____ Date: _____

Laboratory Remarks: Caribon Refinery MW-6

Analyst: _____ 12-18-89
Steve R. Davis — Analysis Date
Analyst, Organic Chemistry

Reviewed By: R Meyerhein
Richard F. Meyerhein 12/28/89
Supervisor, Organic Chemistry Section

75ct
Upu

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

OR89-1975-C

REPORT TO: William Olson, Attn: Ground Water Bureau — S.L.D. No. OR-

N.M. Environmental Improvement Div — DATE REC. 12-15-89

1190, Saint Francis Dr. — PRIORITY 3

Santa Fe, N.M. 87503 — PHONE(S): 827-2899

COLLECTION CITY: Kirtland ; COUNTY: San Juan

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 8|9|1|2|1|3|1|1|0|0

LOCATION CODE: (Township-Range-Section-Tracts) | | | + | | | + | | + | | | |(10N06E24342)

USER CODE: 5|5|4|2|0 SUBMITTER: Olson CODE: W|S|O

SAMPLE TYPE: WATER [X], SOIL [ ], FOOD [ ], OTHER:

This form accompanies 2 Septum Vials, ______ Glass Jugs, and/or

Samples were preserved as follows:

JAN 23 1990

GROUND WATER BUREAU

- [ ] NP: No Preservation; Sample stored at room temperature.
- [X] P-Ice Sample stored in an ice bath (Not Frozen).
- [ ] P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- [ ] P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- [ ] (753) Aliphatic Headspace (1-5 Carbons)
- [X] (754) Aromatic & Halogenated Purgeables
- [ ] (765) Mass Spectrometer Purgeables
- [ ] (766) Trihalomethanes
- [ ] (774) SDWA VOC's I (8 Regulated +)
- [ ] (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- [ ] ______
- [ ] ______

EXTRACTABLE SCREENS

- [ ] (751) Aliphatic Hydrocarbons
- [ ] (755) Base/Neutral Extractables
- [ ] (758) Herbicides, Chlorophenoxy acid
- [ ] (759) Herbicides, Triazines
- [ ] (760) Organochlorine Pesticides
- [ ] (761) Organophosphate Pesticides
- [ ] (767) Polychlorinated Biphenyls (PCB's)
- [ ] (764) Polynuclear Aromatic Hydrocarbons
- [ ] (762) SDWA Pesticides & Herbicides

Remarks:

FIELD DATA:

pH=______; Conductivity=______umho/cm at ______°C; Chlorine Residual=______mg/l

Dissolved Oxygen=______mg/l; Alkalinity=______mg/l; Flow Rate______ ____/____

Depth to water ______ft.; Depth of well______ft.; Perforation Interval ____-____ft.; Casing:______

Sampling Location, Methods and Remarks (i.e. odors, etc.)

Caribou Refinery, MW-9

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Bill Olson Method of Shipment to the Lab: hand

CHAIN OF CUSTODY

I certify that this sample was transferred from ______ to ______

at (location) ______ on ___/___/___ - ___:___ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed [ ] OR Seals Intact: Yes [ ] No [ ]

Signatures ______ ______

STATE OF NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT
SCIENTIFIC LABORATORY DIVISION
700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

December 28, 1989

ANALYTICAL REPORT
SLD Accession No. OR-89-1975

Distribution
(■) Submitter
(※) SLD Files

To: Ground Water Bureau
Environmental Improvement Division
1190 St. Francis Dr.
Santa Fe, 87503

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A purgeable water sample submitted to this laboratory on December 15, 1989**

DEMOGRAPHIC DATA

COLLECTION

On: 13-Dec-89 *By:* Ols . . .
At: 11:00 hrs. *In/Near:* Kirtland

LOCATION

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable Screen

Parameter	Value	Note	MDL	Units
1,2-Dichloroethane	1.20		0.50	ppb
Aromatic Purgeables (6)	0.00	N	0.50	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed☐; Intact: No☐, Yes☐ & Broken By: _____ Date: _____

Laboratory Remarks: Caribon Refinery MW-9
Confirmed by GC/MS.

Analyst: _____ 12-18-89 **Reviewed By:** _____
Steve R. Davis — Analyst, Organic Chemistry
Analysis Date
Richard F. Meyerhein 12/28/89 — Supervisor, Organic Chemistry Section

7/5/4 / 11 pw

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

OR89-1970-C

REPORT TO: William Olson, Attn: Ground Water Bureau S.L.D. No. OR-
N.M. Environmental Improvement Div DATE REC. 12-15-89
1190 Saint Francis Dr. PRIORITY 3
Santa Fe, N.M. 87503 PHONE(S): 827-2899

COLLECTION CITY: Kirtland ; COUNTY: San Juan

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 8 9 1 2 1 3 0 9 3 0

LOCATION CODE: (Township-Range-Section-Tracts) ___ + ___ + ___ + ___ (10N06E24342)

USER CODE: 5 5 4 3 0 SUBMITTER: Olson CODE: 4 6 0

SAMPLE TYPE: WATER [X], SOIL [ ], FOOD [ ], OTHER:

This form accompanies 2 Septum Vials, ______ Glass Jugs, and/or

Samples were preserved as follows:

JAN 23 1990
GROUND WATER BUREAU

- [ ] NP: No Preservation; Sample stored at room temperature.
- [X] P-Ice Sample stored in an ice bath (Not Frozen).
- [ ] P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- [ ] P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- [ ] (753) Aliphatic Headspace (1-5 Carbons)
- [X] (754) Aromatic & Halogenated Purgeables
- [ ] (765) Mass Spectrometer Purgeables
- [ ] (766) Trihalomethanes
- [ ] (774) SDWA VOC's I (8 Regulated +)
- [ ] (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- [ ] ______
- [ ] ______

EXTRACTABLE SCREENS

- [ ] (751) Aliphatic Hydrocarbons
- [ ] (755) Base/Neutral Extractables
- [ ] (758) Herbicides, Chlorophenoxy acid
- [ ] (759) Herbicides, Triazines
- [ ] (760) Organochlorine Pesticides
- [ ] (761) Organophosphate Pesticides
- [ ] (767) Polychlorinated Biphenyls (PCB's)
- [ ] (764) Polynuclear Aromatic Hydrocarbons
- [ ] (762) SDWA Pesticides & Herbicides

Remarks:

FIELD DATA:

pH= ______; Conductivity= ______ umho/cm at ______ °C; Chlorine Residual= ______ mg/l

Dissolved Oxygen= ______ mg/l; Alkalinity= ______ mg/l; Flow Rate ______ ____/____

Depth to water ______ ft.; Depth of well ______ ft.; Perforation Interval ______-______ ft.; Casing:

Sampling Location, Methods and Remarks (i.e. odors, etc.)

Caribou Refinery, MW-10

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Will Olson Method of Shipment to the Lab: hand

CHAIN OF CUSTODY

I certify that this sample was transferred from ______ to ______

at (location) ______ on ___/___/___ - ___:___ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed [ ] OR Seals Intact: Yes [ ] No [ ]

Signatures ______ ______

STATE OF NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT
SCIENTIFIC LABORATORY DIVISION
700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

December 29, 1989

ANALYTICAL REPORT
SLD Accession No. OR-89-1970

Distribution
(■) Submitter
(※) SLD Files

To: Ground Water Bureau
Environmental Improvement Division
1190 St. Francis Dr.
Santa Fe, 87503

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A purgeable water sample submitted to this laboratory on December 15, 1989**

DEMOGRAPHIC DATA

COLLECTION
On: 13-Dec-89 *By:* Ols . . .
At: 9:30 hrs. *In/Near:* Kirtland

LOCATION

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable Screen

Parameter	Value	Note	MDL	Units
1,2-Dichloroethane	1.70		0.50	ppb
Aromatic Purgeables (6)	0.00	N	0.50	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified; T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed [X]; Intact: No [ ], Yes [ ] & Broken By: _____ Date: _____

Laboratory Remarks: Caribon Refinery MW-10
1,2-dichloroethane confirmed by GC/MS.

Analyst: _____ 12-18-89 **Reviewed By:** _____
Steve R. Davis — Analysis Date — Richard F. Meyerhein 12/28/89
Analyst, Organic Chemistry — *Supervisor, Organic Chemistry Section*

754 Upil

SCIENTIFIC LABORATORY DIVISION

ORGANIC ANALYSIS REQUEST FORM

Organic Section - Phone: 841-2570

OR89-1972-C

REPORT TO: William Olson, Attn: Ground Water Bureau
N.M. Environmental Improvement Div.
1190 Saint Francis Dr.
Santa Fe, N.M. 87503

S.L.D. No. OR-
DATE REC. 12-15-89
PRIORITY 3
PHONE(S): 827-2897

COLLECTION CITY: Kirtland ; COUNTY: San Juan

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 89/12/13/1430

LOCATION CODE: (Township-Range-Section-Tracts) | | | + | | + | + | | | (10N06E24342)

USER CODE: 55431O SUBMITTER: Olson CODE: WSO

SAMPLE TYPE: WATER [X], SOIL [ ], FOOD [ ], OTHER:

This form accompanies 2 Septum Vials, _____ Glass Jugs, and/or _____

Samples were preserved as follows:

- [ ] NP: No Preservation; Sample stored at room temperature.
- [X] P-Ice Sample stored in an ice bath (Not Frozen).
- [ ] P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- [ ] P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

JAN 23 1990
GROUND WATER BUREAU

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- [ ] (753) Aliphatic Headspace (1-5 Carbons)
- [X] (754) Aromatic & Halogenated Purgeables
- [ ] (765) Mass Spectrometer Purgeables
- [ ] (766) Trihalomethanes
- [ ] (774) SDWA VOC's I (8 Regulated +)
- [ ] (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- [ ] _____
- [ ] _____

EXTRACTABLE SCREENS

- [ ] (751) Aliphatic Hydrocarbons
- [ ] (755) Base/Neutral Extractables
- [ ] (758) Herbicides, Chlorophenoxy acid
- [ ] (759) Herbicides, Triazines
- [ ] (760) Organochlorine Pesticides
- [ ] (761) Organophosphate Pesticides
- [ ] (767) Polychlorinated Biphenyls (PCB's)
- [ ] (764) Polynuclear Aromatic Hydrocarbons
- [ ] (762) SDWA Pesticides & Herbicides

Remarks: _____

FIELD DATA:

pH=_____; Conductivity=_____umho/cm at _____°C; Chlorine Residual=_____mg/l

Dissolved Oxygen=_____mg/l; Alkalinity=_____mg/l; Flow Rate_____ _____/_____

Depth to water _____ft.; Depth of well_____ft.; Perforation Interval _____-_____ft.; Casing:_____

Sampling Location, Methods and Remarks (i.e. odors, etc.)

Caribou Refinery, MW-11

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Bill Olson Method of Shipment to the Lab: Hand

CHAIN OF CUSTODY

I certify that this sample was transferred from _____ to _____

at (location) _____ on _____/_____/_____ - _____:_____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed [ ] OR Seals Intact: Yes [ ] No [ ]

Signatures _____ _____

STATE OF NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT
SCIENTIFIC LABORATORY DIVISION
700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

December 28, 1989

ANALYTICAL REPORT
SLD Accession No. OR-89-1972

Distribution
(■) Submitter
(※) SLD Files

To: Ground Water Bureau
Environmental Improvement Division
1190 St. Francis Dr.
Santa Fe, 87503

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A purgeable water sample submitted to this laboratory on December 15, 1989**

DEMOGRAPHIC DATA

COLLECTION

On: 13-Dec-89 *By:* Ols . . .
At: 14:30 hrs. *In/Near:* Kirtland

LOCATION

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable Screen

Parameter	Value	Note	MDL	Units
Halogenated Purgeables (33)	0.00	N	0.50	ppb
Aromatic Purgeables (6)	0.00	N	0.50	ppb

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed[✓]; Intact: No[ ], Yes[ ] & Broken By: _____ Date: _____

Laboratory Remarks: Caribon Refinery MW-11

Analyst: _____ 12-28-89
Steve R. Davis — *Analyst, Organic Chemistry*
Analysis Date

Reviewed By: _____
Richard F. Meyerhein 12/28/89
Supervisor, Organic Chemistry Section

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

754 µpH ONE BOTTLE ONLY

ORGW-1971-B

REPORT TO: William Olson, Attn: Ground Water Bureau
N.M. Environmental Improvement Div
1190 Saint Francis Dr.
Santa Fe, N.M. 87503

S.L.D. No. OR-
DATE REC. 12-15-89
PRIORITY 3
PHONE(S): 827-2899

COLLECTION CITY: Aztec ; COUNTY: San Juan

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 8 9 1 2 1 3 1 0 3 0

LOCATION CODE: (Township-Range-Section-Tracts) | | | + | | + | | + | | | | (10N06E24342)

USER CODE: 5 5 4 3 0 SUBMITTER: Olson CODE: W C O

SAMPLE TYPE: WATER [X] SOIL [ ], FOOD [ ], OTHER:

This form accompanies 1 Septum Vials, ____ Glass Jugs, and/or ____ ____
one broken in transit

Samples were preserved as follows:

- [ ] NP: No Preservation; Sample stored at room temperature.
- [X] P-Ice Sample stored in an ice bath (Not Frozen).
- [ ] P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- [ ] P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

I.R. JAN 23 1990 GROUND WATER BUREAU

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- [ ] (753) Aliphatic Headspace (1-5 Carbons)
- [X] (754) Aromatic & Halogenated Purgeables
- [ ] (765) Mass Spectrometer Purgeables
- [ ] (766) Trihalomethanes
- [ ] (774) SDWA VOC's I (8 Regulated +)
- [ ] (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- [ ] ____
- [ ] ____

EXTRACTABLE SCREENS

- [ ] (751) Aliphatic Hydrocarbons
- [ ] (755) Base/Neutral Extractables
- [ ] (758) Herbicides, Chlorophenoxy acid
- [ ] (759) Herbicides, Triazines
- [ ] (760) Organochlorine Pesticides
- [ ] (761) Organophosphate Pesticides
- [ ] (767) Polychlorinated Biphenyls (PCB's)
- [ ] (764) Polynuclear Aromatic Hydrocarbons
- [ ] (762) SDWA Pesticides & Herbicides

Remarks: ~~X~~ BROKEN IN TRANSIT

FIELD DATA:

pH=____; Conductivity=____umho/cm at ____°C; Chlorine Residual=____mg/l

Dissolved Oxygen=____mg/l; Alkalinity=____mg/l; Flow Rate____ ____/____

Depth to water ____ft.; Depth of well____ft.; Perforation Interval ____-____ft.; Casing:____

Sampling Location, Methods and Remarks (i.e. odors, etc.)

