GW - 294

REPORTS

YEAR(S):

1997

SUBSURFACE INVESTIGATION REPORT

TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-97-04
LOVINGTON, NEW MEXICO

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SUBSURFACE INVESTIGATION REPORT

TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-97-04
LOVINGTON, NEW MEXICO

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September 18, 1997

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EXECUTIVE SUMMARY

The Texas - New Mexico Pipe Line Company (TNMPL) site 97-04 is located approximately two miles west of Lovington, New Mexico in Section 16, Township 11 South, Range 35 East. A site location map is presented as FIG. 1. Specific site details are presented on FIG. 2. This report summarizes subsurface investigation activities performed at the project site through July 1997.

Subsurface investigation activities performed included the following:

- installation of five monitoring wells and associated soil borings,
- collection of native soil samples from the monitoring wells/soil borings and laboratory analysis of the samples for determination of benzene, toluene, ethylbenzene, and xylenes (BTEX) and total petroleum hydrocarbons (TPH) concentrations;
- gauging of ground water and phase-separate hydrocarbons (PSH) levels in monitoring wells MW-1 through MW-5; and
- collection of ground water samples from monitoring wells MW-1, MW-2, and MW-4 and laboratory analysis of these samples for determination of BTEX and TPH concentrations.

The following conclusions are based on the field and laboratory data.

- The standard New Mexico Oil Conservation Division (OCD) levels for the site are:

Total Petroleum Hydrocarbons (TPH)	100 mg/kg
Benzene	10 mg/kg
Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX)	50 mg/kg

- Soil samples at the site indicated TPH, benzene, and BTEX concentrations above closure standards.
- PSH was observed in two of the monitoring wells.
- Ground water samples at the site indicated benzene concentrations above the New Mexico Water Quality Control Commission (NMWQCC) drinking water standards for benzene.

PURPOSE AND SCOPE

The objective of the subsurface investigation activities was to delineate hydrocarbon impact across the site. The following activities were performed to achieve this objective:

- install and gauge monitoring wells upgradient and downgradient from release location;
- collect soil samples for analysis of hydrocarbon concentrations; and
- collect ground water samples for analysis of hydrocarbon concentrations.

FIELD INVESTIGATION

SOIL INVESTIGATION AND SOIL DESCRIPTION

During the subsurface investigation, five monitoring wells (designated MW-1 through MW-5) were installed utilizing air rotary technology. Soil samples were collected continuously from the ground surface to termination boring depth. The soils were classified in the field; soil samples were field screened; and selected samples were prepared and shipped to the laboratory for determination of benzene, toluene, ethylbenzene, and xylenes (BTEX) and total petroleum hydrocarbons (TPH) concentrations.

The borings were advanced until refusal was encountered or apparent ground water was encountered.

Upon advancement to total depth and collection of soil samples, a permanent well consisting of two-inch perforated PVC and blank riser was placed in the open hole of each boring designated as a permanent monitoring well.

All drilling equipment was cleaned prior to first use and between boring locations. Sampling equipment was cleaned prior to first use and between sampling intervals.

The soil boring and monitoring well locations were surveyed by a Professional Land Surveyor registered in the state of New Mexico. The locations of all soil borings advanced and monitoring wells installed are presented on FIG. 2.

SOIL DESCRIPTION

The subsurface soil profile was classified in general accordance with the Unified Soil Classification System by visually observing the soil samples obtained during the assessment. In general, five soil types were encountered. A general description of the soil, approximate thickness, and head-space sample results for each soil type are as follows:

Soil Type I

This soil type consisted of a topsoil and was encountered at the surface of monitoring well locations MW-1, MW-3, and MW-4. This soil type thickness was approximately 0.5 feet. No head-space readings were obtained from this soil type.

Soil Type II

This soil type consisted of a tan to white rock and was encountered beneath the topsoil layer at monitoring wells MW-1, MW-3, and MW-4 and at the surface of monitoring well MW-2. The rock was very hard and varied in thickness from approximately 2.5 to 4 feet. The head-space reading from a sample of this soil type was 5 ppm.

Soil Type III

This soil type consisted of a tan to brown sand and was encountered at depths ranging from 0 to 62 feet below ground surface at all monitoring well locations. The sand was fine to medium grained, moist, and was intermixed with stone. This soil type varied in thickness from approximately 1 to 57 feet. The head-space readings from samples of this soil type varied from ND to 736 ppm.

Soil Type IV

This soil type consisted of a red sandstone and was encountered at depths ranging from 5 to 19 feet below ground surface at monitoring well locations MW-2 through MW-4. The sandstone was very hard with white streaks. This soil type varied in thickness from approximately 3.5 to 5.5 feet. The head-space readings from samples of this soil type varied from ND to 31 ppm.

Soil Type V

This soil type consisted of a very hard caliche and was encountered between 3.5 and 6 feet below ground surface at monitoring well location MW-5. This soil type thickness was approximately 2.5 feet. No head-space readings were obtained from this soil type.

Logs indicating the typical subsurface soil profile, depths at which soil samples were obtained, head-space results, laboratory results, and generalized geologic profiles are presented in APPENDIX A.

SOIL SAMPLING AND ANALYTICAL RESULTS

Native soil samples were collected continuously from the ground surface to a depth of approximately two feet below ground water by pushing a pitcher sampler. The soil samples were used to evaluate water levels and the distribution of PSH.

Representative soil samples were divided into two separate portions using clean, disposable gloves and clean sampling tools. One portion of the soil sample was placed in a disposable sample bag. The bag was labeled and sealed for head-space analysis using a photo-ionization detector (PID) calibrated to a 100 ppm isobutylene standard. Each sample was allowed to volatilize for approximately 30 minutes at ambient temperature prior to conducting the PID analysis.

The other portion of the soil sample was placed in a sterile glass container equipped with a Teflon-lined lid furnished by the analytical laboratory. The container was filled to capacity with soil to limit the amount of head-space present. Each container was labeled and placed on ice in an insulated cooler. Upon selection of samples for analysis, the cooler was sealed for shipment to the laboratory. Proper chain-of-custody documentation was maintained throughout the sampling process.

Two to four soil samples were selected from each soil boring based on the following criteria:

- The sample with the highest head-space reading.
- The sample directly above the ground water level measured at the time of drilling.
- The sample at the bottom of each boring.

Seventeen soil samples were selected and submitted to Environmental Lab of Texas (ELOT) located in Odessa, Texas for determination of BTEX and TPH concentrations by EPA Method SW846-8020 and 418.1, respectively.

Laboratory results indicated the following concentration ranges:

PARAMETER	CONCENTRATION RANGE (mg/kg)
Benzene	ND to 343
BTEX	ND to 971.81
TPH	ND to 31,200

Soil laboratory results are summarized in TABLE I and are graphically presented on FIG. 3. Analytical laboratory reports are included in APPENDIX B.

GROUND WATER SAMPLING AND ANALYTICAL RESULTS

On June 18, 1997, each monitoring well was purged of approximately three well volumes of water using a PVC bailer. The bailer was cleaned prior to each use with Liqui-Nox detergent and rinsed with water. After purging the wells, ground water samples were collected from monitoring wells which did not contain PSH with a disposable Teflon bailer and polyethylene line.

Water samples collected for BTEX analyses were placed in sterile, 40 ml glass VOA vials equipped with Teflon-lined caps. The containers were provided by the analytical laboratory. The vials were filled to a positive meniscus, sealed, and visually checked for the presence of air bubbles.

Water samples collected for TPH analysis were filled to capacity in sterile, one liter glass containers equipped with Teflon-lined caps. The containers were provided by the analytical laboratory. The containers were filled to a positive meniscus, sealed, and visually checked for the presence of air bubbles.

The filled containers were labeled and placed on ice in an insulated cooler. The cooler was sealed for shipment to ELOT for determination of BTEX and TPH concentrations using EPA Method SW846-8020 and 418.1, respectively. Proper chain-of-custody documentation was maintained throughout the sampling process.

Laboratory results indicated the following concentration ranges:

PARAMETER	CONCENTRATION RANGE (mg/kg)
Benzene	ND to 0.155
BTEX	ND to 0.291
TPH	ND to 2

Ground water laboratory results are summarized in TABLE II and are graphically presented on FIG. 4. Analytical laboratory reports are included in APPENDIX B.

Ground water elevations indicate an approximate gradient of 0.016 ft/ft towards the southeast. Ground water contours are presented on FIG. 5.

Purged water collected during the event was stored in drums on-site pending disposal.

