REVIEWED
By Olivia Yu at 4:09 pm, Mar 27, 2018

July 6, 2017

Closure denied. NMOCD will grant deferral for the impacted area represented by 1RP-4513. At time of abandonment, retrofit, or inactivity, delineation must be completed in addition to remediation.

#5B24624-BG23

NMOCD District I
Olivia Yu
1625 N. French Dr.
Hobbs, NM 88240

SUBJECT: CLOSURE FOR INCIDENT 1RP-4513, YOUNG DEEP UNIT 3 FED #1 API# 30-025-27369, LEA COUNTY, NEW MEXICO

Dear Olivia Yu:

On behalf of Matador Resources, Souder Miller & Associates (SMA) is pleased to submit this final closure report summarizing the soil remediation for the release site located at the Young Deep Unit 3 Fed #1 in Lea County, New Mexico. The purpose of the closure report is to obtain approval from the New Mexico Oil Conservation Division (NMOCD) for the remediation of the release that occurred on Fee property on November 9, 2016.

Table 1, below, summarizes information regarding the release.

Table 1: Release information and Site Ranking	
Name	Young Deep Unit 3 Fed #1
Company	Matador Resources
Incident Number	1RP-4513
API Number	30-025-27369
Location	32.766603° -103.760984°
Estimated Date of Release	November 9, 2016
Date Reported to NMOCD	November 9, 2016
Land Owner	BLM
Reported To	NMOCD
Source of Release	Buried pipeline
Released Material	Equipment Failure
Released Volume	~175 bbls Produced Water
Recovered Volume	~170 bbls Produced Water
Net Release	~5 bbls Produced Water
Nearest Waterway	13 miles south of the location
Depth to Groundwater	Estimated to be greater than 100 feet
Nearest Domestic Water Source	Greater than 1,000 feet
NMOCD Ranking	0
SMA Response Dates	Initial: 11/15/16

1.0 Background

On behalf of Matador Resources, Souder, Miller & Associates (SMA) has prepared this report that describes the assessment, initial delineation and remediation for a release associated with the Young Deep Unit 3 Fed #1 location, API# 30-025-27369. The site is located in Section 10, Township 18S, Range 32E NMPM, Lea County, New Mexico, on federal land administered by the Bureau Land Management (BLM). Figure 1 illustrates the vicinity and location of the site.

2.0 Site Ranking and Land Jurisdiction

The release site is located approximately 26 miles east of the Pecos River, with an elevation of approximately 3,843 feet above sea level. After evaluation of the site using aerial photography and topographic maps, depth to groundwater is estimated to greater than 100' ground surface (bgs).

SMA searched the New Mexico State Engineer's Office online water well database for water wells in the vicinity of the release. Zero wells are located within a one mile radius of the site. A Well Report of a well drilled 1.5 miles southeast of the location was drilled to 100' bgs and was dry (Appendix D). Figure 1 depicts the site vicinity and Figure 2 shows the site itself. The physical location of this release is within the jurisdiction of NMOCD.

Recommended Remediation Action Levels (RRALs) are determined by the site ranking according to the NMOCD *Guidelines for Remediation of Leaks, Spills, and Releases* (1993). Below in Table 2 are the remediation standards and the site ranking for this location. Justification for this site ranking is found in Figure 1 and Appendix D.

Table 2.

Soil Remediation Standards	**0 to 9**	**10 to 19**	**>19**
Benzene	**10 PPM**	**10 PPM**	**10 PPM**
BTEX	**50 PPM**	**50 PPM**	**50 PPM**
TPH	**5000 PPM**	**1000 PPM**	**100 PPM**

Depth to Groundwater	**NMOCD Numeric Rank**
< 50 BGS = 20	
50' to 99' = 10	
>100' = 0	0
Distance to Nearest Surface Water	**NMOCD Numeric Rank**
< 200' = 20	
200' - 1000' = 10	
>1000' = 0	0
Well Head Protection	**NMOCD Numeric Rank**
<1000' (or <200' domestic) = 20	
> 1000' = 0	0
Total Site Ranking	**0**