Carbon Refinery MW-14

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Will Olson Method of Shipment to the Lab: hand

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____

at (location) ____ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed [ ] OR Seals Intact: Yes [ ] No [ ]

Signatures ____ ____

STATE OF NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT
SCIENTIFIC LABORATORY DIVISION
700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

December 29, 1989

ANALYTICAL REPORT
SLD Accession No. OR-89-1971

Distribution
(■) Submitter
(▩) SLD Files

To: Ground Water Bureau
Environmental Improvement Division
1190 St. Francis Dr.
Santa Fe, 87503

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A purgeable water sample submitted to this laboratory on December 15, 1989**

DEMOGRAPHIC DATA

COLLECTION *LOCATION*

On: 13-Dec-89 *By:* Ols . . .
At: 10:30 hrs. *In/Near:* Kirtland

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable Screen

Parameter	Value	Note	MDL	Units
1,2-Dichloroethane	2.60		0.50	ppb
Aromatic Purgeables (6)	0.00	N	0.50	ppb

See Laboratory Remarks for Additional Information

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified; T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed [X] Intact: No [ ], Yes [ ] & Broken By: _____ Date: _____

Laboratory Remarks: Caribon Refinery MW-14
1,2-dichloroethane not confirmed by GC/MS because second bottle was broken in transit.

Analyst: _____ 12/18-89
Steve R. Davis — Analysis Date
Analyst, Organic Chemistry

Reviewed By: R Meyerhein
Richard F. Meyerhein 12/28/89
Supervisor, Organic Chemistry Section

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

754 WPLL

OR89-1973-C

REPORT TO: William Olson, Attn: Ground Water Bureau
N.M. Environmental Improvement Div.
1190, Saint Francis Dr.
Santa Fe, N.M. 87503

S.L.D. No. OR-
DATE REC. 12-15-89
PRIORITY 3
PHONE(S): 827-2899

COLLECTION CITY: Kirtland ; COUNTY: San Juan

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 8 9 / 1 2 / 1 3 / 1 3 1 0

LOCATION CODE: (Township-Range-Section-Tracts) | | | + | | + | | + | | | (10N06E24342)

USER CODE: 5 5 4 3 1 0 SUBMITTER: Olson CODE: G W C 0

SAMPLE TYPE: WATER [✓], SOIL [ ], FOOD [ ], OTHER:

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____ ____

Samples were preserved as follows:

- [ ] NP: No Preservation; Sample stored at room temperature.
- [✓] P-Ice Sample stored in an ice bath (Not Frozen).
- [ ] P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- [ ] P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

JAN 23 1990
GROUND WATER BUREAU

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- [ ] (753) Aliphatic Headspace (1-5 Carbons)
- [✓] (754) Aromatic & Halogenated Purgeables
- [ ] (765) Mass Spectrometer Purgeables
- [ ] (766) Trihalomethanes
- [ ] (774) SDWA VOC's I (8 Regulated +)
- [ ] (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- [ ] _____
- [ ] _____

EXTRACTABLE SCREENS

- [ ] (751) Aliphatic Hydrocarbons
- [ ] (755) Base/Neutral Extractables
- [ ] (758) Herbicides, Chlorophenoxy acid
- [ ] (759) Herbicides, Triazines
- [ ] (760) Organochlorine Pesticides
- [ ] (761) Organophosphate Pesticides
- [ ] (767) Polychlorinated Biphenyls (PCB's)
- [ ] (764) Polynuclear Aromatic Hydrocarbons
- [ ] (762) SDWA Pesticides & Herbicides

Remarks: _____

FIELD DATA:

pH=_____; Conductivity=_____umho/cm at _____°C; Chlorine Residual=_____mg/l

Dissolved Oxygen=_____mg/l; Alkalinity=_____mg/l; Flow Rate_____ ____/____

Depth to water _____ft.; Depth of well_____ft.; Perforation Interval _____-_____ft.; Casing:_____

Sampling Location, Methods and Remarks (i.e. odors, etc.)

Caribou Refinery - MW - FB2

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Neil Olson Method of Shipment to the Lab: hand

CHAIN OF CUSTODY

I certify that this sample was transferred from _____ to _____

at (location) _____ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed [ ] OR Seals Intact: Yes [ ] No [ ]

Signatures _____ _____

STATE OF NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT
SCIENTIFIC LABORATORY DIVISION
700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

December 28, 1989

ANALYTICAL REPORT
SLD Accession No. OR-89-1973

Distribution
(■) Submitter
(※) SLD Files

To: Ground Water Bureau
Environmental Improvement Division
1190 St. Francis Dr.
Santa Fe, 87503

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A purgeable water sample submitted to this laboratory on December 15, 1989**

DEMOGRAPHIC DATA

COLLECTION		*LOCATION*
On: 13-Dec-89	*By:* Ols . . .	0
At: 13:30 hrs.	*In/Near:* Kirtland	

ANALYTICAL RESULTS: Aromatic & Halogenated Purgeable Screen

Parameter	Value	Note	MDL	Units
Chloroform	0.80		0.50	ppb
Bromodichloromethane	1.30		0.50	ppb
Dibromochloromethane	4.20		0.50	ppb
Bromoform	3.70		0.50	ppb
Halogenated Purgeables (33)	0.00	N	0.50	ppb

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Evidentiary Seals: Not Sealed☒; Intact: No☐, Yes☐ & Broken By: _____ Date: _____

Laboratory Remarks: Caribon Refinery MW-FB2

Analyst: _____ 12-18-89 **Reviewed By:** _____

Steve R. Davis — Analyst, Organic Chemistry
Analysis Date
Richard F. Meyerhein 12/28/89 — Supervisor, Organic Chemistry Section

APPENDIX B

BIODEGRADATION FEASIBILITY STUDY

APPENDIX B

BIODEGRADATION FEASIBILITY STUDY

The results of the biodegradation study performed by ENSR Consultants, Golden, Colorado are included herein. Their analytical tests were performed on soil samples taken from 3 testholes, (TH-1, 2 and 3) hand augered in the southwest corner of the tank farm (Plate B-1).

The results of their screening experiment to characterize the soils for soil nutrients, toxicity and specific chemical contaminants indicate that:

- Nitrogen and phosphorous are the nutrients limiting microbial growth and activity and subsequent reduction in toxicity.
- The soil will readily support the active microflora required to degrade petroleum hydrocarbons when supplemental nitrogen and phosphorous are provided.
- Nitrogen/phosphorous should be applied as a solution to assure uniform application and immediate availability.
- pH should be monitored and maintained near the native pH $\pm$0.4 units during remediation.
- Representative organic contaminant concentrations in the soil were measured at:

Benzene	11,000 ug/kg
Toluene	66,000 ug/kg
Ethylbenzene	24,000 ug/kg
Xylenes	130,000 ug/kg
TPH	310 mg/kg

BIODEGRADATION FEASIBILITY STUDY
DAMES AND MOORE
GOLDEN, CO

Soil and water samples were collected as specified in the Dames & Moore Work Plan. Soil was characterized for:

- soil nutrients,
- toxicity, and
- specific chemical contaminants.

Optimum nutrient ratios required to stimulate the indigenous microflora to degrade the contaminants were identified in a primary screening experiment. The most effective ratio was scaled up for recommendations. The following report provides the analytical data, interpretation, and recommendations for bioremediation. The original laboratory reports are appended.

1.0 SOIL CHARACTERIZATION

A composite soil sample was submitted to an agricultural soils laboratory for routine characterization. Results are summarized in Table 1-1.

- The low concentration of nitrogen as organic nitrogen suggests that nitrogen will limit microbial activity in this system.

- Inadequate concentrations of immediately available phosphorus and excessive concentrations of mineralized phosphorus indicate that the solubility of phosphorus has been reduced by precipitation by some soil constituent. Calcium and iron will react with soluble phosphorus to form as insoluble precipitate: rock

TABLE 1-1

SOIL CHARACTERIZATION

	mg/kg
Macro Nutrients	
Nitrogen	
Estimate Nitrogen Release (from organic matter)	11.2
Phosphorus	
Readily available	1.0
Active reserve	63.0
Potassium	114.0
Secondary Nutrients	
Magnesium	404.0
Calcium	1,500.0
Sulfur	39.0
Micronutrients	
Zinc	3.1
Manganese	121.0
Iron	205.0
Copper	2.4
Boron	0.8
Soil Characteristics	
pH	8.8 units
Cation exchange capacity	11.2 meq/100g
Base saturation	2.6%
	30.2% Mg
	67.2% Ca

phosphate. Both calcium and iron were found in high concentrations in this soil.

- Potassium is readily available.

- Secondary and micronutrients are present in adequate amounts.

- The high concentration of magnesium has displaced some calcium from the cation exchange sites as shown by the percent base saturation data. This imbalance in base saturation will not affect growth and activity of the indigenous microbes.

- A slightly alkaline pH (8.8) provides a good environment for microbial growth. Adequate calcium present in this soil will enable a carbonate buffer system to develop and maintain an alkaline to near neutral pH as bioremediation progresses.

Based on these characterization data, the soil will readily support the active microflora required to degrade petroleum hydrocarbons when supplemental nitrogen and phosphorus is provided.

Soil was also analyzed for specific (BTEX) and collective (TPH) organic contaminants:

Benzene	11,000 ug/kg
Toluene	66,000 ug/kg
Ethylbenzene	24,000 ug/kg
Xylenes	130,000 ug/kg
TPH	310 mg/kg

In addition to the physical and chemical characterization, the soil was characterized for toxicity by the Microtox™ bioassay. In this bioassay, the effective concentration active on 50% of the population (EC_{50}) increases as a test solution is diluted until no toxicity is measured. A system is essentially non-toxic by this assay when the $\%EC_{50}$ exceeds 100%.

The toxicity analysis, expressed in terms of percent EC_{50} at three concentrations is shown below:

Concentration % (w/v)	Toxicity % EC_{50}	
	A	B
1	12.60	13.10
5	5.51	7.14
25	3.60	4.27

Relative toxicity of the contaminated soil was measured upon receipt (Column A) and after six days of cold (4°C) storage (Column B). Toxicity decreased slightly upon storage but the trend of toxicity relative to dilution remained constant.

- The results show a moderate level of toxicity in the first (25%) soil dilution, followed by rapidly decreasing toxicity with subsequent dilution. Toxicity can be significantly reduced by dilution to the 1-5% level. This indicates the absence of low to partially soluble toxicants that partition into the aqueous phase.

- Because the indigenous organisms have a much higher toxicity tolerance than the very sensitive bioassay organisms (approximately 10-fold higher in a soil matrix), the soil can be treated without dilution.

2.0 PRIMARY SCREEN

The primary screen treatments, as summarized in Table 2-1, consist of two controls and five nutrient treatments. One control remained untreated. A second control was treated with sodium azide to eliminate biological activity and provide a check on nonbiological changes during incubation. Three nitrogen to phosphorus ratios were selected. ENSR tested two additional concentrations of the highest nitrogen to phosphorus ratios for a concentration effect. To assure separation of the treatment variables and optimum mixing during the 14-day incubation period, a 20% load of contaminated soil was evaluated.

Prior to the addition of nutrients, the reaction mixture was sampled for BTEX and TPH to establish an initial base line concentration. All treatments were adjusted to pH 7.0 and incubated at ambient room temperature on a rotary shaker. At regular intervals, changes in microbial activity were measured by oxygen uptake analysis. The Microtox bioassay was used to monitor changes in toxicity. After these assays indicated completion of the study, samples were collected from the control treatments and the most active nutrient treatment for analysis of BTEX and TPH.

Changes in the organic analysis during the incubation period are summarized below:

		Day 14 Treatment		
	Day 0	1	2	5
Benzene (ug/l)	800	<1	<1	<1
Toluene (ug/l)	2900	<1	<1	<1
Ethylbenzene (ug/l)	1900	<1	<1	<1
Xylene (ug/l)	4700	<1	<1	<1
TPH (mg/l)	250	<7	<7	8

TABLE 2-1

PRIMARY SCREEN TREATMENTS

Treatment	Nutrients (ppm) N	P	Ratio N:P	Comments
1	0	0	Ambient	Control
2	0	0	Ambient	Abiotic Control
3	60	36.4	5:3	
4	30	6.1	5:1	
5	60	60.1	5:5	
6	60	12.0	5:1 (2x)	
7	90	18.0	5:1 (3x)	

Changes in relative toxicity are summarized in Figure 2-1.

- The intermediate ratio of nitrogen to phosphorus (5:3) provided the most rapid reduction in toxicity.

- One nutrient treatment and the abiotic control failed to reduce toxicity significantly during the seven-day incubation. The unamended, live control provided for moderate toxicity reduction.

Microbial activity data, as measured by the oxygen uptake rate (OUR), are shown in Figure 2-2.

Oxygen uptake rate (OUR) data indicate rapid reduction in microbial activity with time. This suggests rapid assimilation of and removal of available food sources with time.

A composite of soil samples TH 1, 2, 3, 4, contained 4.8×10^7 colony-forming units per gram (CFU/gm). Since soil was loaded into the bioreactors at 20% (W/W), the estimated initial (Day 0) aerobic population was 9.6×10^6 CFU/gm. After 9 days of incubation, the optimum treatment reactor (N:P 5:3) contained 1.1×10^8 CFU/gm--a greater than 10-fold population increase in 9 days. Eventhough the OUR data was inconclusive, the dramatic increase in biomass supports biological transformation of the soil-borne contaminants.

The organic contaminant analyses were inconclusive due to the low initial contaminant concentration. Day-0 TPH was 250 mg/L. After a 14-day incubation period, analyses of both controls and the most active treatment revealed TPH concentrations near or below detection limits (7 mg/L) in all cases. BTEX were below detection limits in both control and the best (5:3) treatment by Day 14.