CONCLUSIONS

The following conclusions are based on field and laboratory data collected:

- The standard New Mexico Oil Conservation Division (OCD) levels for the site are:

Total Petroleum Hydrocarbons (TPH)	100 mg/kg
Benzene	10 mg/kg
Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX)	50 mg/kg

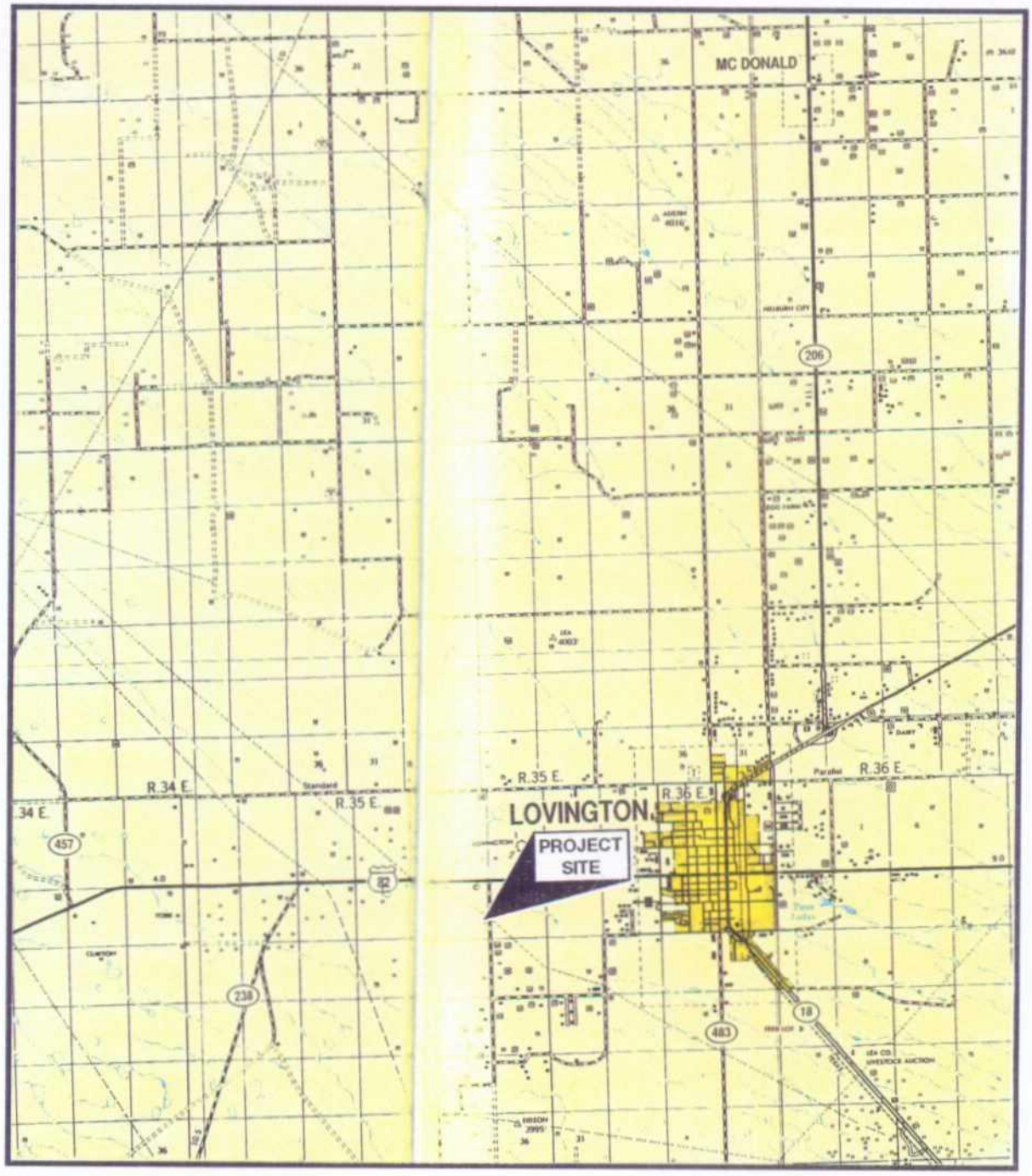
- Soil samples obtained from monitoring wells MW-3 and MW-5 (soil borings SB-2 and SB-4) indicated benzene, BTEX, and TPH concentrations above closure standards.
- PSH was observed in monitoring wells MW-3 and MW-5 with maximum thicknesses of 8.72 and 10.53 feet, respectively.
- Ground water samples obtained from monitoring wells MW-2 and MW-4 indicated benzene concentrations above Water Quality Control Commission (NMWQCC) drinking water standard for benzene.

Figures

THE ROADS OF NEW MEXICO

NEW MEXICO-LEA CO.