3.0 Release Characterization

On November 15, after receiving 811 clearance, SMA field personnel assessed the release area onsite. Soils were screened for hydrocarbons and chlorides using a calibrated Photo Ionization Detector (PID), and a mobile chlorides titration kit (EPA method 9045D) meter. Delineation samples were collected. Specific sample locations for all samples are depicted on Figure 2 (Sample Location Map). All samples were collected and processed according to NMOCD soil sampling procedures. The samples were sent under chain-of-custody protocols to Hall Environmental Analysis Laboratory for analysis for Total Chlorides using EPA Method 300.0, Total Petroleum Hydrocarbons (Motor Oil, Diesel and Gasoline Range) using EPA Method 8015D, and one sample (L1) was analyzed for BTEX using EPA Method 8021B.

The affected area was determined to be approximately 80 feet long and 70 feet wide within the unlined tank battery. Delineation samples at 3' bgs show to be below the Recommended Remediation Action Level according to NMOCD Guidelines for Remediation of Leaks, Spills and Releases, 1993. The site was excavated to 1.5 foot bgs in the battery around sample L-1 as an initial response. The excavated soil was hauled to an approved NMOCD facility. This was the only area excavation that could occur due to the facility equipment.

A summary of the laboratory analyses is included in Table 2. Laboratory reports are included in Appendix A.

4.0 Summary of Soil Remediation

On January 31, 2017 Olivia Yu, NMOCD Environmental Specialist requested:

1. Depth to groundwater documentation.
2. Due to the depth to groundwater, complete delineation to 250 mg/kg target chloride levels and maintained for 10 ft. below this point is requested.
3. Utilize hand or manual methods to sample around operational infrastructure/equipment.

Below is the response for the requested items above:

1. Documentation of depth to ground water is shown in Appendix D.

2. On May 17, 2017 a Geophysical Investigation was conducted to help determine the depth of the chloride plume associated with the 1RP-4513. This technique was used because delineation equipment could not be used within the battery. A conductivity survey for brine contamination beyond the containment berm was performed using an EM-31 ground conductivity meter. To determine the depth of brine contamination within the containment berm, six (6) DC resistivity soundings were collected using an earth resistivity/IP meter. (Report attached as Appendix C)
    a. An area of north of the facility was identified as potentially being affected by the release, though it is likely from drips from the haul trucks during initial spill response and cleanup.
    b. Three background soundings were conducted to compare the resistivity to the three soundings within the battery, and are labeled BG-1, BG-2 and BG-3 in Figure 2.

Soundings within the battery are labeled S1, S2 and S3 in Figure 2. The DC resistivity sounding data concludes: “DC resistivity soundings inside the containment berm shows that infiltration from this release penetrated no deeper than 8 ft. bgs.”

3. It is SMA’s opinion that the Geophysical Investigation has adequately addressed the need to sample around operation infrastructure/equipment. This method was used to delineate past what hand tools could go to.

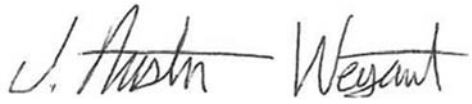
Due to the additional documentation indicating that groundwater is greater than 100 ft bgs, and that chloride contamination does not extend beyond 10 ft. depth in the impacted area, SMA is re-requesting that the area of deferment shown in Figure 2 be exempted from cleanup requirements until the location is abandoned. This area cannot be excavated beyond the already excavated 18 inches, due to the proximity of the operational equipment in the area.

5.0 Scope and Limitations

The scope of our services consisted of the performance of assessment sampling, verification of release stabilization, regulatory liaison, and preparation of this closure report. All work has been performed in accordance with generally accepted professional environmental consulting practices for oil and gas releases in the Permian Basin in New Mexico.

If there are any questions regarding this report, please contact either Austin Weyant at 575-689-8801 or Shawna Chubbuck at 505-325-7535.