Figure 2-1

RELATIVE TOXICITY

DAMES & MOORE PRIMARY SCREEN

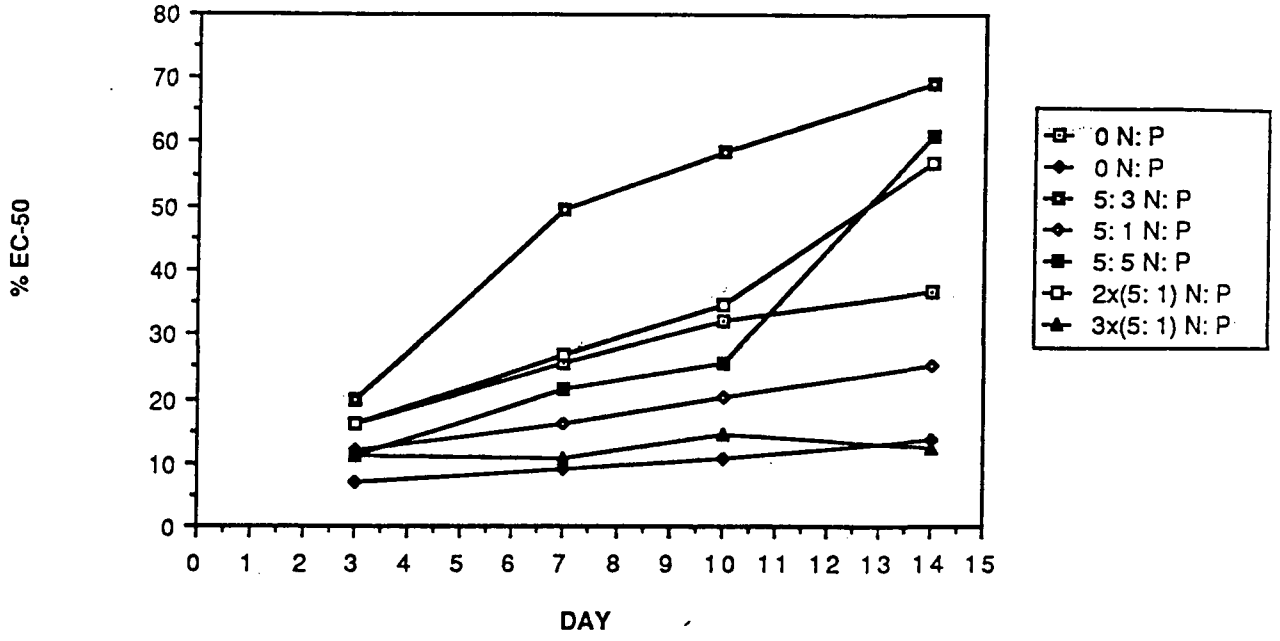
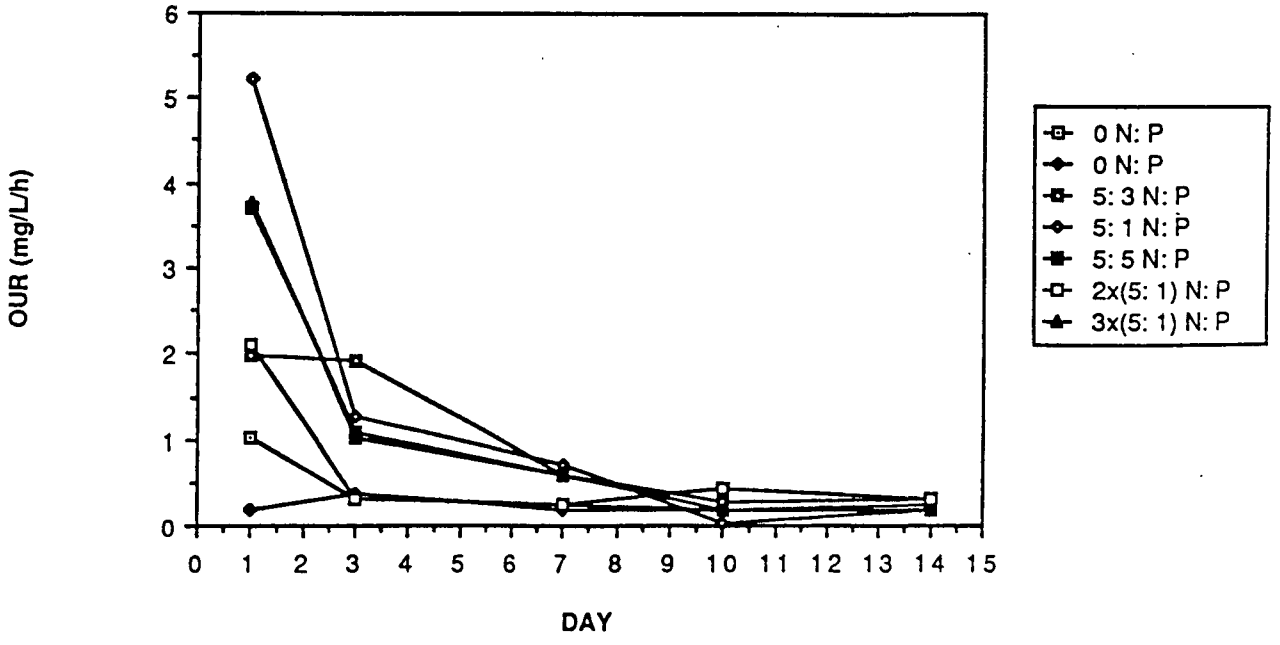


Figure 2-2

OXYGEN UPTAKE RATES

DAMES & MOORE PRIMARY SCREEN



3.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the initial soil characterization results and changes in toxicity and microbial activity, nitrogen and phosphorus are the nutrients limiting microbial growth and activity and subsequent reduction in toxicity. Supplemental application of nitrogen and phosphorus in a 5:3 ratio will stimulate indigenous microbial activity to reduce soil-borne toxicity.

This feasibility study was designed to identify conditions limiting microbial growth and activity.

- Additional studies would be required to identify the optimum nitrogen/phosphorus concentrations and the next limiting nutrient, if appropriate, after nitrogen/phosphorus needs are satisfied.

- For practical purposes, application of at least 60 mg/kg nitrogen and 36 mg/kg phosphorus will provide significant microbial activity to rapidly reduce the soil-borne toxicity.

- Since a 1-acre foot of soil contains approximately 4,000,000 lbs. of soil, application of 240 lbs. of nitrogen and 144 lbs. phosphorus (331 lbs P_2O_5) per acre would provide approximately 60 mg/kg additional nitrogen and 36 mg/kg additional phosphorus respectively to the system. Nitrogen/phosphorus can be added in a variety of forms: monoammonium phosphate, blends with diammonium phosphate, hexametaphosphate, polyphosphates, etc.

- To assure uniform application and immediate availability, nitrogen/phosphorus should be applied as a solution.

- Biodegradation produces carbonic acid which, in the absence of an active buffer system, will shift the pH into the acidic range. pH should be monitored and maintained near the native pH $\pm$ 0.4 units during remediation. Given the low organic load of this system, little pH shift is anticipated.

REPORT NUMBER 235-0034

A & L AGRICULTURAL LABORATORIES

411 N. Third St. • Memphis, TN 38105-2723 • (901) 527-2780
FAX: (901) 526-1031

SEND TO
ENSR CONSULTING & ENGIN.
ATTN: DICK WOODWARD
3000 RICHMOND AVE. 4TH
HOUSTON, TX 77004

GROWER D&M 14819-805

SAMPLES SUBMITTED BY:

ACCT# 05761

DATE OF REPORT 08/29/89

PAGE 1

SOIL ANALYSIS REPORT

SAMPLE NUMBER	LAB NUMBER	ORGANIC MATTER %	ORGANIC MATTER * RATE	ORGANIC MATTER ** ENR lbs./A	PHOSPHORUS P_1 (Weak Bray) * **** ppm-P RATE	PHOSPHORUS P_2 $NaHCO_3$-P * **** ppm-P RATE	POTASSIUM K * ***** ppm-K RATE	MAGNESIUM Mg * *** ppm-Mg RATE	CALCIUM Ca * *** ppm-Ca RATE	SODIUM Na * *** ppm-Na RATE	pH SOIL pH	pH BUFFER INDEX	COMPUTED Cation Exchange C.E.C. meq/100g	PERCENT BASE SATURATION % K	% Mg	% Ca	% H	% Na
1	1287	0.2		45	1VL	63VH	114M	404VH	1500M		8.8		11.2	2.6	30.2	67.2		

(SEE EXPLANATION ON BACK)

SAMPLE NUMBER	NITRATE NO_3 * *** ppm NO_3-N RATE	SULFUR S * *** ppm S RATE	ZINC Zn * *** ppm Zn RATE	MANGANESE Mn * *** ppm Mn RATE	IRON Fe * *** ppm Fe RATE	COPPER Cu * *** ppm Cu RATE	BORON B * *** ppm B RATE	EXCESS LIME RATE	SOLUBLE SALTS mmhos/cm RATE		
1		39VH	3.1M	121VH	205VH	2.4H	0.8M				

REMARKS

This report applies only to the sample(s) tested. Samples are retained a maximum of thirty days after testing.

A & L AGRICULTURAL LABORATORIES OF MEMPHIS, INC.

BY RICHARD LARGE

* CODE TO RATING: VERY LOW (VL), LOW (L), MEDIUM (M), HIGH (H), VERY HIGH (VH), AND NONE (N)
** FOR ESTIMATED ENTHOGEN RELEASE
*** MULTIPLY THE RESULTS IN ppm BY 2 TO CONVERT TO LBS PER ACRE OF THE ELEMENTAL FORM

**** MULTIPLY THE RESULTS IN ppm BY 4.6 TO CONVERT TO LBS PER ACRE P_2O_5
***** MULTIPLY THE RESULTS IN ppm BY 2.4 TO CONVERT TO LBS PER ACRE K_2O
MOST SOILS WEIGH TWO (2) MILLION POUNDS (DRY WEIGHT) FOR AN ACRE OF SOIL 6-2/3 INCHES DEEP

ENSR

Formerly ERT

September 13, 1989

ENSR Consulting and Engineering
3000 Richmond Avenue
Houston, TX 77098

ENSR Consulting
and Engineering
3000 Richmond Avenue
Houston, TX 77098
(713) 520-9900

Attention: Dick Woodward

Attached are reports of chemical analyses of samples received August 11, 1989. These analyses are:

Count	Test Code	Test Name	Test Method	Sampled	Matrix
2	%FS -S-PAR-HOU	PERCENT FIXED SOLIDS OF TS	SM: 209D, GRAVIMETRIC @ 550 DEG. C	08/09/89	SOIL
2	%H2O -S-PAR-HOU	MOISTURE CONTENT ON SOLID (%)	SM: INVERSE OF 209A, GRAVIMETRIC	08/09/89	SOIL
2	%TS -S-PAR-HOU	PERCENT TOTAL SOLIDS ON SOLID	SM: 209A, GRAVIMETRIC @ 103-105DEGC	08/09/89	SOIL
2	%VS -S-PAR-HOU	PERCENT VOLATILE SOLIDS OF TS	SM: 209D, GRAVIMETRIC @ 550 DEG. C	08/09/89	SOIL
2	BENZ -S- -SPL	BENZENE ON SOLID	EPA SW-846: 8020, GC	08/09/89	SOIL
1	COD -S- -WQS	CHEMICAL OXYGEN DEMAND/SOLID		08/09/89	SOIL
2	EB -S- -SPL	ETHYL BENZENE ON SOLID	EPA SW-846: 8020, GC	08/09/89	SOIL
1	MICRO-S- -WLL	MICROTOX ON SOLID		08/09/89	SOIL
1	NH3-N-S- -HOU	AMMONIA NITROGEN ON SOLID	SM: 417A,D, DISTLTN. AND TITRATION	08/09/89	SOIL
1	NO2 -S- -HOU	NITRITE	SM:418F,AUTOMATED Cd REDUCTION	08/09/89	SOIL
1	NO3 -S- -HOU	NITRATE ON SOLID	SM: 418C, CADMIUM REDUCTION	08/09/89	SOIL
1	O-PO4-S- -HOU	ORTHOPHOSPHATE	16TH ED. SM:424A,F, ASCORBIC ACID	08/09/89	SOIL
1	PRIM - -SCN-WLL	PRIMARY SCREEN		08/10/89	WATER
1	PRIM -S-SCN-WLL	PRIMARY SCREEN ON SOLID		08/09/89	SOIL
1	S3 -S- -ALA	BASIC S3 W/O RECOMMENDATIONS		08/09/89	SOIL
1	SA1 -S- -ALA	BASIC SA1 W/O RECOMMENDATIONS		08/09/89	SOIL
1	TKN -S- -HOU	TOTAL KJELDAHL NITROGEN/SOLID	SM: 417D,420A DISTILL.,DIG.,TITRATN	08/09/89	SOIL
1	TOC -S- -SWL	TOTAL ORGANIC CARBON ON SOLID	AGRONOMY #9: 89-3.5, LECO FURNACE	08/09/89	SOIL
2	TOL -S- -SPL	TOLUENE ON SOLID	EPA SW-846: 8020, GC	08/09/89	SOIL
2	TPH -S- -HOU	TOTAL PET. HYDROCARBONS/SOLID	EXT:SM:503D, ANALYSIS:600:418.1, IR	08/09/89	SOIL
2	XYL -S- -SPL	XYLENE ON SOLID	EPA SW-846: 8020, GC	08/09/89	SOIL

Data contained in this report reflect a full quality control review and have met all applicable standards established by ENSR. ENSR quality assurance protocols are in accordance with EPA guidelines.

Should you have any questions, do not hesitate to contact me at (713) 520-9900.

Very Truly Yours,

Bo Blankfield

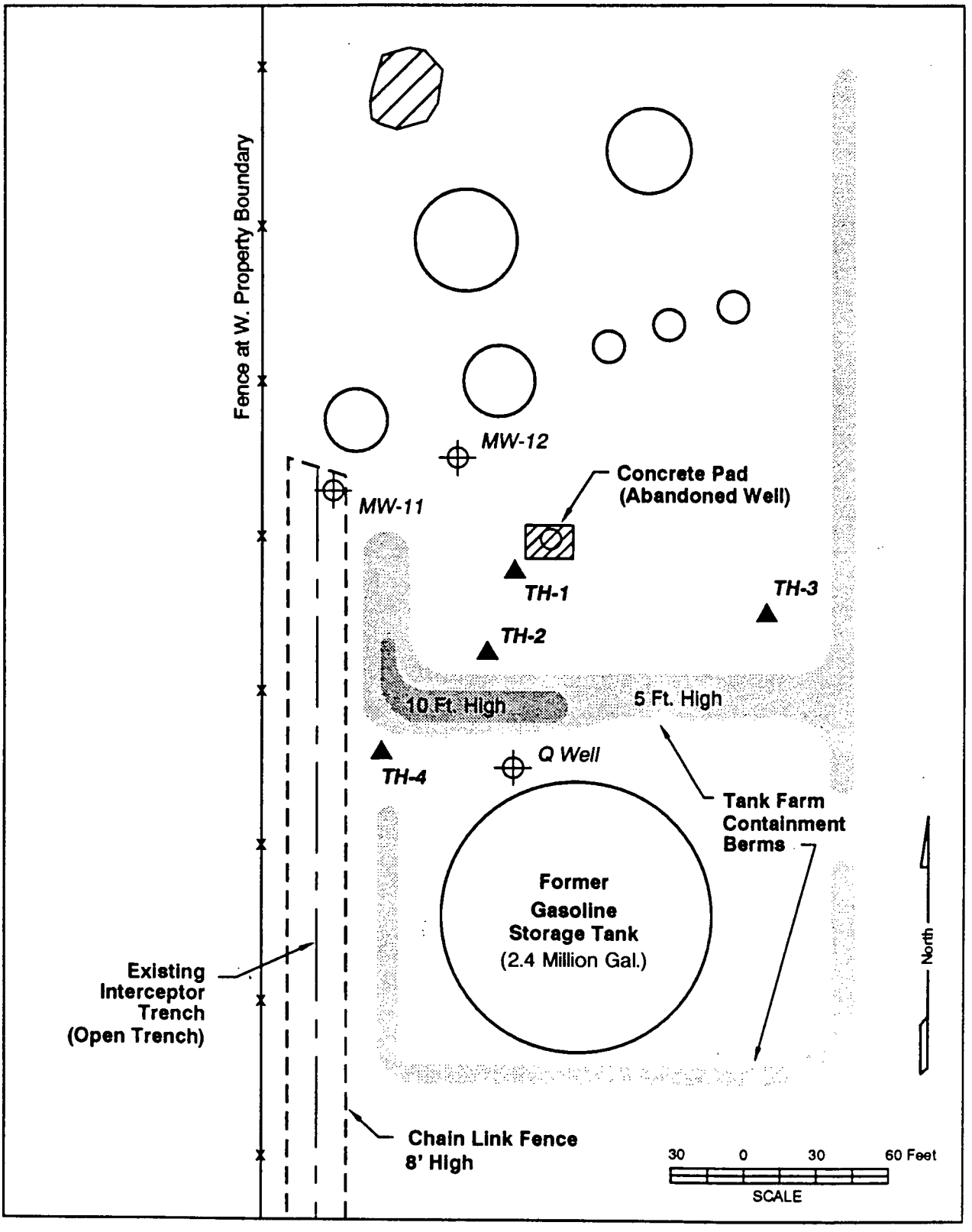
Bo Blankfield
Lab Director

BB/lis

Enclosures: Analytical Summary, Analytical Report, Chain of Custody, Sample Receipt Checklist, Quality Control Logs, NARRATIVE LOG, Billing Summary