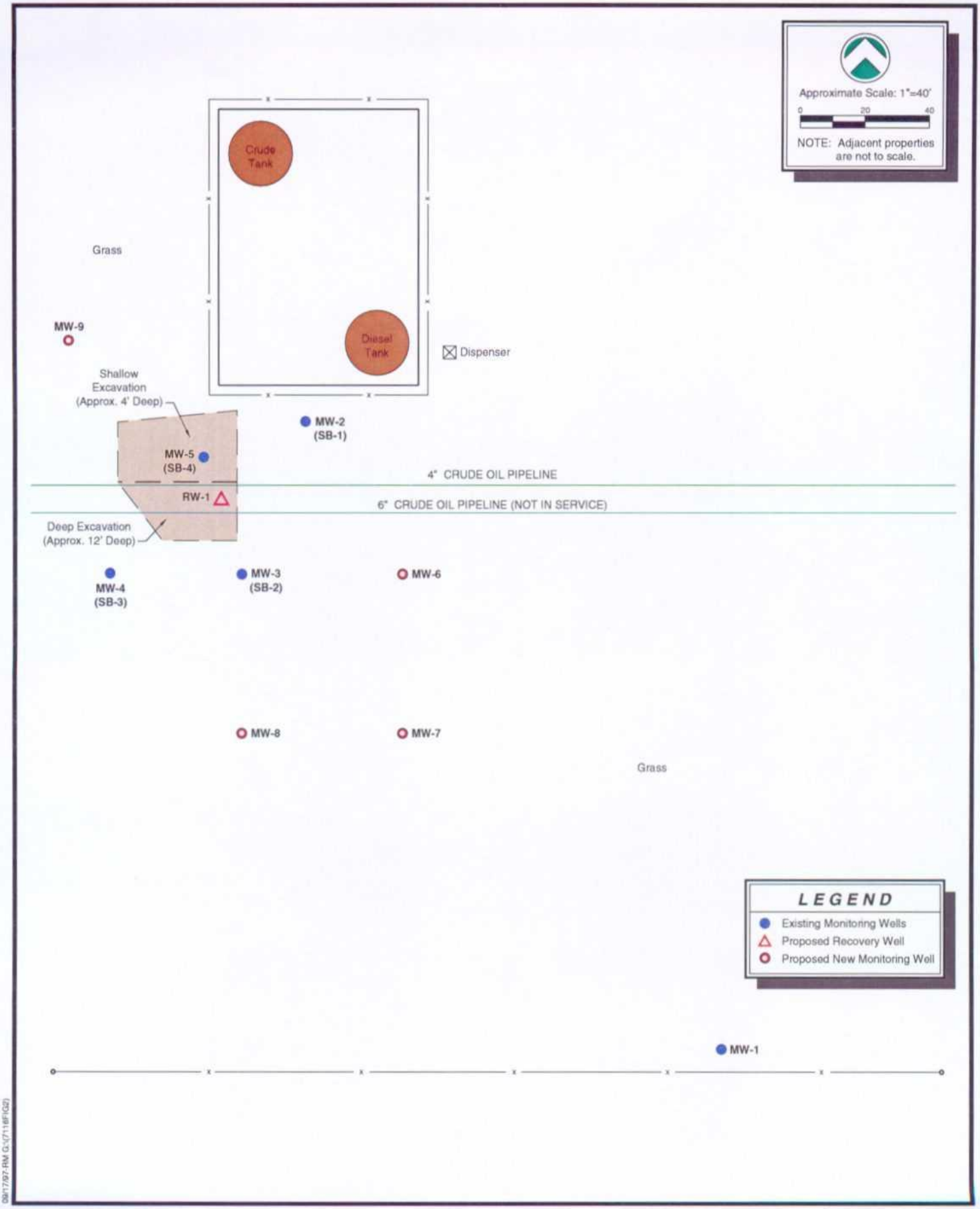
LOVINGTON



SCALE - ONE INCH EQUALS 2.9 MILES

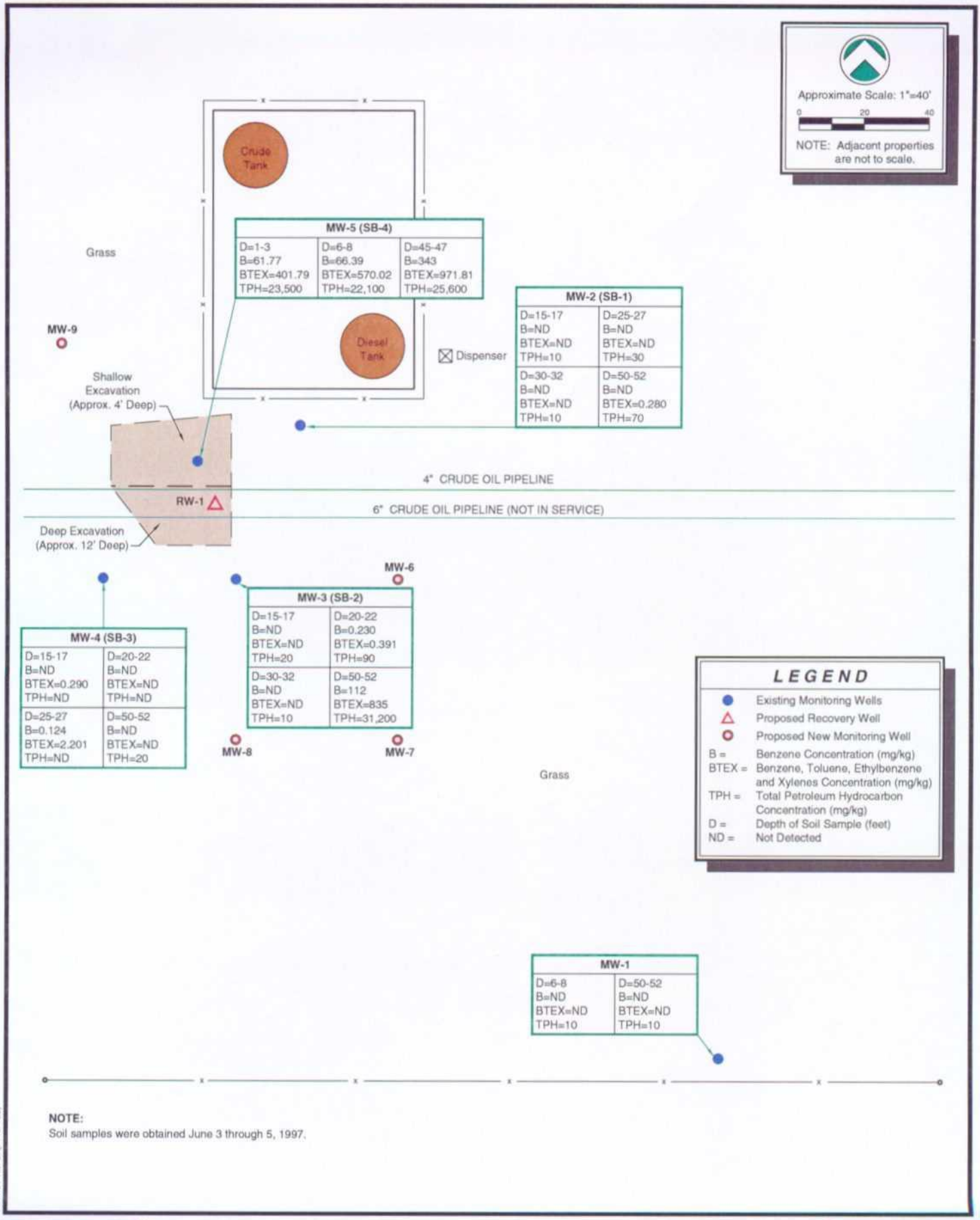
0 1 2 3 4 5 6

k·e·i	*SITE LOCATION MAP*	710016
	TEXAS - NEW MEXICO PIPE LINE COMPANY TNM-97-04 LOVINGTON, NEW MEXICO	FIG 1



09/17/97-RM G:\7116\FIG2)

k·e·i	*SITE PLAN*	710016
	TEXAS - NEW MEXICO PIPE LINE COMPANY TNM-97-04 LOVINGTON, NEW MEXICO	FIG 2



NOTE:
Soil samples were obtained June 3 through 5, 1997.

09/17/97-RM G:\(711\FIG3)

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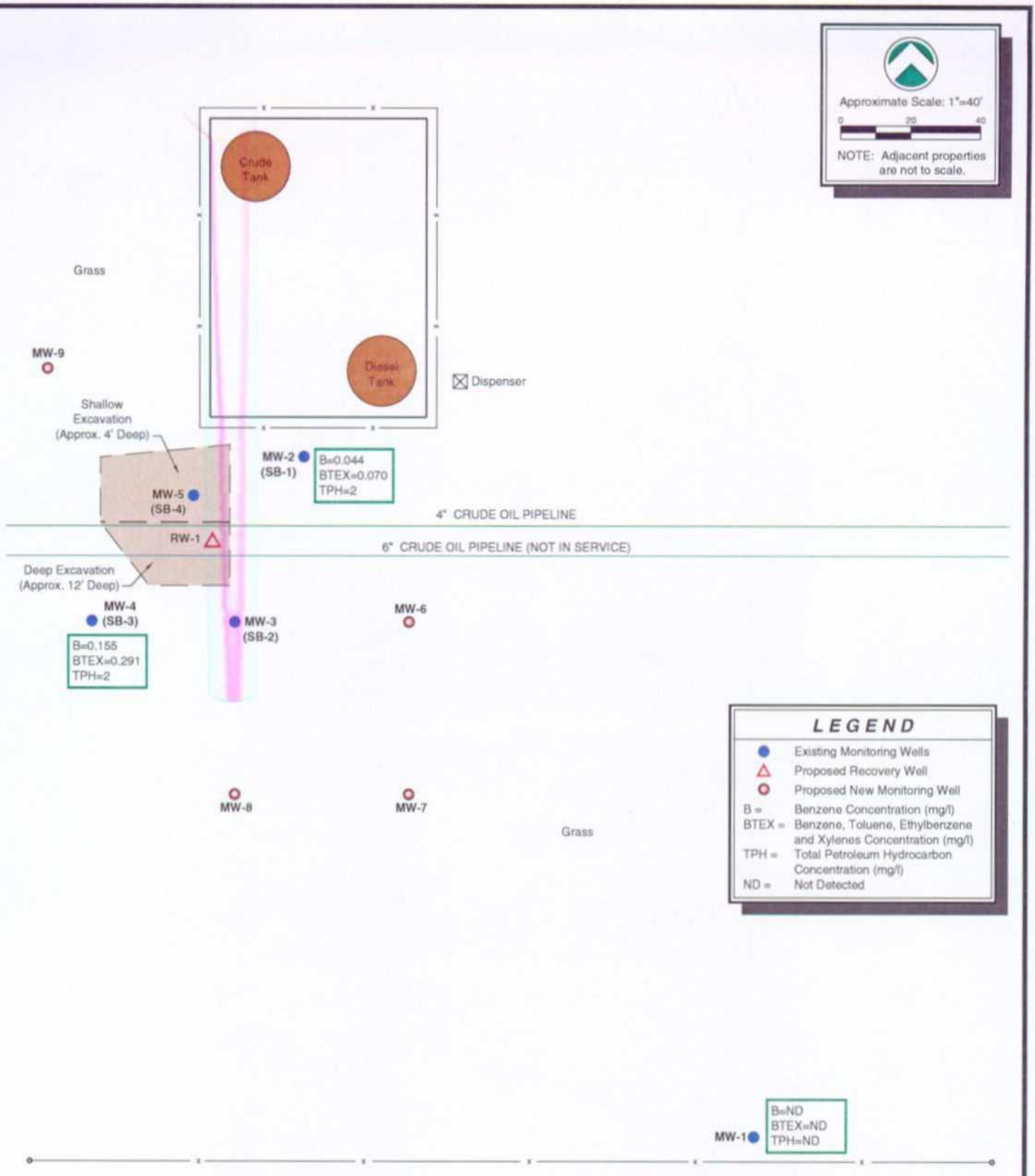
SOIL CONCENTRATION MAP			710016
TEXAS - NEW MEXICO PIPE LINE COMPANY	TNM-97-04	LOVINGTON, NEW MEXICO	FIG 3