Submitted by:
SOUDER, MILLER & ASSOCIATES



Austin Weyant
Project Scientist

Reviewed by:

Shawna Chubbuck
Senior Scientist

ATTACHMENTS:

Figures:

Figure 1: Vicinity Map
Figure 2: Site and Sample Location Map

Tables:

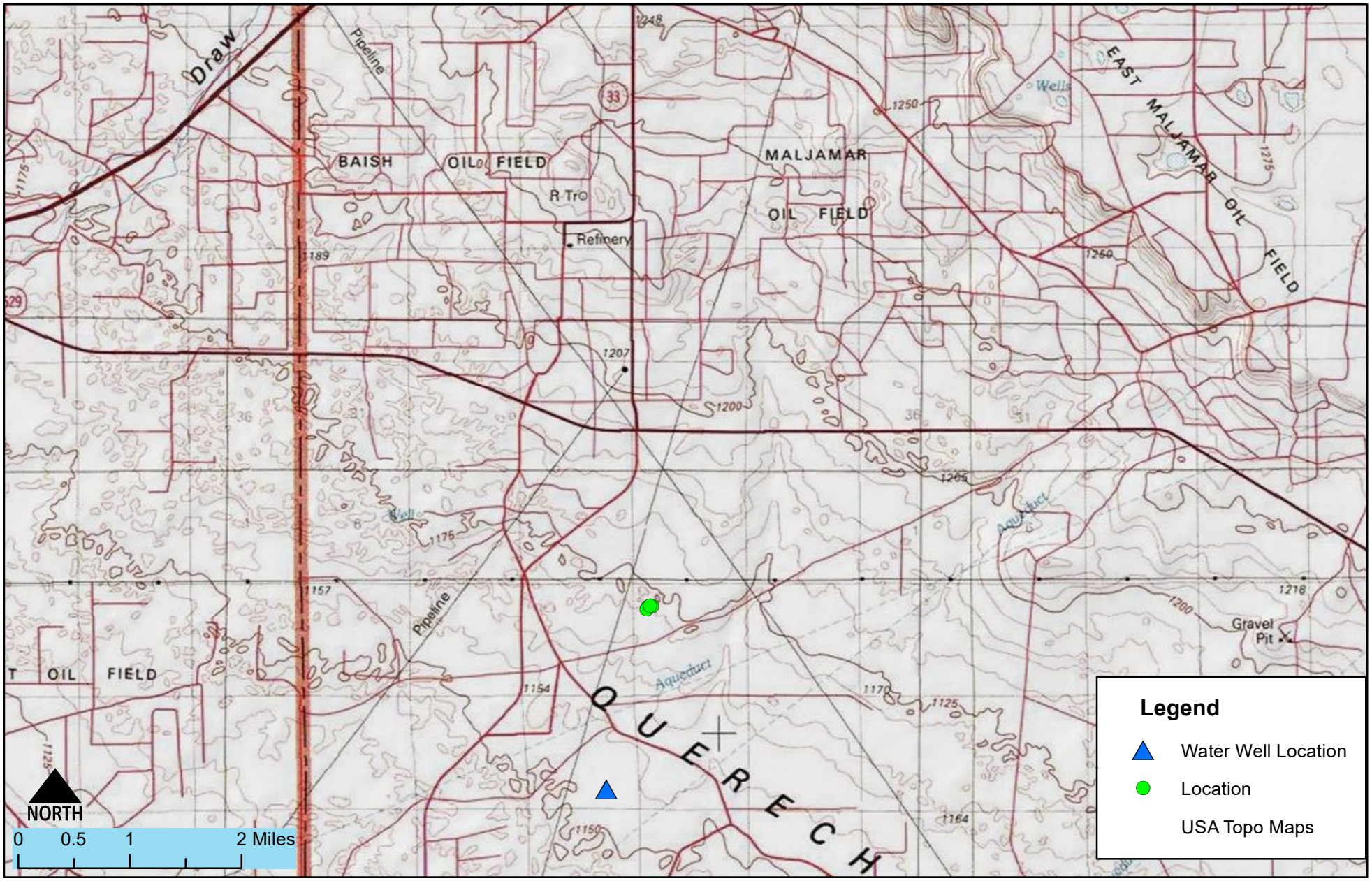
Table 3A: Summary Chloride Field Screening
Table 3B: Summary of Laboratory Analyses