cc: Dave Ramsden

LAB NO. A2780
PROJECT D&M-14819-505 Dames & Moore



▲ Soil Sampling Location 8/89

Soil Sampling Locations for Bioremediation Feasibility

ENSR Labs-Houston

Analytical Summary
09/13/89 13:10

Lab Number: A2780
Project: D&M-14819-505
Dames & Moore

Lab ID *Field ID* *(Cont.)* *Test /Matrix*	1 TH-1,2, 3&4 SOIL	2 TH-1-60- 72 SOIL	3 TH-1-5- 6 SOIL	4 MW-12 WATER
%FS -S-PAR-HOU *(MDL)*	99.56 PERCENT *(0.001)*	99.46 PERCENT *(0.001)*	--	--
%H2O -S-PAR-HOU *(MDL)*	18.4 PERCENT *(0.001)*	19.0 PERCENT *(0.001)*	--	--
%TS -S-PAR-HOU *(MDL)*	81.6 PERCENT *(0.001)*	81.0 PERCENT *(0.001)*	--	--
%VS -S-PAR-HOU *(MDL)*	0.44 PERCENT *(0.001)*	0.54 PERCENT *(0.001)*	--	--
BENZ -S- -SPL *(MDL)*	11000 UG/KG *(1)*	--	4300 UG/KG *(1)*	--
COD -S- -WQS *(MDL)*	4900 MG/KG *(5)*	--	--	--
EB -S- -SPL *(MDL)*	24000 UG/KG *(1)*	--	5400 UG/KG *(1)*	--
MICRO-S- -WLL *(MDL)*	SEE REM* ()*	--	--	--

QAQC Approval: Dee Davis Date: 9-13-89

Mgr. Approval: Joann M. Hall Date: 9/13/89
* Please see attached Analytical Report for remarks.

***** CONTINUED *****

ENSR

ENSR Labs-Houston

Analytical Summary
09/13/89 13:10

Lab Number: A2780
Project: D&M-14819-505
Dames & Moore

Lab ID *Field ID* *(Cont.)* *Test /Matrix*	1 TH-1,2, 3&4 SOIL	2 TH-1-60- 72 SOIL	3 TH-1-5- 6 SOIL	4 MW-12 WATER
NH3-N-S- -HOU *(MDL)*	3.2 MG/KG *(3.2)*	--	--	--
NO2 -S- -HOU *(MDL)*	*SEE REM *()**	--	--	--
NO3 -S- -HOU *(MDL)*	*SEE REM *()**	--	--	--
O-PO4-S- -HOU *(MDL)*	SEE REM* *()**	--	--	--
PRIM - -SCN-WLL *(MDL)*	--	--	--	SEE REM* *()**
PRIM -S-SCN-WLL *(MDL)*	SEE REM* *()**	--	--	--
S3 -S- -ALA *(MDL)*	SEE REM* *()**	--	--	--
SA1 -S- -ALA *(MDL)*	SEE REM* *()**	--	--	--

QAQC Approval: Dee Davis Date: 9-13-89

Mgr. Approval: Joann M. Hood Date: 9/13/89

* Please see attached Analytical Report for remarks.

***** CONTINUED *****

ENSR

ENSR Labs-Houston

Analytical Summary
09/13/89 13:10

Lab Number: A2780
Project: D&M-14819-505
Dames & Moore

Lab ID / *Field ID* (*Cont.*) / *Test* /*Matrix*	1 TH-1,2,3&4 SOIL	2 TH-1-60-72 SOIL	3 TH-1-5-6 SOIL	4 MW-12 WATER
TKN -S- -HOU	90 MG/KG	--	--	--
(MDL)	*(6.4)*			
TOC -S- -SWL	0.19 PERCENT	--	--	--
(MDL)	*()*			
TOL -S- -SPL	66000 UG/KG	--	10000 UG/KG	--
(MDL)	*(1)*		*(1)*	
TPH -S- -HOU	310 MG/KG	<50 MG/KG	--	--
(MDL)	*(50)*	*(50)*		
XYL -S- -SPL	130000 UG/KG	--	13000 UG/KG	--
(MDL)	*(1)*		*(1)*	

QAQC Approval: Dee Davis Date: 9-13-89

Mgr. Approval: Joann Wood Date: 9-13-89

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ENSR Labs-Houston

Analytical Report
09/13/89 13:09

Dames & Moore	Field ID: TH-1,2,3&4	Date Sampled: 08/09/89
Proj. No.: D&M-14819-505	Lab ID: 1	Time Sampled: 1800
Lab No.: A2780	Matrix: SOIL (COMPOSITE)	Date Received:08/11/89

Parameter (Test Code) (Test Name) (Test Method)	Concentration	Units	Method Detection Limit	Date/Time Analysis Performed
%FS -S-PAR-HOU PERCENT FIXED SOLIDS OF TS SM: 209D, GRAVIMETRIC @ 550 DEG. C	99.56	PERCENT	0.001	08/21/89 1400
%H2O -S-PAR-HOU MOISTURE CONTENT ON SOLID (%) SM: INVERSE OF 209A, GRAVIMETRIC	18.4	PERCENT	0.001	08/21/89 1400
%TS -S-PAR-HOU PERCENT TOTAL SOLIDS ON SOLID SM: 209A, GRAVIMETRIC @ 103-105DEGC	81.6	PERCENT	0.001	08/21/89 1400
%VS -S-PAR-HOU PERCENT VOLATILE SOLIDS OF TS SM: 209D, GRAVIMETRIC @ 550 DEG. C	0.44	PERCENT	0.001	08/21/89 1400
BENZ -S- -SPL BENZENE ON SOLID EPA SW-846: 8020, GC	11000	UG/KG	1	08/11/89
COD -S- -WQS CHEMICAL OXYGEN DEMAND/SOLID	4900	MG/KG	5	08/15/89 845
EB -S- -SPL ETHYL BENZENE ON SOLID EPA SW-846: 8020, GC	24000	UG/KG	1	08/11/89
MICRO-S- -WLL MICROTOX ON SOLID	SEE REM* *1			/ /
NH3-N-S- -HOU AMMONIA NITROGEN ON SOLID SM: 417A,D, DISTLTN. AND TITRATION	3.2	MG/KG	3.2	08/15/89 830

*1 *SENT UNDER SEPARATE COVER

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***** CONTINUED *****

ENSR Labs—Houston

Analytical Report
09/13/89 13:09

Dames & Moore	Field ID: TH-1,2,3&4	Date Sampled: 08/09/89
Proj. No.: D&M-14819-505	Lab ID: 1	Time Sampled: 1800
Lab No.: A2780	Matrix: SOIL (COMPOSITE)	Date Received:08/11/89

Parameter (Test Code) (Test Name) (Test Method)	Concentration	Units	Method Detection Limit	Date/Time Analysis Performed
NO2 -S- -HOU NITRITE SM:418F,AUTOMATED Cd REDUCTION	*SEE REM *1			/ /
NO3 -S- -HOU NITRATE ON SOLID SM: 418C, CADMIUM REDUCTION	*SEE REM *1			/ /
O-PO4-S- -HOU ORTHOPHOSPHATE 16TH ED. SM:424A,F, ASCORBIC ACID	SEE REM* *2			08/17/89 1000
PRIM -S-SCN-WLL PRIMARY SCREEN ON SOLID	SEE REM* *3			/ /
S3 -S- -ALA BASIC S3 W/O RECOMMENDATIONS	SEE REM* *3			/ /
SA1 -S- -ALA BASIC SA1 W/O RECOMMENDATIONS	SEE REM* *3			/ /
TKN -S- -HOU TOTAL KJELDAHL NITROGEN/SOLID SM: 417D,420A DISTILL.,DIG.,TITRATN	90	MG/KG	6.4	08/21/89 1015
TOC -S- -SWL TOTAL ORGANIC CARBON ON SOLID AGRONOMY #9: 89-3.5, LECO FURNACE	0.19	PERCENT		08/15/89 1132

*1 *UNABLE TO ANALYZE DUE TO TURBIDITY OF FILTRATE
*2 *SEE NARRATIVE LOG
*3 *SENT UNDER SEPARATE COVER

ENSR

***** CONTINUED *****

ENSR Labs-Houston

Analytical Report
09/13/89 13:09

Dames & Moore	Field ID: TH-1,2,3&4	Date Sampled: 08/09/89
Proj. No.: D&M-14819-505	Lab ID: 1	Time Sampled: 1800
Lab No.: A2780	Matrix: SOIL (COMPOSITE)	Date Received:08/11/89

Parameter (Test Code) (Test Name) (Test Method)	Concentration	Units	Method Detection Limit	Date/Time Analysis Performed
TOL -S- -SPL TOLUENE ON SOLID EPA SW-846: 8020, GC	66000	UG/KG	1	08/11/89
TPH -S- -HOU TOTAL PET. HYDROCARBONS/SOLID EXT:SM:503D, ANALYSIS:600:418.1, IR	310	MG/KG	50	08/23/89 1400
XYL -S- -SPL XYLENE ON SOLID EPA SW-846: 8020, GC	130000	UG/KG	1	08/11/89

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ENSR Labs-Houston

Analytical Report
09/13/89 13:09

Dames & Moore	Field ID: TH-1-60-72	Date Sampled: 08/09/89
Proj. No.: D&M-14819-505	Lab ID: 2	Time Sampled:
Lab No.: A2780	Matrix: SOIL (GRAB)	Date Received:08/11/89

Parameter (Test Code) (Test Name) (Test Method)	Concentration	Units	Method Detection Limit	Date/Time Analysis Performed
%FS -S-PAR-HOU PERCENT FIXED SOLIDS OF TS SM: 209D, GRAVIMETRIC @ 550 DEG. C	99.46	PERCENT	0.001	08/21/89 1400
%H2O -S-PAR-HOU MOISTURE CONTENT ON SOLID (%) SM: INVERSE OF 209A, GRAVIMETRIC	19.0	PERCENT	0.001	08/21/89 1400
%TS -S-PAR-HOU PERCENT TOTAL SOLIDS ON SOLID SM: 209A, GRAVIMETRIC @ 103-105DEGC	81.0	PERCENT	0.001	08/21/89 1400
%VS -S-PAR-HOU PERCENT VOLATILE SOLIDS OF TS SM: 209D, GRAVIMETRIC @ 550 DEG. C	0.54	PERCENT	0.001	08/21/89 1400
TPH -S- -HOU TOTAL PET. HYDROCARBONS/SOLID EXT:SM:503D, ANALYSIS:600:418.1, IR	<50	MG/KG	50	08/23/89 1400

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Analytical Report
09/13/89 13:09

Dames & Moore	Field ID: TH-1-5-6	Date Sampled: 08/09/89
Proj. No.: D&M-14819-505	Lab ID: 3	Time Sampled:
Lab No.: A2780	Matrix: SOIL (GRAB)	Date Received:08/11/89

Parameter (Test Code) (Test Name) (Test Method)	Concentration	Units	Method Detection Limit	Date/Time Analysis Performed
BENZ -S- -SPL BENZENE ON SOLID EPA SW-846: 8020, GC	4300	UG/KG	1	08/11/89
EB -S- -SPL ETHYL BENZENE ON SOLID EPA SW-846: 8020, GC	5400	UG/KG	1	08/11/89
TOL -S- -SPL TOLUENE ON SOLID EPA SW-846: 8020, GC	10000	UG/KG	1	08/11/89
XYL -S- -SPL XYLENE ON SOLID EPA SW-846: 8020, GC	13000	UG/KG	1	08/11/89

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Analytical Report
09/13/89 13:09

Dames & Moore	Field ID: MW-12	Date Sampled: 08/10/89
Proj. No.: D&M-14819-505	Lab ID: 4	Time Sampled:
Lab No.: A2780	Matrix: WATER (GRAB)	Date Received:08/11/89

Parameter (Test Code) (Test Name) (Test Method)	Concentration	Units	Method Detection Limit	Date/Time Analysis Performed
PRIM - -SCN-WLL PRIMARY SCREEN	SEE REM* *1			/ /

*1 *SENT UNDER SEPARATE COVER

ENSR

ENSR LABORATORIES ©

CONSULTING AND ENGINEERING
2925 RICHMOND AVENUE HOUSTON, TX 77098 (713) 520-1495

Analysis Request and Chain of Custody Record

Project no.: DM-14819-505

Client/Project Name: Dames+Moore - ~~Farm~~ - Tim Holbrook

Project Location: Formington, NM

Lab ID No	Field Sample No./ Identification	Date and Time	Grab	Comp	Sample Container (Size/Mat'l)	Sample Type (Liquid Sludge, Etc.)	Preservative	ANALYSIS REQUESTED	LABORATORY REMARKS
1	TH-1,2,3+4	8/9/89 600 P		X	Brn glass	SOIL	Cool	Microtox (2 containers)	8/21/89- Add Primary Screen on Lab ID 1 per D. Woodward to KB
1	TH-1,2,3+4	8/9/89		Y	glass	SOIL	"	NO_3, NO_2, NH_3, TKN, O-Phos	
1	TH-1,2,3+4	8/9/89		Y	glass	SOIL	"	TPH, COD Partition (2 containers)	
1	TH-1,2,3+4	8/9/89		X	P	SOIL	"	TOC (2 containers) Sent to ACL Air: 8-21-89 FedEX KLB	
1	TH-1,2,3+4	8/9/89		X	G	SOIL	"	TVS ADD Basic SNA, S3 per D Woodward 8-21-89.	
1	TH-1,2,3+4	8/9/89		X	G	SOIL	"	BTEX	
2	TH-1-60-72	8/9/89	X		G	SOIL	"	TPH, Partition	
3	TH-1-5-6	8/9/89	Y		G	SOIL	"	BTEX	
4	MW-12	8/10/89	X		G	WATER	"	Primary Screen - Bio (6 containers)	
								NOTE 2 are not Marked	

Samplers: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time	COC Seal No.
Tim Holbrook	Tim Holbrook	Date: 8/10/89 Time: 1200 noon		Date: Time:	31700
Affiliation: Dames + Moore	Relinquished by: (Signature)	Date: Time:	Received by: (Signature)	Date: Time:	
	Relinquished by: (Signature)	Date: Time:	Received by Laboratory: (Signature) [signature]	Date: 8/11/89 Time: 1010	Intact:

REMARKS: 8/30/89 Microtox to be sent under separate cover per D. Ramsden DB

Data Results To:
1.
2.