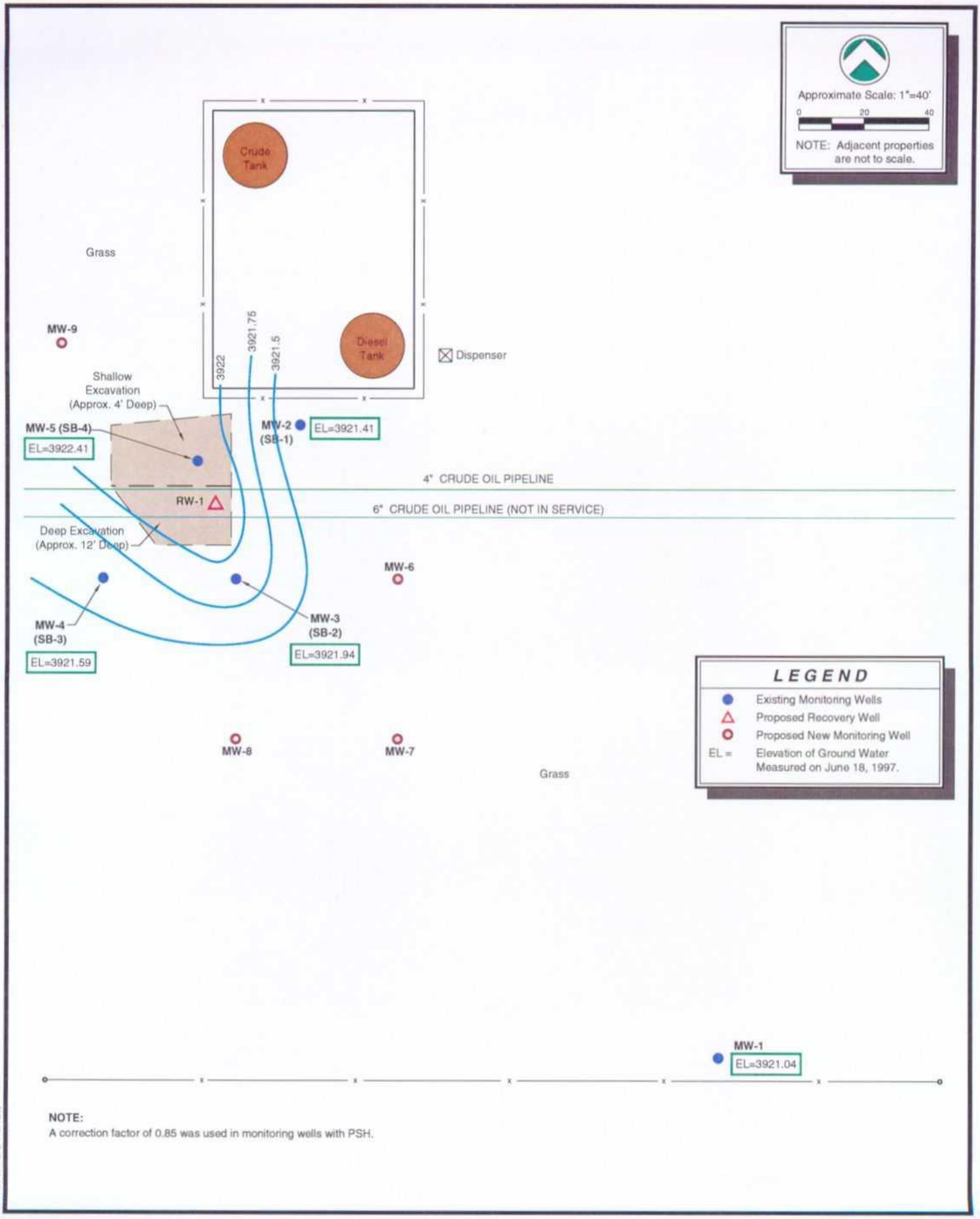


NOTE:
Monitoring wells MW-3 and MW-5 were not sampled due to the presence of PSH.

09/17/97-RM G:\710\16FIG4)

k·e·i

GROUND WATER CONCENTRATION MAP - JUNE 18, 1997			710016
TEXAS - NEW MEXICO PIPE LINE COMPANY	TNM-97-04	LOVINGTON, NEW MEXICO	FIG 4



NOTE:
A correction factor of 0.85 was used in monitoring wells with PSH.

09/17/97-RM G:\7116FIG5\

k·e·i	GROUND WATER CONTOUR MAP - JUNE 18, 1997	710016
	TEXAS - NEW MEXICO PIPE LINE COMPANY TNM-97-04 LOVINGTON, NEW MEXICO	FIG 5

Tables

GENERAL NOTES

ND - Indicates constituent was not detected above the method detection limit.

Method detection limits:

Soil:	BTEX	-	0.100 mg/kg
	TPH	-	10 mg/kg
Water:	BTEX	-	0.001 mg/l
	TPH	-	1 mg/l
Laboratory test methods:	BTEX	-	EPA Method SW846-8020
	TPH	-	EPA Method 418.1

TABLE I

SUMMARY OF LABORATORY RESULTS - SOIL
TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-97-04
LOVINGTON, NEW MEXICO

SAMPLE LOCATION	DATE SAMPLED	SAMPLE DEPTH (feet)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	XYLENES (mg/kg)	BTEX (mg/kg)	TPH (mg/kg)
SB-1	06/03/97	15 - 17	ND	ND	ND	ND	ND	10
SB-1	06/03/97	25 - 27	ND	ND	ND	ND	ND	30
SB-1	06/03/97	30 - 32	ND	ND	ND	ND	ND	10
SB-1	06/05/97	50 - 52	ND	ND	ND	0.280	0.280	70
SB-2	06/04/97	15 - 17	ND	ND	ND	ND	ND	20
SB-2	06/04/97	20 - 22	0.230	0.161	ND	ND	0.391	90
SB-2	06/04/97	30 - 32	ND	ND	ND	ND	ND	10
SB-2	06/05/97	50 - 52	112	322	87.42	313.58	835	31,200
SB-3	06/04/97	15 - 17	ND	0.189	ND	0.101	0.290	ND
SB-3	06/04/97	20 - 22	ND	ND	ND	ND	ND	ND
SB-3	06/04/97	25 - 27	0.124	0.612	0.262	1.203	2.201	ND
SB-3	06/05/97	50 - 52	ND	ND	ND	ND	ND	20
SB-4	06/04/97	1 - 3	61.77	154	42.00	144.02	401.79	23,500
SB-4	06/04/97	6 - 8	66.39	225	59.84	218.79	570.02	22,100
SB-4	06/04/97	45 - 47	343	667	176	328.67	971.81	25,600
MW-1	06/03/97	6 - 8	ND	ND	ND	ND	ND	10
MW-1	06/03/97	50 - 52	ND	ND	ND	ND	ND	10

TABLE II

SUMMARY OF LABORATORY RESULTS - GROUND WATER
TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-97-04
LOVINGTON, NEW MEXICO

MONITORING WELL NO.	DATE SAMPLED	BENZENE (mg/l)	TOLUENE (mg/l)	ETHYL-BENZENE (mg/l)	XYLENES (mg/l)	BTEX (mg/l)	TPH (mg/l)
MW-1	06/18/97	ND	ND	ND	ND	ND	ND
MW-2	06/18/97	0.044	0.014	0.004	0.008	0.070	2
MW-4	06/18/97	0.155	0.106	0.007	0.023	0.291	2

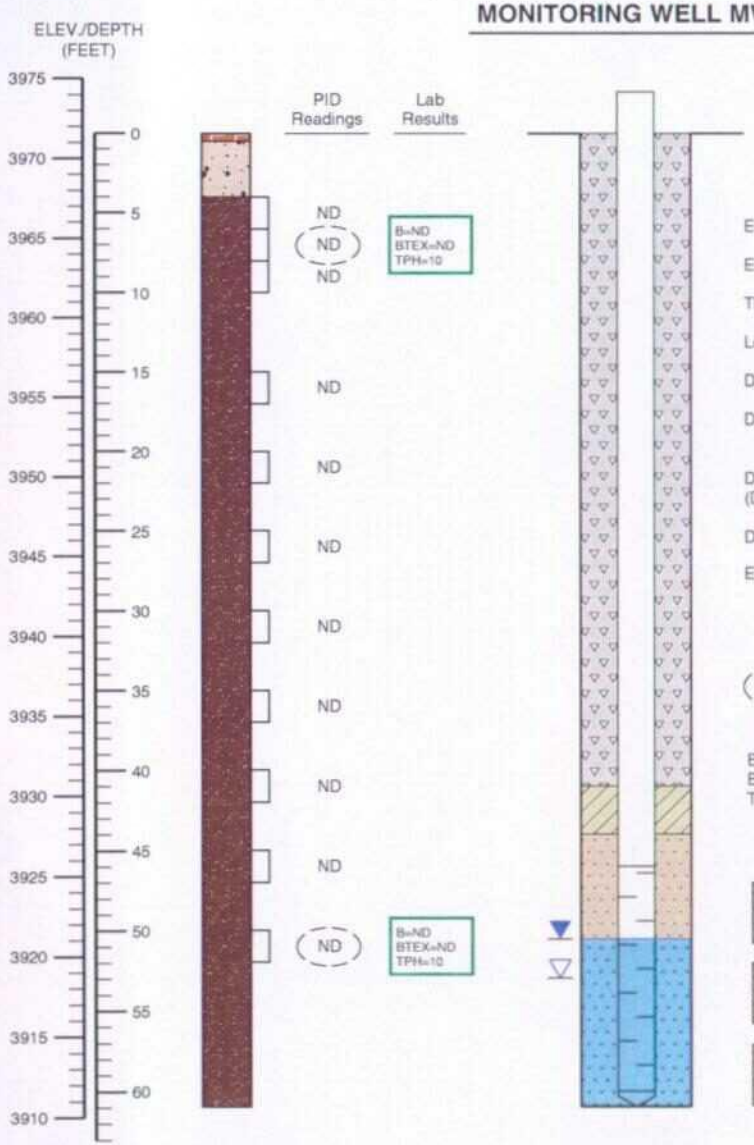
TABLE III

SUMMARY OF GROUND WATER MONITORING
TEXAS - NEW MEXICO PIPE LINE COMPANY
TNM-97-04
LOVINGTON, NEW MEXICO

WELL NO.	DATE MEASURED	PVC ELEVATION (feet)	DEPTH TO WATER (feet)	GROUND WATER ELEVATION		PSH THICKNESS (feet)
				Actual	Corrected	
MW-1	06/18/97	3,974.19	53.15	3921.04	—	—
	07/29/97	3,974.19	53.05	3921.14	—	—
MW-2	06/18/97	3,974.65	53.24	3921.41	—	—
	07/29/97	3,974.65	53.14	3921.51	—	—
MW-3	06/18/97	3,974.63	60.08	3914.55	3921.94	8.69
	06/23/97	3,974.63	60.08	3914.55	3921.96	8.72
	06/23/97	3,974.63	53.30	3921.33	3921.56	0.27
	06/23/97	3,974.63	53.78	3920.85	3921.71	1.01
	06/25/97	3,974.63	59.85	3914.78	3921.99	8.48
	06/25/97	3,974.63	55.50	3919.13	3921.72	3.05
	06/25/97	3,974.63	56.34	3918.29	3921.78	4.10
	06/25/97	3,974.63	53.29	3921.34	—	—
	06/27/97	3,974.63	59.99	3914.64	3921.96	8.61
	06/27/97	3,974.63	56.68	3917.95	3921.60	4.29
	07/01/97	3,974.63	59.99	3914.64	3921.96	8.61
	07/03/97	3,974.63	60.04	3914.59	3921.98	8.69
	07/03/97	3,974.63	55.22	3919.41	3921.75	2.75
	07/29/97	3,974.63	60.03	3914.60	3921.96	8.66
	07/29/97	3,974.63	54.47	3920.16	3921.90	2.05
MW-4	06/18/97	3,974.55	52.96	3921.59	—	—
	07/29/97	3,974.55	52.92	3921.63	—	—
MW-5	06/18/97	3,974.31	60.85	3913.46	3922.41	10.53
	06/23/97	3,974.31	58.09	3916.22	3922.08	6.89
	06/23/97	3,974.31	56.57	3917.74	3922.38	5.46
	06/23/97	3,974.31	59.18	3915.13	3921.32	7.28
	06/23/97	3,974.31	59.74	3914.57	3922.08	8.83
	06/23/97	3,974.31	54.91	3919.40	3921.88	2.92
	06/25/97	3,974.31	60.47	3913.84	3922.02	9.62
	06/25/97	3,974.31	58.47	3915.84	3921.99	7.24
	06/25/97	3,974.31	59.49	3914.82	3922.01	8.46
	06/25/97	3,974.31	53.42	3920.89	3921.94	1.23
	06/25/97	3,974.31	55.95	3918.36	3921.90	4.16
	06/25/97	3,974.31	58.50	3915.81	3922.02	7.30
	06/25/97	3,974.31	52.46	3921.85	3921.87	0.02
	06/25/97	3,974.31	51.81	3922.50	3922.50	0.00
	06/27/97	3,974.31	60.46	3913.85	3922.06	9.66
	06/27/97	3,974.31	57.47	3916.84	3922.00	6.07
	07/01/97	3,974.31	60.45	3913.86	3922.01	9.59
	07/01/97	3,974.31	56.40	3917.91	3921.94	4.74
	07/03/97	3,974.31	60.41	3913.90	3922.01	9.54
	07/03/97	3,974.31	57.53	3916.78	3921.98	6.12
	07/29/97	3,974.31	60.19	3914.12	3922.02	9.29
	07/29/97	3,974.31	57.69	3916.62	3920.97	5.12

Appendix A

MONITORING WELL MW-1



Monitoring Well Details (MW-1)

Elev of Ground Surface	3971.60 ft
Elev Top of PVC Well	3974.19 ft
Thickness of Bentonite Seal	3.0 ft
Length of PVC Well Screen	15.0 ft
Depth of PVC Well	61.0 ft
Depth of Exploratory Hole	61.0 ft
Depth to Ground Water (During drilling)	53.0 ft
Depth to Ground Water	50.56 ft
Elev of Ground Water	3921.04 ft

Indicates sample selected for laboratory analysis.

B = Benzene Concentration (mg/kg)
BTEX = Total BTEX Concentration (mg/kg)
TPH = Total Petroleum Hydrocarbon Concentration (mg/kg)

Concrete Surface Seal

Bentonite Pellet Seal

Sand Pack

LEGEND

Top Soil

Rock, very hard, tan to white.

Sand (SM), fine to medium grained, moist, tan to brown, intermixed with stone.

Indicates sample interval. Sample was obtained by hydraulically pushing a split spoon sampler.

Indicates the ground water level measured during drilling.

Indicates the ground water level measured on June 18, 1997.

PID Head-space readings in ppm obtained with a photo-ionization detector.

ND Indicates the constituent was not detected.

NS Indicates the sample was not obtained.

NOTES

1. The monitoring well was installed on June 3, 1997 using air rotary techniques.
2. The well was constructed with 2 inch ID, 0.010 inch factory slotted, threaded joint, Schedule 40 PVC pipe.
3. The well is protected with a stick-up steel cover and a locked compression cap.
4. The lines between material types shown on the profile log represent approximate boundaries. Actual transitions may be gradual.
5. The depths indicated are referenced from the ground surface.

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LOG AND DETAILS OF MONITORING WELL MW-1

TEXAS - NEW MEXICO PIPE LINE COMPANY | TNM-97-04 | LOVINGTON, NEW MEXICO

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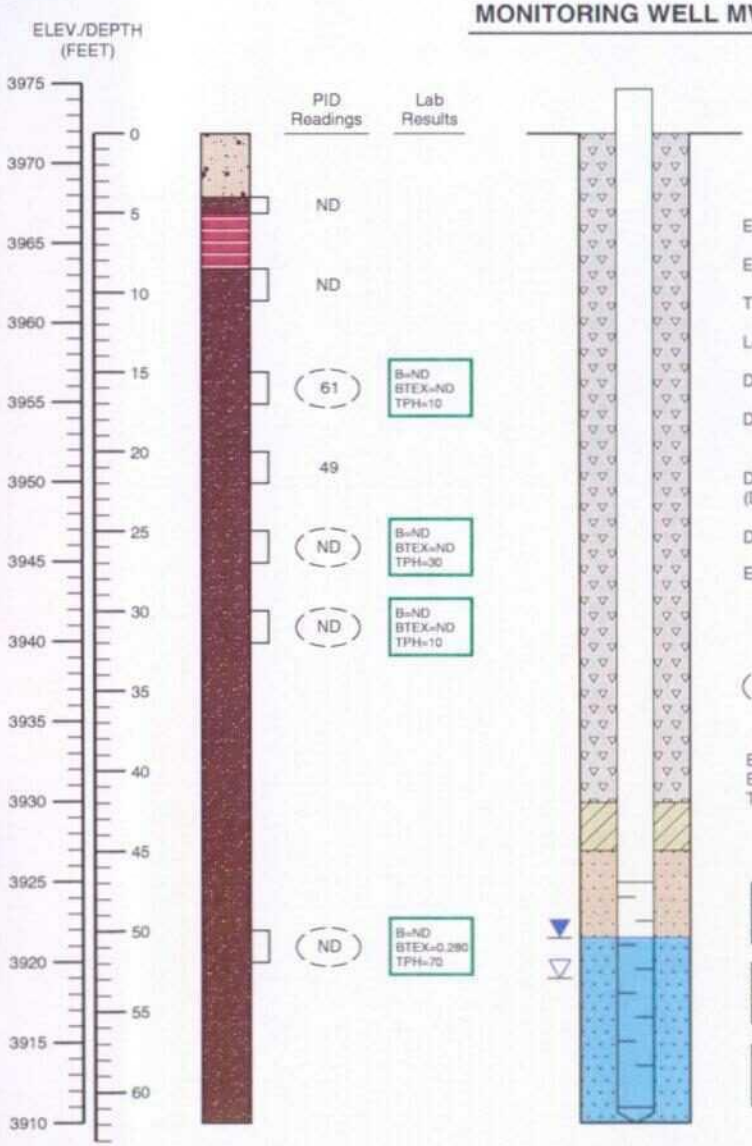
APPENDIX A

MONITORING WELL MW-2



Monitoring Well Details (MW-2)

Elev of Ground Surface	3971.88 ft
Elev Top of PVC Well	3974.65 ft
Thickness of Bentonite Seal	3.0 ft
Length of PVC Well Screen	15.0 ft
Depth of PVC Well	62.0 ft
Depth of Exploratory Hole	62.0 ft
Depth to Ground Water (During drilling)	53.0 ft
Depth to Ground Water	50.47 ft
Elev of Ground Water	3921.41 ft

( ) Indicates sample selected for laboratory analysis.