Laboratory No. A2780

ENSR LABORATORIES
SAMPLE RECEIPT CHECKLIST

CLIENT Dames & Moore PROJECT NO. DTM-14819-505 LAB NO. A2780

1. ✓ shipped — NOTES: Airborne Express # 3793C4133
   ____ hand-delivered
2. ✓ COC present on receipt — NOTES:
   ____ no COC
3. ✓ COC tape on shipping container — NOTES: Seal # 31700
   ____ no COC tape
4. ____ samples broken/leaking on receipt — NOTES: Intact
   ✓ samples intact on receipt
   ____ other, see notes
5. ____ ambient on receipt — NOTES:
   ✓ chilled on receipt
6. ✓ samples preserved correctly — NOTES:
   ____ improper preservatives
   ____ N/A, no recommended preservatives
   ____ other, see notes
7. ✓ received within holding times — NOTES:
   ____ not received within holding times
   ____ N/A, no recommended holding time
   ____ other, see notes
8. ____ COC tapes on samples — NOTES:
   ✓ no COC tapes
9. ____ discrepancies between COC and sample labels — NOTES:
   ✓ no discrepancies noted
   ____ N/A, no COC received
   ____ other, see notes

Additional comments:

Samples inspected and logged in by: [signature] Date/Time: 9/16/94 1645

ENSR Labs—Houston

QUALITY CONTROL LOG

Parameter: %VS, %TS, %FS, %H2O

Method of Analysis: SM: 2090 SM: 209A

Page: 1 of 1

Matrix: Soil

Date/Time: 8-21-89 1400

Lab Numbers	Detection Limits
A2780-1	0.001%
-2	↓

Calibration Standards/Blank	Absorbance

Correlation Coefficient:

Comments:

Check Standards	Concentration Found/True
Sample Blank	
Method Blank	0.0000 gm
P.E. Std.	
Internal Std.	

Internal Quality Control Duplicates and Spikes

* Below MDL

Lab No. - Sample ID	Sample Conc.	Duplicate Conc.	Range	Percent RPD	Spiked Result	Sample Result	Spike Added	Percent Recovery
A2780-TS	81.6	80.4	1.2	1.5				
-H2O	18.4	19.6	1.2	6.3				
-FS	99.5	99.4	0.1	0.1				
-VS	0.43	0.50	0.07	15.0				

Analyst: [signature]

QA/QC Approval: [signature]

ENSR LABORATORIES

Quality Control Log

Parameter: NH_3-N Matrix: Liquid & Sol, d
Method of Analysis: 417A, D Date/Time: 0830 / 8-15-89

Lab Numbers	Detection Limits
A2769-2	0.2 mg/L
A2778-2	0.2 mg/L
A2779-1	0.1 mg/L
A2780-1	3.2 mg/L

Calibration Standards/Blank	Absorbance

Check Standards	Concentration Found/True
Sample Blank	
Method Blank	0.2 mls
P.E.Std. EPA 987	2.24 / 2.00
Internal Std	
10 ppm	9.6

Comments:
* Below MDL

Internal Quality Control Duplicates and Spikes

Lab No.- Sample ID	Sample Conc.	Duplicate Conc.	Range	% R.P.D.	Spiked Sample Result	Sample Result	Spike Added	Percent Recovery
A2780-1	3.16	3.37	0.21	643	246.4	3.16	249.93	97
A2779-1	0.14				5.97	0.07	5.0	118

Analyst: Lien Nguyen QAQC Approval: Dee Davis

ENSR LABORATORIES

Quality Control Log

Parameter: TKN on soil
Method of Analysis: SM: 417D, 420A
Matrix: soil
Date/Time: 8-21-89 / 1015

Lab Numbers	Detection Limits
A2780-1	6.4 mg/kg

Calibration Standards/Blank	Absorbance

Comments:
*Duplicate analyzed on 8-18-89 at 0830.

Check Standards	Concentration Found/True
Sample Blank	
Method Blank	0.2 mls
P.E.Std. EPA 987	4.9/5.0
Internal Std	10-1/10 mm

Internal Quality Control Duplicates and Spikes

Lab No.- Sample ID	Sample Conc.	Duplicate Conc.	Range	% R.P.D.	Spiked Sample Result	Sample Result	Spike Added	Percent Recovery
A2780-1	90.3	*97.0	6.7	7.1%	600	90.2	446.23	114

Analyst: Lien Nguyen

QAQC Approval: Dan Davis

ENSR Labs—Houston

QUALITY CONTROL LOG

Parameter: TPH on Solid

Method of Analysis: SM:5030 EPA 600:418.1 IR.

Matrix: Solid

Date/Time: 8-23-89 1400

Lab Numbers	Detection Limits
A2784(1,4,9)	40 mg/kg
A2784(2,3,5, 14,15,16,19.)	50 mg/kg ↓
A2784-6	190 mg/kg
-7	410 mg/kg
-8	220 mg/kg
(10,12)	90 mg/kg
-13	380 mg/kg
-17	200 mg/kg
-18	190 mg/kg

Calibration Stds./Blk	Absorbance/Conc.
2.1	0.0430 / 1.7
4.2	0.0740 / 3.9
8.5	0.1396 / 8.5
17.0	0.2740 / 17.0
42.5	0.6104 / 42.0

Correlation Coefficient: 0.9992

Comments:

Check Standards	Concentration Found/True
Sample Blank	
Method Blank	Abs. 0.0158
P.E. Std.	
Internal Std.	22.7 / 21.3

Internal Quality Control Duplicates and Spikes

* Below MDL

Lab No. - Sample ID	Sample Conc.	Duplicate Conc.	Range	Percent RPD	Spiked Result (mg)	Sample Result (mg)	Spike Added (mg)	Percent Recovery (mg)
A2784-2	<50	<50	*	*	8.8	<2	8.5	104 %
A2784-10	1132	1178	46	4.0 %	→	Diluted	out ←	
A2787-1	13.4	13.8	0.4	2.9 %	→	Diluted	out ←	
A2780-1	310	333	23	7.1 %	15.3	7.5	8.5	92 %
A2781-1	34.8	36.3	1.5	4.2 %	→	Diluted	out ←	
A2784-17	3124	3262	138	4.3 %	→	Diluted	out ←	
A2798-1	7362	7560	198	2.7 %	→	Diluted	out ←	

Analyst: [signature]

QA/QC Approval: Dee Davis

ENSR Labs-Houston

QUALITY CONTROL LOG

Parameter: TPH on Solid

Method of Analysis: SM: 5030 EPA 600:418.1

Page: 2 of 2

Matrix: Solid

Date/Time: 8-23-89 1400

Lab Numbers	Detection Limits
A2787-1	1.0 %
-2	0.3 %
A2780-(1,2)	50 mg/kg
A2781-1	2.3 %
A2798-1	380 mg/kg
-2	190 mg/kg

Calibration Stds./Blk	Absorbance/Conc.
Correlation Coefficient:	

Comments:

Check Standards	Concentration Found/True
Sample Blank	
Method Blank	Abs.
P.E. Std.	
Internal Std.	

Internal Quality Control Duplicates and Spikes

* Below MDL

Lab No. - Sample ID	Sample Conc.	Duplicate Conc.	Range	Percent RPD	Spiked Result (mg)	Sample Result (mg)	Spike Added (mg)	Percent Recovery (mg)

Analyst: [signature]

QA/QC Approval: [signature]

SOUTHERN PETROLEUM LABORATORIES, INC.

BETX MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

SPL SAMPLE ID: 908122 04A
MATRIX: Soil

DATE: 8-1-89
Inst. E

COMPOUND	SPIKE ADDED ug/L or kg/L	SAMPLE CONCENTRATION ug/L or kg/L	MS CONCENTRATION ug/L or kg/L	MS % REC #	QC LIMITS REC.
Benzene	50	<1	52	104	39-150
Ethylbenzene	50	<1	53	106	32-160
Toluene	50	<1	50	100	46-148
m+p-Xylene	100	<1	106	106	32-160
o-Xylene	50	<1	52	104	32-160

Cert. # 908132-01→05A 908149-04→10A
908139-01/02A

COMPOUND	SPIKE ADDED ug/L or kg/L	MSD CONCENTRATION ug/L or kg/L	MSD % REC. #	% RPD #	V	QC LIMITS
Benzene	50	46	92	12.2	20	39-150
Ethylbenzene	50	47	94	12.0	20	32-160
Toluene	50	44	88	12.8	20	46-148
m+p-Xylene	100	96	96	9.9	20	32-160
o-Xylene	50	46	92	12.2	20	32-160

$$\% \text{ Recovery} = \frac{100\ (\text{Spike Sample Result} - \text{Sample Result})}{\text{Amount Spike}}$$

RPD = Relative Percent Deviation = 200 (D1 - D2) / (D1 + D2)

Where: D1 = MS Result
D2 = MSD Result

P.O. BOX 20407 HOUSTON, TX 77225
P.O. BOX 31796 LAFAYETTE, LA 70503
143 MALLARD, SUITE B ST. ROSE, LA 70087
458 HUGHES DRIVE TRAVERSE CITY, MI 49684
P.O. BOX 648 CARTHAGE, TX 75633

ENSR

SOUTHWESTERN LABORATORIES QUALITY CONTROL LOG

MDL. _____

METHOD OF ANALYSIS Agronomy No. 9 90-2.6 PARAMETER TOC MATRIX Soil ANALYST Lois Armstrong DATE 8-15-89 TIME 11:32am

CALIBRATION STANDARDS/BLANK	ABSORBANCE
High C. Std.: 0.679	NA
Low C. Std. 0.041	
Standard Value: High Std: 0.675±0.007	
Low Std: 0.040±0.002	
SLOPE	

STANDARDS	THEORETICAL CONCENTRATION	MEASURED CONCENTRATION	% RECOVERY
BLANK	NA	NA	
Soil STd.	0.98 ± 0.05	0.99	
METHOD BLANK			

LAB NUMBERS/SAMPLE ID NUMBERS IN THIS RUN:

Project Number: DTM-14819-505

Sample ID: TH-1,2,3 & 4 (Composite)

Sample size: 250 mg

QUALITY CONTROL DUPLICATES AND SPIKES

PERCENT RECOVERY CALCULATION: $\frac{\text{SPIKED SAMPLE} - \text{SAMPLE}}{\text{THEORETICAL}} \times 100$

LAB #-SAMPLE ID #	FIRST CONC.	DIL. FACTOR	REPL. CONC.	DIL. FACTOR	RANGE	%PRECISION	SPIKED SAMPLE CONC.	SAMPLE CONC.	THEO. CONC.	% RECOVERY
		NA		NA			NA	NA	NA	NA
TH 1,2,3+4 322-001	0.19		0.19							
SAMPLES RUN BY MOA:										

WATER
QUALITY
SERVICES

17459 VILLAGE GREEN DRIVE
HOUSTON, TEXAS 77040
(713) 466-0958

ENVIRONMENTAL TESTING SPECIALISTS

August 17, 1989

ENSR
2925 Richmond Ave
Houston, TX 77098

LABORATORY REPORT

Soil sample received 08/14/89. Project DTM-14819-505.

ENSR Lab#	COD, mg/kg	WQS ID
A-2780-1	4900	4522

Quality Control

Analysis	COD
Date	08/15/89
Time	0845
Analyst	JM
Dup 1, mg/l	<5
Dup 2, mg/l	<5
Method*	508B
MDL	5

*Standard Methods for the Examination of Water and Wastewater, 16th Ed.

WATER QUALITY SERVICES

Anne Fidelman
General Manager

ENSR

Formerly ERT

DATE: 09/24/89

TO: Dick Woodward

FROM: Bo Blankfield, Lab Director

PROJ. NO.: HE36002-001 LAB NO.: A2901

ENSR Consulting
and Engineering

3000 Richmond Avenue
Houston, TX 77098
(713) 520-9900

Attached are reports of chemical analyses of samples received September 6, 1989. These analyses are:

Count	Test Code	Test Name	Test Method	Sampled	Matrix
1	BENZ - - -HOU	BENZENE	EPA 600: 602, GC	09/05/89	SOIL/H2O
1	EB - - -HOU	ETHYL BENZENE	EPA 600: 602, GC	09/05/89	SOIL/H2O
1	TOL - - -HOU	TOLUENE	EPA 600: 602, GC	09/05/89	SOIL/H2O
1	TPH - - -HOU	TOTAL PETROLEUM HYDROCARBONS	EPA 600: 418.1, IR SPEC	09/05/89	SOIL/H2O
1	XYL - - -HOU	XYLENE	EPA 600: 602, GC	09/05/89	SOIL/H2O

Data contained in this report reflect a full quality control review and have met all applicable standards established by ENSR. ENSR quality assurance protocols are in accordance with EPA guidelines.

Should you have any questions, do not hesitate to contact me at (713) 520-9900.

BB/lis

Enclosures: Analytical Summary, Analytical Report, Chain of Custody, Sample Receipt Checklist, Quality Control Logs, NARRATIVE LOG, Billing Summary

cc: Sandra Cavanaugh

LAB NO. A2901
PROJECT HE36002-001 Dames & Moore

ENSR Labs—Houston

Analytical Summary
09/24/89 14:42

Lab Number: A2901 *Project:* HE36002-001 Dames & Moore	
Lab ID *Field ID* *(Cont.)* *Test /Matrix*	1 DAY ZERO SOIL/H2O
BENZ - - -HOU *(MDL)*	800 UG/L *(500)*
EB - - -HOU *(MDL)*	1900 UG/L *(500)*
TOL - - -HOU *(MDL)*	2900 UG/L *(500)*
TPH - - -HOU *(MDL)*	250* MG/L *(17)**
XYL - - -HOU *(MDL)*	4700 UG/L *(500)*

QAQC Approval: [signature] Date: 9/25/89

Mgr. Approval: Brenda P. Basile Date: 9/25/89

* Please see attached Analytical Report for remarks.