B = Benzene Concentration (mg/kg)
BTEX = Total BTEX Concentration (mg/kg)
TPH = Total Petroleum Hydrocarbon Concentration (mg/kg)

Concrete Surface Seal

Bentonite Pellet Seal

Sand Pack

LEGEND

Rock, very hard, tan to white.

Sand (SM), fine to medium grained, moist, tan to brown, intermixed with stone.

Sandstone, very hard, red with white streaks.

Indicates sample interval. Sample was obtained by hydraulically pushing a split spoon sampler.

Indicates the ground water level measured during drilling.

Indicates the ground water level measured on June 18, 1997.

PID Head-space readings in ppm obtained with a photo-ionization detector.

ND Indicates the constituent was not detected.

NS Indicates the sample was not obtained.

NOTES

1. The monitoring well was installed on June 3, 1997 using air rotary techniques.
2. The well was constructed with 2 inch ID, 0.010 inch factory slotted, threaded joint, Schedule 40 PVC pipe.
3. The well is protected with a stick-up steel cover and a locked compression cap.
4. The lines between material types shown on the profile log represent approximate boundaries. Actual transitions may be gradual.
5. The depths indicated are referenced from the ground surface.

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LOG AND DETAILS OF MONITORING WELL MW-2

TEXAS - NEW MEXICO PIPE LINE COMPANY | TNM-97-04 | LOVINGTON, NEW MEXICO

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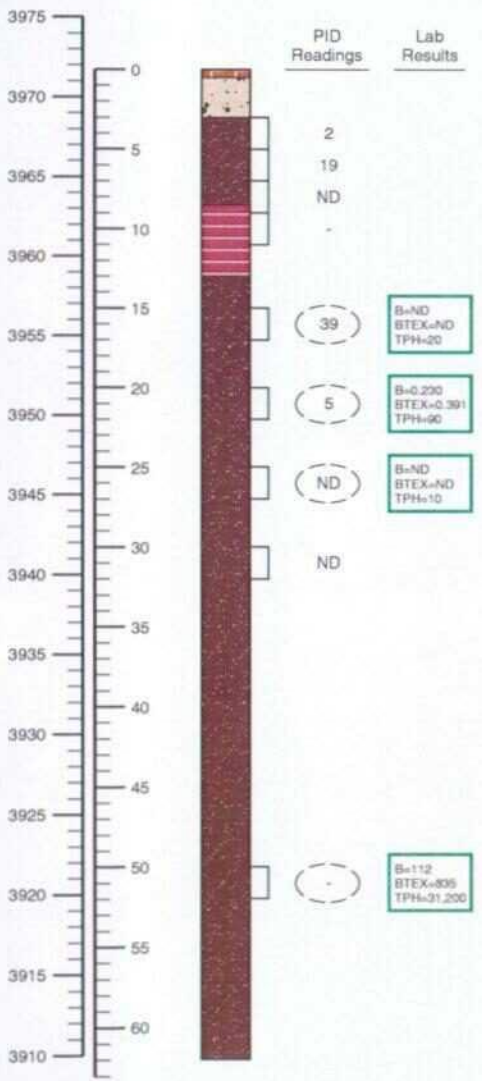
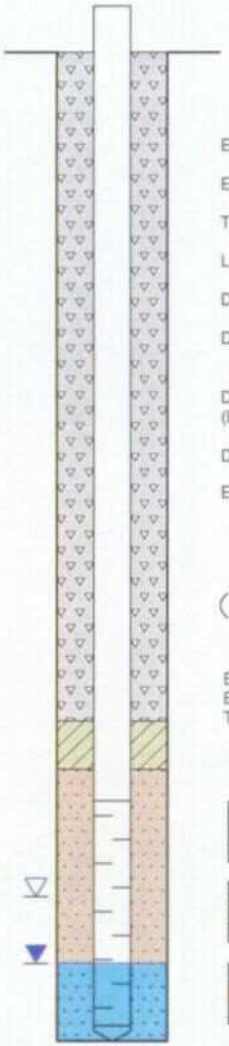
APPENDIX A

MONITORING WELL MW-3



PID Readings	Lab Results
2	
19	
ND	
-	
39	B=ND BTEX=ND TPH=20
5	B=0.200 BTEX=0.391 TPH=90
ND	B=ND BTEX=ND TPH=10
ND	
-	B=112 BTEX=805 TPH=31,200



Monitoring Well Details (MW-3)

Elev of Ground Surface	3971.73 ft
Elev Top of PVC Well	3974.63 ft
Thickness of Bentonite Seal	3.0 ft
Length of PVC Well Screen	15.0 ft
Depth of PVC Well	62.0 ft
Depth of Exploratory Hole	62.0 ft
Depth to Ground Water (During drilling)	53.0 ft
Depth to Ground Water	57.18 ft
Elev of Ground Water	3921.94 ft

( ) Indicates sample selected for laboratory analysis.

B = Benzene Concentration (mg/kg)
BTEX = Total BTEX Concentration (mg/kg)
TPH = Total Petroleum Hydrocarbon Concentration (mg/kg)

Concrete Surface Seal

Bentonite Pellet Seal

Sand Pack

LEGEND

Top Soil

Rock, very hard, tan to white.

Sand (SM), fine to medium grained, moist, tan to brown, intermixed with stone.

Sandstone, very hard, red with white streaks.

Indicates sample interval. Sample was obtained by hydraulically pushing a split spoon sampler.

Indicates the ground water level measured during drilling.

Indicates the ground water level measured on June 18, 1997.

PID — Head-space readings in ppm obtained with a photo-ionization detector.

ND — Indicates the constituent was not detected.

NS — Indicates the sample was not obtained.

NOTES

1. The monitoring well was installed on June 4, 1997 using air rotary techniques.
2. The well was constructed with 2 inch ID, 0.010 inch factory slotted, threaded joint, Schedule 40 PVC pipe.
3. The well is protected with a stick-up steel cover and a locked compression cap.
4. The lines between material types shown on the profile log represent approximate boundaries. Actual transitions may be gradual.
5. The depths indicated are referenced from the ground surface.

k·e·i

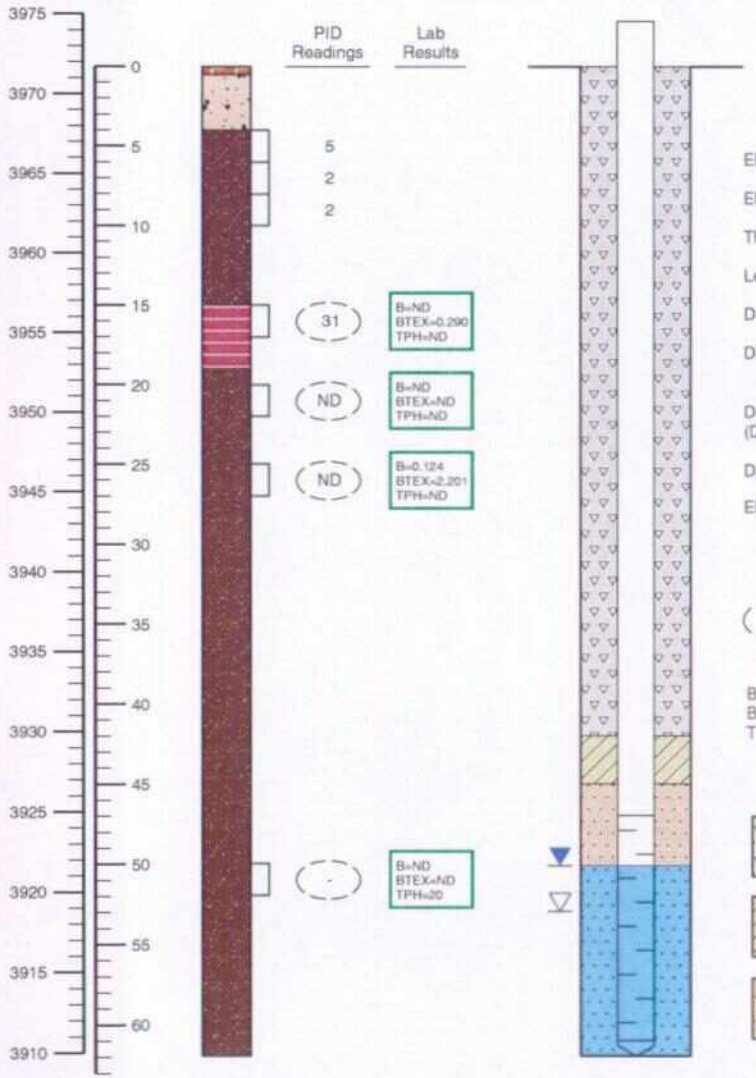
LOG AND DETAILS OF MONITORING WELL MW-3

TEXAS - NEW MEXICO PIPE LINE COMPANY | TNM-97-04 | LOVINGTON, NEW MEXICO

710016

APPENDIX A

MONITORING WELL MW-4



Monitoring Well Details (MW-4)

Elev of Ground Surface	3971.72 ft
Elev Top of PVC Well	3974.55 ft
Thickness of Bentonite Seal	3.0 ft
Length of PVC Well Screen	15.0 ft
Depth of PVC Well	62.0 ft
Depth of Exploratory Hole	62.0 ft
Depth to Ground Water (During drilling)	53.0 ft
Depth to Ground Water	50.13 ft
Elev of Ground Water	3921.59 ft

( ) Indicates sample selected for laboratory analysis.