ENSR

ENSR Labs—Houston

Analytical Report
09/24/89 14:37

Dames & Moore	Field ID: DAY ZERO	Date Sampled: 09/05/89
Proj. No.: HE36002-001	Lab ID: 1	Time Sampled: 1500
Lab No.: A2901	Matrix: SOIL/H2O(COMPOSITE)	Date Received:09/06/89

Parameter (Test Code) (Test Name) (Test Method)	Concentration	Units	Method Detection Limit	Date/Time Analysis Performed
BENZ - - -HOU BENZENE EPA 600: 602, GC	800	UG/L	500	09/14/89
EB - - -HOU ETHYL BENZENE EPA 600: 602, GC	1900	UG/L	500	09/14/89
TOL - - -HOU TOLUENE EPA 600: 602, GC	2900	UG/L	500	09/14/89
TPH - - -HOU TOTAL PETROLEUM HYDROCARBONS EPA 600: 418.1, IR SPEC	250* *1	MG/L	17	09/14/89 1500
XYL - - -HOU XYLENE EPA 600: 602, GC	4700	UG/L	500	09/14/89

*1 *SEE NARRATIVE LOG

ENSR

ENSR LABORATORIES ©

CONSULTING AND ENGINEERING
2925 RICHMOND AVENUE HOUSTON, TX 77098 (713) 520-1495

Analysis Request and Chain of Custody Record

Project no.: HE 36002 001
Client/Project Name: Primary Screen - Dames + Moore
Project Location: West Loop Lab

Lab ID No	Field Sample No./ Identification	Date and Time	Grab	Comp	Sample Container (Size/Mat'l)	Sample Type (Liquid Sludge, Etc.)	Preservative	ANALYSIS REQUESTED	LABORATORY REMARKS
1	Day Zero	1500 9/5/89		/	VOA (x2)	soil and water ~~slurry~~	4°C	BTEX	
1	Day Zero	↓		/	4 oz amber	soil and water ~~slurry~~	HCL 4°C	TPH	

Samplers: (Signature) Sandra L. Cavanaugh
Affiliation

Relinquished by: (Signature) Sandra L. Cavanaugh — Date: 9/6/89 Time: 9:15 Am
Relinquished by: (Signature) — Date: Time:
Relinquished by: (Signature) — Date: Time:

Received by: (Signature) — Date: Time:
Received by: (Signature) — Date: Time:
Received by Laboratory: (Signature) — Date: 9/6/89 Time: 0920

COC Seal No.
Intact:

REMARKS:

Data Results To:
1. Dave Ramsden
2. Dick Woodward

Laboratory No. A2901

ENSR LABORATORIES ©
SAMPLE RECEIPT CHECKLIST

CLIENT James & Moore PROJECT NO. HE36002001 LAB NO. 142901

1. ____ shipped — NOTES:
   ✓ hand-delivered
2. ✓ COC present on receipt — NOTES:
   ____ no COC
3. ____ COC tape on shipping container — NOTES:
   ✓ no COC tape
4. ____ samples broken/leaking on receipt — NOTES: Intact
   ✓ samples intact on receipt
   ____ other, see notes
5. ____ ambient on receipt — NOTES:
   ✓ chilled on receipt
6. ✓ samples preserved correctly — NOTES:
   ____ improper preservatives
   ____ N/A, no recommended preservatives
   ____ other, see notes
7. ✓ received within holding times — NOTES:
   ____ not received within holding times
   ____ N/A, no recommended holding time
   ____ other, see notes
8. ____ COC tapes on samples — NOTES:
   ✓ no COC tapes
9. ____ discrepancies between COC and sample labels — NOTES:
   ✓ no discrepancies noted
   ____ N/A, no COC received
   ____ other, see notes

Additional comments:

Samples inspected and logged in by: [signature] Date/Time: 9/6/91 9:30

ENSR Labs-Houston

QUALITY CONTROL LOG

Parameter: TPH - Water

Method of Analysis: EPA 600:418.1

Page: 1 of 1

Matrix: Liquid

Date/Time: 9-14-89/1500

Lab Numbers	Detection Limits
A2901-1	17 mg/l
A2929-1	0.2%
A2933-8	4 mg/l

Calibration Stds./Blk	Absorbance/Conc.
2.10	0.0578/1.74
4.30	0.0905/4.08
8.50	0.1485/8.24
17.00	0.2866/18.2
42.60	0.6210/42.2

Correlation Coefficient: 0.9992

Comments:

** See Narrative Log; Insufficient sample volumes provided for further QC.

Check Standards	Concentration Found/True
Sample Blank	
Method Blank	Abs. .2161
P.E. Std.	
Internal Std.	22.3/21.3

Internal Quality Control Duplicates and Spikes

* Below MDL

Lab No. - Sample ID	Sample Conc.	Duplicate Conc.	Range	Percent RPD	Spiked Result (mg)	Sample Result (mg)	Spike Added (mg)	Percent Recovery (mg)
Water Blk-Spk	*				19.5	4.0	21.3	**73%

Analyst: Ericka M. Edwards

QA/QC Approval: Dee Davis

NARRATIVE LOG

CLIENT	PROJECT NO.	LAB NO.
Dames & Moore	HE36002001	A2901-1
Exxon-La Pata	2620-0208-005	A2929-1
AT&T/Mesquite	0550-118-004	A2933-8

PARAMETER	METHOD	ANALYST	DATE/TIME
Total Petroleum Hydrocarbons	SM:503D EPA 600:418.1 IR	EME	9-14-89/1500

Upon analysis of TPH for the water samples listed above, it was determined that possible glassware contamination occurred due to the presence of TPH in the method blank. The percent recovery of the blank spike is low due to the TPH detected in the blank. To compensate for the contamination, the method blank and the freon blank absorbances were subtracted from the sample absorbance instead of the single freon blank. ENSR Laboratory Management reviewed the situation and corrected the source of the contamination problem.

REFERENCE:

1. Standard Methods for the Examination of Water and Wastewater, t Edition, 1985.

2. Test Methods for Evaluating Solid Waste Physical/Chemical Methods (USEPA SW-846), r Edition, Revision 0, 1986.

3. EPA 600 - Guidelines Establishing Test Procedures for the Analysis of Pollutants under the Clean Water Act, 1984.

ENSR

Formerly ERT

DATE: 10/04/89

TO: Dick Woodward

FROM: Bo Blankfield, Lab Director

PROJ. NO.: HE36002-001 LAB NO.: A2983

ENSR Consulting
and Engineering

3000 Richmond Avenue
Houston, TX 77098
(713) 520-9900

Attached are reports of chemical analyses of samples received September 21, 1989. These analyses are:

Count	Test Code	Test Name	Test Method	Sampled	Matrix
3	BENZ - - -HOU	BENZENE	EPA 600: 602, GC	09/20/89	SOIL*
3	EB - - -HOU	ETHYL BENZENE	EPA 600: 602, GC	09/20/89	SOIL*
3	TOL - - -HOU	TOLUENE	EPA 600: 602, GC	09/20/89	SOIL*
3	TPH - - -HOU	TOTAL PETROLEUM HYDROCARBONS	EPA 600: 418.1, IR SPEC	09/20/89	SOIL*
3	XYL - - -HOU	XYLENE	EPA 600: 602, GC	09/20/89	SOIL*

Data contained in this report reflect a full quality control review and have met all applicable standards established by ENSR. ENSR quality assurance protocols are in accordance with EPA guidelines.

Should you have any questions, do not hesitate to contact me at (713) 520-9900.

BB/lis

Enclosures: Analytical Summary, Analytical Report, Chain of Custody, Sample Receipt Checklist, Quality Control Logs, Billing Summary

cc: Sandra Cavanaugh

LAB NO. A2983
PROJECT HE36002-001 Dames & Moore

ENSR Labs—Houston

Analytical Summary
10/04/89 13:14

Lab Number: A2983
Project: HE36002-001
Dames & Moore

Lab ID / *Field ID* / *(Cont.)* / *Test /Matrix*	1 FLASK 1 DAY 14 SOIL*	2 FLASK 2 DAY 14 SOIL*	3 FLASK 5 DAY 14 SOIL*
BENZ - - -HOU	<1 UG/L	<1 UG/L	<1 UG/L
(MDL)	*(1)**	*(1)**	*(1)**
EB - - -HOU	<1 UG/L	<1 UG/L	<1 UG/L
(MDL)	*(1)**	*(1)**	*(1)**
TOL - - -HOU	<1 UG/L	<1 UG/L	<1 UG/L
(MDL)	*(1)**	*(1)**	*(1)**
TPH - - -HOU	<7 MG/L	<7 MG/L	8 MG/L
(MDL)	*(7)**	*(7)**	*(6)**
XYL - - -HOU	<1 UG/L	<1 UG/L	<1 UG/L
(MDL)	*(1)**	*(1)**	*(1)**

QAQC Approval: Deborah Cafe Date: 10-6-89

Mgr. Approval: _____ Date: _____

* Please see attached Analytical Report for remarks.

ENSR

ENSR Labs-Houston

Analytical Report
10/04/89 12:58

Dames & Moore	Field ID: FLASK 1 DAY 14	Date Sampled: 09/20/89
Proj. No.: HE36002-001	Lab ID: 1	Time Sampled: 1700
Lab No.: A2983	Matrix: SOIL* (GRAB)	Date Received: 09/21/89

Parameter (Test Code) (Test Name) (Test Method)	Concentration	Units	Method Detection Limit	Date/Time Analysis Performed
BENZ - - -HOU BENZENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89
EB - - -HOU ETHYL BENZENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89
TOL - - -HOU TOLUENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89
TPH - - -HOU TOTAL PETROLEUM HYDROCARBONS EPA 600: 418.1, IR SPEC	<7 *1	MG/L	7	09/28/89 1000
XYL - - -HOU XYLENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89

*1 *MATRIX CONT.:AND WATER

ENSR

ENSR Labs-Houston

Analytical Report
10/04/89 12:58

Dames & Moore	Field ID: FLASK 2 DAY 14	Date Sampled: 09/20/89
Proj. No.: HE36002-001	Lab ID: 2	Time Sampled: 1700
Lab No.: A2983	Matrix: SOIL* (GRAB)	Date Received:09/21/89

Parameter (Test Code) (Test Name) (Test Method)	Concentration	Units	Method Detection Limit	Date/Time Analysis Performed
BENZ - - -HOU BENZENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89
EB - - -HOU ETHYL BENZENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89
TOL - - -HOU TOLUENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89
TPH - - -HOU TOTAL PETROLEUM HYDROCARBONS EPA 600: 418.1, IR SPEC	<7 *1	MG/L	7	09/28/89 1000
XYL - - -HOU XYLENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89

*1 *MATRIX CONT.:AND WATER

ENSR

ENSR Labs-Houston

Analytical Report
10/04/89 12:58

Dames & Moore	Field ID: FLASK 5 DAY 14	Date Sampled: 09/20/89
Proj. No.: HE36002-001	Lab ID: 3	Time Sampled: 1700
Lab No.: A2983	Matrix: SOIL* (GRAB)	Date Received:09/21/89

Parameter (Test Code) (Test Name) (Test Method)	Concentration	Units	Method Detection Limit	Date/Time Analysis Performed
BENZ - - -HOU BENZENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89
EB - - -HOU ETHYL BENZENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89
TOL - - -HOU TOLUENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89
TPH - - -HOU TOTAL PETROLEUM HYDROCARBONS EPA 600: 418.1, IR SPEC	8 *1	MG/L	6	09/28/89 1000
XYL - - -HOU XYLENE EPA 600: 602, GC	<1 *1	UG/L	1	09/28/89

*1 *MATRIX CONT.:AND WATER

ENSR

ENSR LABORATORIES ©

CONSULTING AND ENGINEERING
2925 RICHMOND AVENUE HOUSTON, TX 77098 (713) 520-1495

Analysis Request and Chain of Custody Record

Project no.: HE 36002 001

Client/Project Name: Dames and Moore Primary Screen

Project Location: West Loop Lab

Lab ID No	Field Sample No./ Identification	Date and Time	Grab	Comp	Sample Container (Size/Mat'l)	Sample Type (Liquid Sludge, Etc.)	Preservative	ANALYSIS REQUESTED	LABORATORY REMARKS
1	Flask 1 Day 14	1700 9/20/89	✓		16 oz Amber	Soil and Water	HCL	TPH	
2	Flask 2 Day 14		✓		↓	↓	↓	TPH	
3	Flask 5 Day 14		✓		↓	↓	↓	TPH	
1	Flask 1 Day 14		✓		VOA (x2)	↓		BETX	
2	Flask 2 day 14		✓		↓	↓		BETX	
3	Flask 5 Day 14		✓		↓	↓		BETX	

Samplers: (Signature) Sandra L. Cavanaugh

Affiliation

REMARKS:

Relinquished by: (Signature) Sandra L. Cavanaugh — Date: 9/21/89 Time: 1004

Relinquished by: (Signature) — Date: Time:

Relinquished by: (Signature) — Date: Time:

Received by: (Signature) — Date: Time:

Received by: (Signature) — Date: Time:

Received by Laboratory: (Signature) Julie Holub — Date: 9-21-89 Time: 10:05

COC Seal No.

Contact:

Data Results To:
1. Dick Wardward
2. Sandra Cavanaugh

Laboratory No. A2983

ENSR LABORATORIES ©
SAMPLE RECEIPT CHECKLIST

CLIENT Dames & Moore PROJECT NO. HE-36002001 LAB NO. A2983

1. ____ shipped — NOTES:
   ✓ hand-delivered
2. ✓ COC present on receipt — NOTES:
   ____ no COC
3. ____ COC tape on shipping container — NOTES:
   ✓ no COC tape
4. ____ samples broken/leaking on receipt — NOTES: Intact
   ✓ samples intact on receipt
   ____ other, see notes
5. ____ ambient on receipt — NOTES:
   ✓ chilled on receipt
6. ✓ samples preserved correctly — NOTES:
   ____ improper preservatives
   ____ N/A, no recommended preservatives
   ____ other, see notes
7. ✓ received within holding times — NOTES:
   ____ not received within holding times
   ____ N/A, no recommended holding time
   ____ other, see notes
8. ____ COC tapes on samples — NOTES:
   ✓ no COC tapes
9. ____ discrepancies between COC and sample labels — NOTES:
   ✓ no discrepancies noted
   ____ N/A, no COC received
   ____ other, see notes

Additional comments:

Samples inspected and logged in by: Thelma Lowe Date/Time: 9-21-89 / 1000

ENSR Labs—Houston

QUALITY CONTROL LOG

Parameter: TPH Water

Method of Analysis: EPA 600: 418.1

Page: 1 of 1

Matrix: Water

Date/Time: 9-26-99 / 1:00

Lab Numbers	Detection Limits
A2983-(1,2)	7 mg/l
A2993-3	6
A2992-(1-4)	2
A3005-15	4
A3008-12	13
A3008(13,14)	14
A3008(16,17,19,20)	6

Calibration Stds./Blk	Absorbance/Conc.
2.10	0.0583 / 1.79
4.30	0.0900 / 4.16
8.50	0.1431 / 8.13
17.0	0.2764 / 18.1
42.6	0.5979 / 42.2
IS 21.3	0.3405 / 22.9
Correlation Coefficient:	0.9992

Comments: Insufficient Sample for further Q.C.