B = Benzene Concentration (mg/kg)
BTEX = Total BTEX Concentration (mg/kg)
TPH = Total Petroleum Hydrocarbon Concentration (mg/kg)

Concrete Surface Seal

Bentonite Pellet Seal

Sand Pack

LEGEND

Top Soil

Rock, very hard, tan to white.

Sand (SM), fine to medium grained, moist, tan to brown, intermixed with stone.

Sandstone, very hard, red with white streaks.

Indicates sample interval. Sample was obtained by hydraulically pushing a split spoon sampler.

Indicates the ground water level measured during drilling.

Indicates the ground water level measured on June 18, 1997.

PID — Head-space readings in ppm obtained with a photo-ionization detector.

ND — Indicates the constituent was not detected.

NS — Indicates the sample was not obtained.

NOTES

1. The monitoring well was installed on June 4, 1997 using air rotary techniques.
2. The well was constructed with 2 inch ID, 0.010 inch factory slotted, threaded joint, Schedule 40 PVC pipe.
3. The well is protected with a stick-up steel cover and a locked compression cap.
4. The lines between material types shown on the profile log represent approximate boundaries. Actual transitions may be gradual.
5. The depths indicated are referenced from the ground surface.

k·e·i

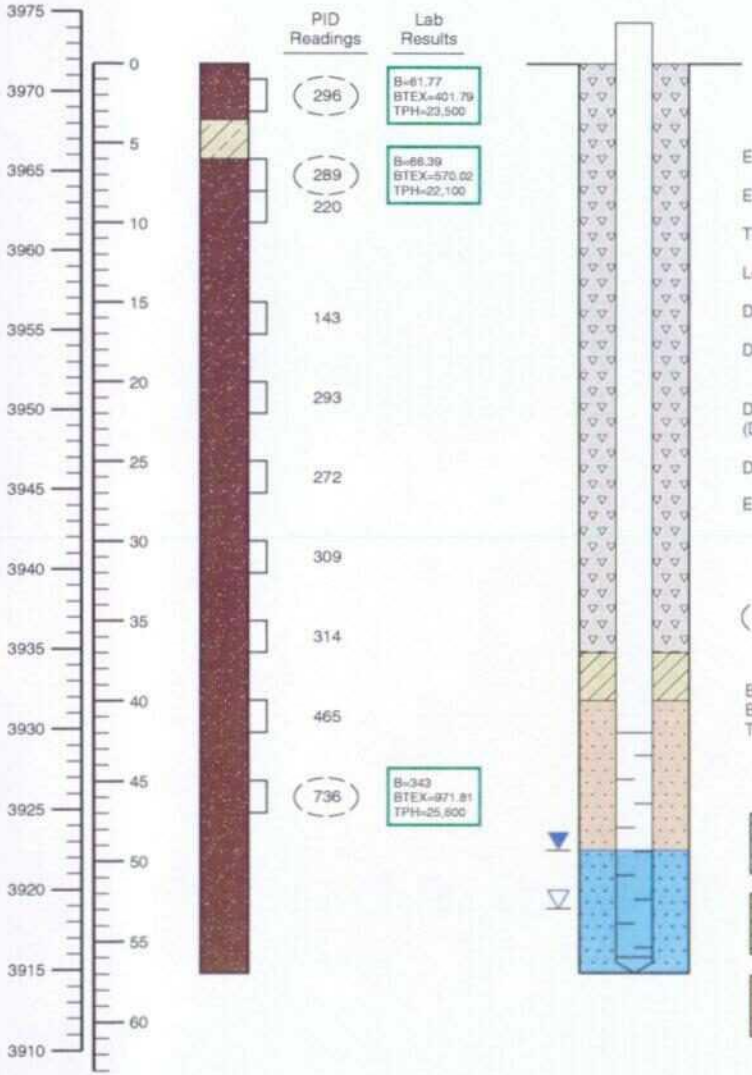
LOG AND DETAILS OF MONITORING WELL MW-4

TEXAS - NEW MEXICO PIPE LINE COMPANY | TNM-97-04 | LOVINGTON, NEW MEXICO

710016

APPENDIX A

MONITORING WELL MW-5



Monitoring Well Details (MW-5)

Elev of Ground Surface	3971.76 ft
Elev Top of PVC Well	3974.31 ft
Thickness of Bentonite Seal	3.0 ft
Length of PVC Well Screen	15.0 ft
Depth of PVC Well	57.0 ft
Depth of Exploratory Hole	57.0 ft
Depth to Ground Water (During drilling)	51.75 ft
Depth to Ground Water	49.35 ft
Elev of Ground Water	3922.41 ft

( ) Indicates sample selected for laboratory analysis.

B = Benzene Concentration (mg/kg)
BTEX = Total BTEX Concentration (mg/kg)
TPH = Total Petroleum Hydrocarbon Concentration (mg/kg)

Concrete Surface Seal

Bentonite Pellet Seal

Sand Pack

LEGEND

Sand (SM), fine to medium grained, moist, tan to brown, intermixed with stone.

Caliche, very hard.

Indicates sample interval. Sample was obtained by hydraulically pushing a split spoon sampler.

Indicates the ground water level measured during drilling.

Indicates the ground water level measured on June 18, 1997.

PID Head-space readings in ppm obtained with a photo-ionization detector.

ND Indicates the constituent was not detected.

NS Indicates the sample was not obtained.

NOTES

1. The monitoring well was installed on June 4, 1997 using air rotary techniques.
2. The well was constructed with 2 inch ID, 0.010 inch factory slotted, threaded joint, Schedule 40 PVC pipe.
3. The well is protected with a stick-up steel cover and a locked compression cap.
4. The lines between material types shown on the profile log represent approximate boundaries. Actual transitions may be gradual.
5. The depths indicated are referenced from the ground surface.

k·e·i

LOG AND DETAILS OF MONITORING WELL MW-5

TEXAS - NEW MEXICO PIPE LINE COMPANY | TNM-97-04 | LOVINGTON, NEW MEXICO

710016

APPENDIX A

Appendix B

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

KEI
ATTN: THERESA NIX
5309 WURZBACH SUITE 100
SAN ANTONIO, TEXAS 78238
FAX: 210-680-3763

Receiving Date: 06/07/97
Sample Type: SOIL
Project #: 710016
Project Name: MW INSTALLATION
Project Location: LOVINGTON

Analysis Date: 06/09/97
Sampling Date: 06/03/97
Sample Condition: Intact/Iced

ELT#	FIELD CODE	BENZENE mg/kg	TOLUENE mg/kg	ETHYLBENZENE mg/kg	m,p-XYLENE mg/kg	o-XYLENE mg/kg	TPH mg/kg
11426	MW-1; 6-8	<0.100	<0.100	<0.100	<0.100	<0.100	10
11427	MW-1; 50-52	<0.100	<0.100	<0.100	<0.100	<0.100	10
11428	SB-1; 30-32	<0.100	<0.100	<0.100	<0.100	<0.100	10
11429	SB-1; 15-17	<0.100	<0.100	<0.100	<0.100	<0.100	10
	% IA	123	115	113	113	112	101
	% EA	125	118	114	111	113	110
	BLANK	<0.001	<0.001	<0.001	<0.001	<0.001	<10

METHODS: SW 846-8020,5030 , EPA 418.1

Michael R. Fowler

6-11-97
Date

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

KEI
ATTN: THERESA NIX
5309 WURZBACH SUITE 100
SAN ANTONIO, TEXAS 78238
FAX: 210-680-3763

Receiving Date: 06/07/97
Sample Type: SOIL
Project #: 710016
Project Name: MW INSTALLATION
Project Location: LOVINGTON

Analysis Date: TPH 06/09/97
Analysis Date: BTEX 06/10/97
Sampling Date: 06/03 - 06/05
Sample Condition: Intact/Iced