Check Standards	Concentration Found/True
Sample Blank	
Method Blank	Abs. 0.0346
P.E. Std.	
Internal Std.	22.9 / 21.3

Internal Quality Control Duplicates and Spikes

* Below MDL

Lab No. - Sample ID	Sample Conc.	Duplicate Conc.	Range	Percent RPD	Spiked Result (mg)	Sample Result (mg)	Spike Added (mg)	Percent Recovery (mg)
Blk-Spk					19.8	—	21.3	93%

Analyst: Erika M Edwards

QA/QC Approval: [signature]

ENSR CONSULTING AND ENGINEERING-HOUSTON LABORATORY
QUALITY CONTROL LOG
BTEX ANALYSES

LABORATORY NO: A2983

BLANK ANALYSIS DATE: 9/28/89

NO BTEX DETECTED AT STATED METHOD DETECTION LIMIT

MATRIX SPIKE RECOVERIES SAMPLE: 1

ANALYTE	SPIKE (UG/L)	SAMPLE (UG/L)	CONC MS	% REC	CONC MSD	% REC	RPD	QC LIMITS % REC	QC LIMITS RPD
BENZENE	20	0	0	0	0	0	ERR	39-150	15
TOLUENE	20	0	0	0	0	0	ERR	46-148	15
ETHYLBENZENE	20	0	0	0	0	0	ERR	32-160	15
TOTAL XYLENES	20	0	0	0	0	0	ERR	35-150	15

COMMENTS: No matrix spike or matrix spiked duplicate analyzed from this laboratory number

J. Rico 10/2/89
ANALYST SIGNATURE DATE

Brenda Casile 10/2/89
QA/QC COORDINATOR DATE

ENSR CONSULTING AND ENGINEERING-HOUSTON LABORATORY
SURROGATE QUALITY CONTROL LOG
BTEX ANALYSES

LABORATORY NO: A2983 COMMENTS:

LAB ID	SPIKED AMT(UG)	CALC AMT(UG)	PERCENT RECOVERY (75-125%)
CC092889	30	28.26	94
MB092889	30	29.26	98
1	30	28.72	96
2	30	28.83	96
3	30	29.41	98

ANALYST SIGNATURE DATE 10/2/89

QAQC COORDINATOR DATE 10/2/89

APPENDIX C

TANK CLEAN-OUT SPECIFICATIONS AND MANIFESTS

APPENDIX C

TANK CLEAN-OUT SPECIFICATIONS AND MANIFESTS

Enclosed are contractual letters from Rocky Mountain Construction Company, Inc. (RMCCI) and Mesa Oil, Inc., the companies that performed the tank clean-out and product removal at the tank farm. The tank-clean out work started in late November 1989 and was completed in January 1990. A description of the tank and pipeline clean-out procedures and copies of the product shipping manifests are included herein.

ROCKY MOUNTAIN
CONSTRUCTION
COMPANY, INC.

(505) 325-8979 • (505) 632-2491
P.O. Box 3089 • Farmington, NM 87499

ATTACHMENT 2

October 9, 1989

Ms. Terry D. Vandell
Hydrogeologist
Dames & Moore
250 East Broadway
Suite 200
Salt Lake City, Utah 84111-2480

Re: Proposal for tank & piping cleanup
at Caribou Refinery in Kirtland, NM.

Dear Ms. Vandell,

Thank you for the time and courtesies extended during our recent phone conversations and for allowing Rocky Mountain Construction Company, Inc. the opportunity to bid on your cleanup requirements at the Caribou Refinery in Kirtland, New Mexico.

Pending final lab reports and final destination of the product, we are submitting the following proposal for the piping and tank cleanup, not to include the removal of product and waste.

1. Dismantling of flanged and some threaded valves and connections on existing 1" through 8" pipe.

2. With the use of pipe jacks, compressor, pipe adapter fittings, expandable rubber pigs, and blowout product from 13,000'to 15,000' of 1" to 8" pipe. The 2000' variable is due to unknown lengths underground however 13,000' on the surface is accurate. Clogged lines containing product will also be cleaned out.

3. Lines will be disconnected from point to point and cleaned out from point to point. All collected product will be transfered to a tank for removal. As lines are cleaned out they will be re-connected to their original points of entry or exit using existing gaskets where available.

4. Piping North of the No.1 Diesel Fuel (Stove Oil) tanks will not be cleaned since they are running up hill and are welded. We are assuming they are naturally drained and clean. All other pipe South of that point will be cleaned out.

5. Existing product and residue from all tanks will be cleaned out with with the exception of the 30,000 BBL Crude Oil Tank which has already been cleaned and the 2.4 Million Gallon Leaded GAsoline Tank No. 7 which currently contains product.

6. Product in all the tanks will be diluted with the number 5 fuel oil, Hot oiled, and transfered to a temporary holding tank for transfer to a disposal facility.

7. All tanks will be steam cleaned to insure all residue is removed.

8. Cleaning will not include replacement of manway cover gaskets, floor coatings, or replacement of missing bolts on the manway openings or flanged pipe connections.

9. This proposal does not allow for transporting of the product from the job location to an approved disposal area.

Rocky Mountain Construction Company, Inc. is experienced in cleanups and enforces strong safety practices along with EPA, EID, and OCD compliance. A copy of our safety manual is being forwarded to you for your files.

All work conducted within tanks will be done with two personnel working on the inside and one monitoring on the outside of each tank. Safety equipment will include hard hats, full face respirators complete with travel monitor and filtering systems, rubber hooded jackets, trousers, and boots, explosion proof lights, and entry ventilation system.

Thank you for the opportunity to bid on your cleanup requirements and look forward to the prospect of serving Dames & Moore in your cleanup operations.

Total Bid Price: $36,484.00
Terms: Net 30 days upon completion

Sincerely,

Stan J. Kuchera
Executive Vice president

SJK:mk

ATTACHMENT 1

MESA

OIL, Inc.

Telephone No: (505) 877-8855
Wats No: 1-800-873-3645

4701 Broadway, S.E.
Albuquerque, N.M. 87105

October 17, 1989

Ms. Terri Vandell
Dames & Moore
250 East Broadway
Salt Lake City, Utah 84111

Dear Ms. Vandell:

Per our conversation this is the information you have requested.

Mesa Oil is an established oil recycler with our main office and plant in Albuquerque, New Mexico. We have branch operations in Artesia, Clovis, and Farmington, New Mexico as well as El Paso, Texas and Denver, Colorado. All oil picked up is brought to Albuquerque for processing.

We certify to you that our oil is recycled in an environmentally acceptable process into fuels and lubricants. We do not manufacture products which could pose environmental problems. We are registered with the New Mexico Environmental Improvement Department, Texas Water Commission, Colorado Department of Health, and the Federal EPA. Our EPA number is NMD0071090805.

We manifest the oil to provide you with record documentation that the oil reaches our location. We provide our service with our own truck mounted equipment. Our equipment is new and clean and our personnel are well trained. We will provide you with $1,000,000 in broadform liability protection.

If you have any questions please call me at 877-8855.

Sincerely,

John F. Dempsey
Vice President

JFD:ab

Enclosures

MESA OIL, Inc.

USED OIL RECYCLING MANIFEST / INVOICE

14851

DATE _____ CALL IN NUMBER _____

GENERATOR

Generator Name _____

Phone _____ Contact _____

Pickup Address _____

City _____ State _____ Zip _____

Mailing Address _____

City _____ State _____ Zip _____

U.S. DOT DESCRIPTION	GALLONS BEFORE B.S. & W. DEDUCTION	PRICE PER GALLON

SERVICE CHARGE DUE MESA OIL $

PLEASE PAY FROM THIS INVOICE. NO STATEMENT WILL BE SENT. TERMS ARE NET TEN (10) DAYS.

Special handling instructions _____

GENERATORS CERTIFICATION:
This used oil is described to the best of my ability and it was delivered to a licensed Used Oil Recycler. There are no Listed Hazardous Materials in this product.

Printed / Typed Name Signature Date

TRANSPORTER, STORER AND TREATOR OF USED OIL

MESA OIL, INC.
4701 Broadway SE
Albuquerque, N.M. 87105
(505) 877-8855

EPA # NMD 0071090805
TEXAS TWC ID# 40849

MESA OIL, INC.
Box 16473
Denver, Co, 80216
(303) 292-8309

EPA #COD 982581993

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED OIL

TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS

Printed / Typed Name Signature Date

TREATMENT FACILITY OPERATOR
The described used oil was handled by me, the treatment facility named above, and was accepted.

Printed / Typed Name Signature Date

% B.S. & W.	TOTAL GALLONS DEDUCTED	NET GALLONS	AMOUNT DUE GENERATOR
			$

White - Return to Generator Green - Office Canary - Oil Collection Pink - Plant Goldenrod - Generator Copy

MESA OIL 1/89

BPS FORM 6870

EPA

ACKNOWLEDGEMENT OF NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

This is to acknowledge that you have filed a Notification of Hazardous Waste Activity for the installation located at the address shown in the box below to comply with Section 3010 of the Resource Conservation and Recovery Act *(RCRA)*. Your EPA Identification Number for that installation appears in the box below. The EPA Identification Number must be included on all shipping manifests for transporting hazardous wastes; on all Annual Reports that generators of hazardous waste, and owners and operators of hazardous waste treatment, storage and disposal facilities must file with EPA; on all applications for a Federal Hazardous Waste Permit; and other hazardous waste management reports and documents required under Subtitle C of RCRA.

EPA I.D. NUMBER ➤ NMD 007 710 9085
COD 982581993

Mesa Oil, Inc.
Attn: Lawrence Meers, President
4701 Broadway S.E.
Albuquerque, New Mexico 87105

INSTALLATION ADDRESS ➤ 4701 Broadway S.E.
Albuquerque, New Mexico 87105

EPA Form 8700-12A (4-80)

MESA

OIL, Inc.

Telephone No: (505) 877-8855
Wats No: 1-800-873-3645

4701 Broadway, S.E.
Albuquerque, N.M. 87105

Jaunary 9, 1990

Ms. Terri Vandell
Dames & Moore
250 East Broadway
Salt Lake City, Utah 84111

Dear Ms. Vandell:

Per our recent phone conversation this is the information you have requested.

The oil picked up from Caribou Refining will be stored at our plant until market conditions improve. As our fuel oil sales increase the oil will be blended with our other products and will be sold as fuel.

The oil/water mix picked up from Caribou Refining will be stored at our plant and processed as soon as possible. The oil will be blended into the fuel and the water will be properly disposed of.

If you have any other questions please contact me at 877-8855.

Sincerely,

John F. Dempsey
Vice President

JFD:ab

MESA
OIL, Inc.

Telephone No: (505) 877-8855
Wats No: 1-800-873-3645

4701 Broadway, S.E.
Albuquerque, N.M. 87105

January 10, 1990

Mr. William Call
President
Maverick County Stores

Dear Mr. Call:

The residual fuel from Caribou Refinery was marketed to PNM Four Corners Power Plant. The remaining residual fuel and water emulsion will be processed at our facility in Albuquerque, NM. The separated residual fuel will be recycled and blended into industrial Burner Fuel. The separated water will be treated and disposed of to the Albuquerque waste water treatment plant. If you have any questions please call me at 1-800-873-3645.

Sincerely,

Lawrence A. Meers
President

LAM:ab

MESA OIL, Inc.

USED OIL RECYCLING MANIFEST / INVOICE

17007

DATE 1/24/90 CALL IN NUMBER

GENERATOR

Generator Name DAMES & MOORE

Phone Contact

Pickup Address HWAY CARIBOU REFINERY

City KIRTLAND State NM Zip

Mailing Address

City State Zip

U.S. DOT DESCRIPTION	GALLONS BEFORE B.S. & W. DEDUCTION	PRICE PER GALLON
WATER & OIL	7230	.36¢

SERVICE CHARGE DUE MESA OIL $

PLEASE PAY FROM THIS INVOICE. NO STATEMENT WILL BE SENT. TERMS ARE NET TEN (10) DAYS.

Special handling instructions TO BE PAID TO MESA OIL
TRANSPORTED TO VALVERDE STORAGE.

GENERATORS CERTIFICATION:
This used oil is described to the best of my ability and it was delivered to a licensed Used Oil Recycler. There are no Listed Hazardous Materials in this product.

Ernest Frank — Printed / Typed Name — Signature — 1/24/90 Date

TRANSPORTER, STORER AND TREATOR OF USED OIL

MESA OIL, INC.
4701 Broadway SE
Albuquerque, N.M. 87105
(505) 877-8855

EPA # NMD 0071090805
TEXAS TWC ID# 40849

MESA OIL, INC.
Box 16473
Denver, Co, 80216
(303) 292-8309

EPA #COD 982581993

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED OIL

TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS

CHUCK WHITTEN Chuck Whitten — Printed / Typed Name — Signature — 1/24/90 Date

TREATMENT FACILITY OPERATOR
The described used oil was handled by me, the treatment facility named above, and was accepted.

Printed / Typed Name — Signature — Date

% B.S. & W.	TOTAL GALLONS DEDUCTED	NET GALLONS	AMOUNT DUE GENERATOR
			$

White - Return to Generator Green - Office Canary - Oil Collection Pink - Plant Goldenrod - Generator Copy

MESA OIL 1/89 BPS FORM 6870

MESA OIL, Inc.

USED OIL RECYCLING MANIFEST / INVOICE

16688

DATE 1/11/90 CALL IN NUMBER

GENERATOR

Generator Name DAMES & MOORE

Phone Contact

Pickup Address KIRKLAND CARIBOU

City KIRKLAND State NM Zip 87417

Mailing Address

City State Zip

U.S. DOT DESCRIPTION	GALLONS BEFORE B.S. & W. DEDUCTION	PRICE PER GALLON
WATER & OIL	864-1	36¢

SERVICE CHARGE DUE MESA OIL $

PLEASE PAY FROM THIS INVOICE. NO STATEMENT WILL BE SENT. TERMS ARE NET TEN (10) DAYS.

Special handling instructions JOB # 14819005-31
TRANSPORTED TO FLORA VISTA STORAGE

GENERATORS CERTIFICATION:

This used oil is described to the best of my ability and it was delivered to a licensed Used Oil Recycler. There are no Listed Hazardous Materials in this product.

X Brad Clark Brad Clark 1/11/90

Printed / Typed Name Signature Date

TRANSPORTER, STORER AND TREATOR OF USED OIL

MESA OIL, INC.
4701 Broadway SE
Albuquerque, N.M. 87105
(505) 877-8855

EPA # NMD 0071090805
TEXAS TWC ID# 40849

MESA OIL, INC.
Box 16473
Denver, Co, 80216
(303) 292-8309

EPA #COD 982581993

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED OIL

TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS

CHUCK WHITTEN Chuck Whitten 1/11/90

Printed / Typed Name Signature Date

TREATMENT FACILITY OPERATOR

The described used oil was handled by me, the treatment facility named above, and was accepted.

Printed / Typed Name Signature Date

% B.S. & W.	TOTAL GALLONS DEDUCTED	NET GALLONS	AMOUNT DUE GENERATOR
			$

White - Return to Generator Green - Office Canary - Oil Collection Pink - Plant Goldenrod - Generator Copy

MESA OIL 1/89 BPS FORM 6870

MESA OIL, Inc.

USED OIL RECYCLING MANIFEST / INVOICE

16687

DATE 1/11/90 CALL IN NUMBER

GENERATOR

Generator Name DAMES & MOORE

Phone Contact

Pickup Address KIRKLAND CARIBOU

City KIRKLAND State NM Zip 87417

Mailing Address

City State / Zip

U.S. DOT DESCRIPTION	GALLONS BEFORE B.S. & W. DEDUCTION	PRICE PER GALLON
WATER & OIL	~~8000~~ (5861)	36 ¢

SERVICE CHARGE DUE MESA OIL $

PLEASE PAY FROM THIS INVOICE. NO STATEMENT WILL BE SENT. TERMS ARE NET TEN (10) DAYS.

Special handling instructions JOB # 14819005-31
TRANSPORTED TO FLORA VISTA

GENERATORS CERTIFICATION:
This used oil is described to the best of my ability and it was delivered to a licensed Used Oil Recycler. There are no Listed Hazardous Materials in this product.

X Brad Clark — Brad Clark — 1/11/90
Printed / Typed Name — Signature — Date

TRANSPORTER, STORER AND TREATOR OF USED OIL

MESA OIL, INC.
4701 Broadway SE
Albuquerque, N.M. 87105
(505) 877-8855

EPA # NMD 0071090805
TEXAS TWC ID# 40849

MESA OIL, INC.
Box 16473
Denver, Co, 80216
(303) 292-8309

EPA #COD 982581993

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED OIL

TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS

CHUCK WHITTEN — Chuck Whitten — 1/11/90
Printed / Typed Name — Signature — Date

TREATMENT FACILITY OPERATOR
The described used oil was handled by me, the treatment facility named above, and was accepted.

Printed / Typed Name — Signature — Date

% B.S. & W.	TOTAL GALLONS DEDUCTED	NET GALLONS	AMOUNT DUE GENERATOR
			$

White - Return to Generator Green - Office Canary - Oil Collection Pink - Plant Goldenrod - Generator Copy

MESA OIL 1/89 BPS FORM 6870

MESA OIL, Inc.

USED OIL RECYCLING MANIFEST / INVOICE

16685

DATE 1/10/90 CALL IN NUMBER

GENERATOR

Generator Name DAMES & MOORE

Phone Contact

Pickup Address

City KIRKLAND State NM Zip 87417

Mailing Address

City State NM Zip

U.S. DOT DESCRIPTION	GALLONS BEFORE B.S. & W. DEDUCTION	PRICE PER GALLON
WATER & OIL	4730	36¢

SERVICE CHARGE DUE MESA OIL $

PLEASE PAY FROM THIS INVOICE. NO STATEMENT WILL BE SENT. TERMS ARE NET TEN (10) DAYS.

Special handling instructions JOB # 14819005-31
TRANSPORTED TO ABQ. NM MESA OIL 4701 BROADWAY SW

GENERATORS CERTIFICATION:
This used oil is described to the best of my ability and it was delivered to a licensed Used Oil Recycler. There are no Listed Hazardous Materials in this product.

X Brad Clark — Brad Clark — 9/10/90
Printed / Typed Name — Signature — Date

TRANSPORTER, STORER AND TREATOR OF USED OIL

MESA OIL, INC.
4701 Broadway SE
Albuquerque, N.M. 87105
(505) 877-8855

EPA # NMD 0071090805
TEXAS TWC ID# 40849

MESA OIL, INC.
Box 16473
Denver, Co, 80216
(303) 292-8309

EPA #COD 982581993

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED OIL

TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS

CHUCK WHITTEN — Chuck Whitten — 9/10/90
Printed / Typed Name — Signature — Date

TREATMENT FACILITY OPERATOR
The described used oil was handled by me, the treatment facility named above, and was accepted.

Printed / Typed Name — Signature — Date

% B.S. & W.	TOTAL GALLONS DEDUCTED	NET GALLONS	AMOUNT DUE GENERATOR
			$

White - Return to Generator Green - Office Canary - Oil Collection Pink - Plant Goldenrod - Generator Copy

MESA OIL 1/89 BPS FORM 6870

MESA OIL, Inc.

USED OIL RECYCLING MANIFEST / INVOICE

16658

DATE 12/23/89 CALL IN NUMBER

GENERATOR

Generator Name MAVRICK STORES

Phone 1-307-886-3861 Contact

Pickup Address HIWAY 655

City KIRKLAND State NM Zip

Mailing Address PO BOX 457

City AFTON State WYO. Zip 83110

U.S. DOT DESCRIPTION	GALLONS BEFORE B.S. & W. DEDUCTION	PRICE PER GALLON
USED OIL	4500	

SERVICE CHARGE DUE MESA OIL $

PLEASE PAY FROM THIS INVOICE, NO STATEMENT WILL BE SENT. TERMS ARE NET TEN (10) DAYS.

Special handling instructions TRANSPORTED TO VALVERDE STORAGE

GENERATORS CERTIFICATION:

This used oil is described to the best of my ability and it was delivered to a licensed Used Oil Recycler. There are no Listed Hazardous Materials in this product.

X Brad Clark Brad Clark 12/23/89

Printed / Typed Name Signature Date

TRANSPORTER, STORER AND TREATOR OF USED OIL

MESA OIL INC.
4701 Broadway SE
Albuquerque, N.M. 87105
(505) 877-8855

EPA # NMD 0071090805
TEXAS TWC ID# 40849

MESA OIL, INC.
Box 16473
Denver, Co, 80216
(303) 292-8309

EPA #COD 982581993

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED OIL

TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS

CHUCK WHITTEN Chuck Whitten 12/23/89

Printed / Typed Name Signature Date

TREATMENT FACILITY OPERATOR

The described used oil was handled by me, the treatment facility named above, and was accepted.

Printed / Typed Name Signature Date

% B.S. & W.	TOTAL GALLONS DEDUCTED	NET GALLONS	AMOUNT DUE GENERATOR
			$

White - Return to Generator Green - Office Canary - Oil Collection Pink - Plant Goldenrod - Generator Copy

MESA OIL 1/89 BPS FORM 6870

MESA OIL, Inc.

USED OIL RECYCLING MANIFEST / INVOICE

16752

DATE 12-21-85 CALL IN NUMBER [illegible]

GENERATOR

Generator Name [illegible]

Phone [illegible] Contact

Pickup Address

City State Zip

Mailing Address [illegible]

City [illegible] State [illegible] Zip [illegible]

U.S. DOT DESCRIPTION	GALLONS BEFORE B.S. & W. DEDUCTION	PRICE PER GALLON
Used oil	7100	

SERVICE CHARGE DUE MESA OIL $

PLEASE PAY FROM THIS INVOICE. NO STATEMENT WILL BE SENT. TERMS ARE NET TEN (10) DAYS.

Special handling instructions TRANSPORTED TO VALVERDE STORAGE.

GENERATORS CERTIFICATION:

This used oil is described to the best of my ability and it was delivered to a licensed Used Oil Recycler. There are no Listed Hazardous Materials in this product.

Printed / Typed Name Signature Date

TRANSPORTER, STORER AND TREATOR OF USED OIL

MESA OIL, INC.
4701 Broadway SE
Albuquerque, N.M. 87105
(505) 877-8855

EPA # NMD 0071090805
TEXAS TWC ID# 40849

MESA OIL, INC.
Box 16473
Denver, Co. 80216
(303) 292-8309

EPA #COD 982581993

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED OIL

TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS

Lee Ross — 12-21-85

Printed / Typed Name Signature Date

TREATMENT FACILITY OPERATOR

The described used oil was handled by me, the treatment facility named above, and was accepted.

Printed / Typed Name Signature Date

% B.S. & W.	TOTAL GALLONS DEDUCTED	NET GALLONS	AMOUNT DUE GENERATOR
			$

White - Return to Generator Green - Office Canary - Oil Collection Pink - Plant Goldenrod - Generator Copy

MESA OIL 1/89 BPS FORM 6870

MESA OIL, Inc.

USED OIL RECYCLING MANIFEST / INVOICE

16657

DATE 12/21/89 CALL IN NUMBER

GENERATOR

Generator Name MAVERICK STORES INC

Phone 1 307 886-3861 Contact

Pickup Address HWAY 555

City FARMINGTON State NMX Zip

Mailing Address

City AFTON State WYO Zip 83110

U.S. DOT DESCRIPTION	GALLONS BEFORE B.S. & W. DEDUCTION	PRICE PER GALLON
USED MOTOR OIL	7500	

SERVICE CHARGE DUE MESA OIL $

PLEASE PAY FROM THIS INVOICE. NO STATEMENT WILL BE SENT. TERMS ARE NET TEN (10) DAYS.

Special handling instructions TRANSPORTED TO VALVERDE STORAGE

GENERATORS CERTIFICATION:

This used oil is described to the best of my ability and it was delivered to a licensed Used Oil Recycler. There are no Listed Hazardous Materials in this product.

X Brad Clark — Brad Clark — 12/21/89

Printed / Typed Name — Signature — Date

TRANSPORTER, STORER AND TREATOR OF USED OIL

MESA OIL, INC.
4701 Broadway SE
Albuquerque, N.M. 87105
(505) 877-8855

EPA # NMD 0071090805
TEXAS TWC ID# 40849

MESA OIL, INC.
Box 16473
Denver, Co, 80216
(303) 292-8309

EPA #COD 982581993

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED OIL

TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS

CHUCK WHITTEN — Chuck Whitten — 12/21/89

Printed / Typed Name — Signature — Date

TREATMENT FACILITY OPERATOR

The described used oil was handled by me, the treatment facility named above, and was accepted.

Printed / Typed Name — Signature — Date

% B.S. & W.	TOTAL GALLONS DEDUCTED	NET GALLONS	AMOUNT DUE GENERATOR
			$

White - Return to Generator Green - Office Canary - Oil Collection Pink - Plant Goldenrod - Generator Copy

MESA OIL 1/89 BPS FORM 6870

MESA OIL, Inc.

USED OIL RECYCLING MANIFEST / INVOICE

16751

DATE 12-30-91 CALL IN NUMBER [illegible]

GENERATOR

Generator Name MAVERICK [illegible]

Phone [illegible] Contact [illegible]

Pickup Address [illegible]

City [illegible] State [illegible] Zip [illegible]

Mailing Address [illegible]

City [illegible] State [illegible] Zip [illegible]

U.S. DOT DESCRIPTION	GALLONS BEFORE B.S. & W. DEDUCTION	PRICE PER GALLON
Used oil	7100	

SERVICE CHARGE DUE MESA OIL $

PLEASE PAY FROM THIS INVOICE. NO STATEMENT WILL BE SENT. TERMS ARE NET TEN (10) DAYS.

Special handling instructions TRANSPORTED TO VALVERDE STORAGE

GENERATORS CERTIFICATION:

This used oil is described to the best of my ability and it was delivered to a licensed Used Oil Recycler. There are no Listed Hazardous Materials in this product.

Mike Morrow Mike Morrow Date

Printed / Typed Name Signature

TRANSPORTER, STORER AND TREATOR OF USED OIL

MESA OIL, INC.
4701 Broadway SE
Albuquerque, N.M. 87105
(505) 877-8855

EPA # NMD 0071090805
TEXAS TWC ID# 40849

MESA OIL, INC.
Box 16473
Denver, Co, 80216
(303) 292-8309

EPA #COD 982581993

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED OIL

TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS

[illegible] [illegible] [illegible]

Printed / Typed Name Signature Date

TREATMENT FACILITY OPERATOR

The described used oil was handled by me, the treatment facility named above, and was accepted.

Printed / Typed Name Signature Date

% B.S. & W.	TOTAL GALLONS DEDUCTED	NET GALLONS	AMOUNT DUE GENERATOR
			$

White - Return to Generator Green - Office Canary - Oil Collection Pink - Plant Goldenrod - Generator Copy

MESA OIL 1/89 BPS FORM 6870

MESA OIL, Inc.

USED OIL RECYCLING MANIFEST / INVOICE

16655

DATE 12/20/89 CALL IN NUMBER

GENERATOR

Generator Name MAVERICK STORES INC.

Phone 1-307-886-3861 Contact

Pickup Address HIWAY 555

City KIRKLAND State NM Zip

Mailing Address PO Box 457

City AFTON State WYO. Zip 83110

U.S. DOT DESCRIPTION	GALLONS BEFORE B.S. & W. DEDUCTION	PRICE PER GALLON
USED OIL	~~7500~~ 5800	

SERVICE CHARGE DUE MESA OIL $

PLEASE PAY FROM THIS INVOICE, NO STATEMENT WILL BE SENT. TERMS ARE NET TEN (10) DAYS.

Special handling instructions TRANSPORTED TO VALEROS STORAGE

GENERATORS CERTIFICATION:

This used oil is described to the best of my ability and it was delivered to a licensed Used Oil Recycler. There are no Listed Hazardous Materials in this product.

Fred Clark (Printed / Typed Name) Fred Clark (Signature) 12/20/89 (Date)

TRANSPORTER, STORER AND TREATOR OF USED OIL

MESA OIL, INC.
4701 Broadway SE
Albuquerque, N.M. 87105
(505) 877-8855
EPA # NMD 0071090805
TEXAS TWC ID# 40849

MESA OIL, INC.
Box 16473
Denver, Co, 80216
(303) 292-8309
EPA #COD 982581993

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED OIL

TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS

CHUCK WHITTEN (Printed / Typed Name) Chuck Whitten (Signature) 12/20/89 (Date)

TREATMENT FACILITY OPERATOR

The described used oil was handled by me, the treatment facility named above, and was accepted.

Printed / Typed Name Signature Date

% B.S. & W.	TOTAL GALLONS DEDUCTED	NET GALLONS	AMOUNT DUE GENERATOR
			$

White - Return to Generator Green - Office Canary - Oil Collection Pink - Plant Goldenrod - Generator Copy

MESA OIL 1/89 BPS FORM 6870

MESA OIL, Inc.

USED OIL RECYCLING MANIFEST / INVOICE

15388

DATE 12-20-89 CALL IN NUMBER

GENERATOR

Generator Name

Phone Contact

Pickup Address

City State Zip

Mailing Address

City State Zip

U.S. DOT DESCRIPTION	GALLONS BEFORE B.S. & W. DEDUCTION	PRICE PER GALLON
Used Oil	5800	

SERVICE CHARGE DUE MESA OIL $

PLEASE PAY FROM THIS INVOICE. NO STATEMENT WILL BE SENT. TERMS ARE NET TEN (10) DAYS.

Special handling instructions TRANSPORTED TO VALVERDE STORAGE

GENERATORS CERTIFICATION:

This used oil is described to the best of my ability and it was delivered to a licensed Used Oil Recycler. There are no Listed Hazardous Materials in this product.

Brad Clark — Printed / Typed Name

Brad Clark — Signature

12-20-89 — Date

TRANSPORTER, STORER AND TREATOR OF USED OIL

MESA OIL, INC.
4701 Broadway SE
Albuquerque, N.M. 87105
(505) 877-8855

EPA # NMD 0071090805
TEXAS TWC ID# 40849

MESA OIL, INC.
Box 16473
Denver, Co, 80216
(303) 292-8309

EPA #COD 982581993

IN CASE OF SPILL CONTACT: MESA OIL, INC. 1-800-USED OIL

TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF MATERIALS

Printed / Typed Name — Signature — Date

TREATMENT FACILITY OPERATOR

The described used oil was handled by me, the treatment facility named above, and was accepted.

Printed / Typed Name — Signature — Date

% B.S. & W.	TOTAL GALLONS DEDUCTED	NET GALLONS	AMOUNT DUE GENERATOR
			$

White - Return to Generator Green - Office Canary - Oil Collection Pink - Plant Goldenrod - Generator Copy

MESA OIL 1/89

BPS FORM 6870