ELT#	FIELD CODE	BENZENE mg/kg	TOLUENE mg/kg	ETHYLBENZENE mg/kg	m,p-XYLENE mg/kg	o-XYLENE mg/kg	TPH mg/kg
11430	SB-1; 50-52	<0.100	<0.100	<0.100	0.280	<0.100	70
11431	SB-1; 25-27	<0.100	<0.100	<0.100	<0.100	<0.100	30
11432	SB-2; 15-17	<0.100	<0.100	<0.100	<0.100	<0.100	20
11433	SB-2; 30-32	<0.100	<0.100	<0.100	<0.100	<0.100	10
11434	SB-2; 20-22	0.230	0.161	<0.100	<0.100	<0.100	90
	% IA	104	97	95	93	93	101
	% EA	121	115	110	110	110	110
	BLANK	<0.001	<0.001	<0.001	<0.001	<0.001	<10

METHODS: SW 846-8020,5030 , EPA 418.1

Michael R. Fowler

6-11-97
Date

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

KEI
ATTN: THERESA NIX
5309 WURZBACH SUITE 100
SAN ANTONIO, TEXAS 78238
FAX: 210-680-3763

Receiving Date: 06/07/97
Sample Type: SOIL
Project #: 710016
Project Name: MW INSTALLATION
Project Location: LOVINGTON

Analysis Date: TPH 06/09/97
Analysis Date: BTEX 06/10/97
Sampling Date: 06/03 - 06/05
Sample Condition: Intact/Iced

ELT#	FIELD CODE	BENZENE mg/kg	TOLUENE mg/kg	ETHYLBENZENE mg/kg	m,p-XYLENE mg/kg	o-XYLENE mg/kg	TPH mg/kg
11435	SB-2; 50-52	112	322	87.42	214	99.58	31,200
11436	SB-3; 25-27	0.124	0.612	0.262	0.785	0.418	<10
11437	SB-3; 15-17	<0.100	0.189	<0.100	0.101	<0.100	<10
11438	SB-3; 20-22	<0.100	<0.100	<0.100	<0.100	<0.100	<10
11439	SB-3; 50-52	<0.100	<0.100	<0.100	<0.100	<0.100	20
11440	SB-4; 45-47	343	667	176	231	97.67	25,600
11441	SB-4; 1-3	61.77	154	42.00	97.71	46.31	23,500
11442	SB-4; 6-8	66.39	225	59.84	149	69.79	22,100
	% IA	104	97	95	93	93	101
	% EA	121	115	110	110	110	114
	BLANK	<0.001	<0.001	<0.001	<0.001	<0.001	<10

METHODS: SW 846-8020,5030 , EPA 418.1

Michael R. Fowler

6-11-97
Date

PO # 7438 pg 1 of 2

Environmental Lab of Texas, Inc.

12600 West I-20 East Odessa, Texas 79763
(915) 563-1800 FAX (915) 563-1713

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Theresa Nix

Phone #: 210 680 3767

FAX #: 210 680 3763

Company Name & Address: KEI 5309 Wurzbach Ste 100 SA, Tx 78238

Project #: 710016

Project Name: MW installation

Project Location: Lovington

Sampler Signature:

LAB # (LAB USE ONLY)	FIELD CODE	# CONTAINERS	Volume/Amount	MATRIX: WATER	SOIL	AIR	SLUDGE	OTHER	PRESERVATIVE METHOD: HCL	HNO3	ICE	NONE	OTHER	SAMPLING: DATE	TIME	BTEX 8021B/5030	TPH 418.1	TCLP Metals Ag As Ba Cd Cr Pb Hg Se	Total Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Volatiles	TCLP Semi Volatiles	TDS	RCI
11426	MW-1 ; 6-8	1			X						X			6-3	AM	X	X						
11427	MW-1 ; 50-52	1			X						X			6-3	AM	X	X						
11428	SB-1 ; 30-32	1			X						X			6-3	PM	X	X						
11429	SB-1 ; 15-17	1			X						X			6-3	PM	X	X						
11430	SB-1 ; 50-52	1			X						X			6-5	AM	X	X						
11431	SB-1 ; 25-27	1			X						X			6-3	PM	X	X						
11432	SB-2 ; 15-17	1			X						X			6-4	AM	X	X						
11433	SB-2 ; 30-32	1			X						X			6-4	AM	X	X						
11434	SB-2 ; 20-22	1			X						X			6-4	AM	X	X						
11435	SB-2 ; 50-52	1			X						X			6-5	AM	X	X						

Relinquished by:	Date:	Time:	Received by:
	6-7-97	1000	
Relinquished by:	Date:	Time:	Received by:
Relinquished by:	Date:	Time:	Received by Laboratory:

REMARKS

Environmental Lab of Texas, Inc.

12600 West I-20 East Odessa, Texas 79763
(915) 563-1800 FAX (915) 563-1713

PO # 7438 pg 2 of 2

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Theresa Nix	Phone #: 210 680-3767 FAX #: 210 680 3763
Company Name & Address: KEI 5309 Wurzbach Ste 100 SA, Tx 78238	
Project #: 710016	Project Name: MW installation
Project Location: Lovington	Sampler Signature:

LAB # (LAB USE ONLY)	FIELD CODE	# CONTAINERS	Volume/Amount	MATRIX: WATER	SOIL	AIR	SLUDGE	OTHER	PRESERVATIVE METHOD: HCL	HNO3	ICE	NONE	OTHER	SAMPLING: DATE	TIME	ANALYSIS REQUEST: BTEX 8020/5030	TPH 418.1	TCLP Metals Ag As Ba Cd Cr Pb Hg Se	Total Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Volatiles	TCLP Semi Volatiles	TDS	RCI
11436	SB-3 ; 25-27	1	4oz		X						X			6-4		X	X						
11437	SB-3 ; 15-17	1			X						X			6-4		X	X						
11438	SB-3 ; 20-22	1			X						X			6-4		X	X						
11439	SB-3 ; 50-52	1			X						X			6-5		X	X						
11440	SB-4 ; 45-47	1			X						X			6-4		X	X						
11441	SB-4 ; 1-3	1			X						X			6-4		X	X						
11442	SB-4 ; 6-8	1			X						X			6-4		X	X						
	SB-5 (MW)	1			X						X			6-4		X	X						

Relinquished by:	Date: 6-7-97	Times: 1000	Received by:
Relinquished by:	Date:	Times:	Received by:
Relinquished by:	Date:	Times:	Received by Laboratory:

REMARKS

ENVIRONMENTAL LAB OF , INC.

"Don't Treat Your Soil Like Dirt!"

KEI
ATTN: THERESA NIX
5309 WURZBACH SUITE 100
SAN ANTONIO, TEXAS 78238
FAX: 210-680-3763

Receiving Date: 06/19/97
Sample Type: WATER
Project #: 710016
Project Location: LOVINGTON
Project Name: GW Sampling

Analysis Date: TPH 06/19/97
Analysis Date: BTEX 06/20/97
Sampling Date: 06/18/97
Sample Condition: Intact/Iced

ELT#	FIELD CODE	BENZENE mg/L	TOLUENE mg/L	ETHYLBENZENE mg/L	m,p-XYLENE mg/L	o-XYLENE mg/L	TPH mg/L
11513	MW-1	<0.001	<0.001	<0.001	<0.001	<0.001	<1
11514	MW-2	0.044	0.014	0.004	0.006	0.002	2
11515	MW-4	0.155	0.106	0.007	0.014	0.009	2
	% IA	94	89	87	85	86	102
	% EA	103	97	95	92	95	***
	BLANK	<0.001	<0.001	<0.001	<0.001	<0.001	<1

METHODS: SW 846-8020,5030 , EPA 418.1

Michael R. Fowler

6-20-97
Date

Environmental Lab of Texas, Inc.

12600 West I-20 East Odessa, Texas 79763
(915) 563-1800 FAX (915) 563-1713

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

PO # 76666

Project Manager: Theresa Nix	Phone #: 210 680-3763 FAX #: 210 680-3763
Company Name & Address: KEI 5309 Wurzbach Suite 100 SA, Tx 78238	
Project #: 710016	Project Name: GW Sampling
Project Location: Lovington	Sampler Signature:

LAB # (LAB USE ONLY)	FIELD CODE	# CONTAINERS	Volume/Amount	MATRIX: WATER	SOIL	AIR	SLUDGE	OTHER	PRESERVATIVE METHOD: HCL	HNO3	ICE	NONE	OTHER	SAMPLING: DATE	TIME	BTEX 8020/5030	TPH 418.1	TCLP Metals Ag As Ba Cd Cr Pb Hg Se	Total Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Volatiles	TCLP Semi Volatiles	TDS	RCI
11513	MW-1	3		/							/			6-18	AM	/	/						
11514	MW-2	3		/							/			6-18	AM	/	/						
11515	MW-4	3		/							/			6-18	AM	/	/						

Relinquished by:	Date: 6-18-97	Time: 1630	Received by:
Relinquished by:	Date: 06-19-97	Time: 0900	Received by: jmcmurrey
Relinquished by:	Date:	Time:	Received by Laboratory:

REMARKS

Results by Monday June 23 (P.M)
Please. (MAS)