Appendices:

Appendix A: Laboratory Analytical Reports
Appendix B: Form C141 Final
Appendix C: Geophysical Investigation at the Young Deep Water Flood Maljamar, New Mexico
Appendix D: NMOSE Well Record

FIGURE 1

VICINITY AND NMOSE DATA MAP



Vicinity Map
Matador- Young Deep Unit 3 Fed #1
Section.10, Township 18S, Range 32E , New Mexico

Figure 1

Revisions
By: Date: Descr:
By: Date: Descr:

Drawn Lucas Middleton
Checked
Approved

201 South Halaguena Street
Carlsbad, New Mexico 88221
(575) 689.7040
www.soudermiller.com
Serving the Southwest & Rocky Mountains

Date Saved: 7/6/2017

Document: C:\Users\lcm.CBO\Documents\GIS DATA\MAPS\YOUNg deep Matador Figure 1.mxd

FIGURE 2

SITE AND SAMPLE

LOCATION MAP

Site and Sample Location Map
Matador- Young Deep Unit 3 Fed #1
Section 10, Township 18S, Range 32E , New Mexico

Figure 2

Revisions
By: Date: Descr:
By: Date: Descr:

Drawn Lucas Middleton
Checked
Approved

201 South Halaguena Street
Carlsbad, New Mexico 88221
(575) 689.7040
www.soudermiller.com
Serving the Southwest & Rocky Mountains

Date Saved: 7/6/2017

Document: C:\Users\lcm.CBO\Documents\GIS DATA\MAPS\YOUNg deep Matador Figure 2.mxd

TABLE 3A & 3B

SUMMARY SAMPLE RESULTS

FIELD SCREENING RESULTS SUMMARY					
Date	Time	Field Screening Reference	Sample Depth (Feet BGS)	Chlorides Results	Lab Sample Collected Y/N
11/15/2016	2:00	L1-1	1'	3875	Y
11/15/2016	2:00	L2-2	2'	3898	Y
11/15/2016	2:00	L2-4	4'	3955	Y
11/15/2016	2:00	L3-1	1'	1260	Y
11/15/2016	2:00	L4-1	1'	895	Y
11/15/2016	2:00	L4-3.5	3.5'	221	Y
11/15/2016	2:00	L5	0.5'	1934	Y
11/15/2016	2:00	S	Surface	6832	Y

Table 3b: Summary of Laboratory Analyses

Analytical Report- 1611A97	Sample Number on Figure 2 Map	Sample Date	Depth	BTEX ppm	Benzene mg/Kg	GRO mg/Kg	DRO mg/Kg	Cl- mg/Kg
1611A97-001	L4	11/15/2016	3'	>0.093	>0.023	>4.7	360	210
1611A97-002	L3-1	11/15/2016	1'	N/A	N/A	>4.7	420	9500
1611A97-003	L1-1	11/15/2016	1'	N/A	N/A	>4.7	2800	5600

APPENDIX A:

LABORATORY ANALYTICAL REPORTS

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

December 06, 2016

Austin Weyant
Souder, Miller & Associates
201 S Halagueno
Carlsbad, NM 88221
TEL: (575) 689-7040
FAX

RE: Young Deep Unit 3 Fed #1 OrderNo.: 1611A97

Dear Austin Weyant:

Hall Environmental Analysis Laboratory received 3 sample(s) on 11/19/2016 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0190

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Souder, Miller & Associates
Client Sample ID: L4-3S
Project: Young Deep Unit 3 Fed #1
Collection Date: 11/15/2016 7:00:00 AM
Lab ID: 1611A97-001 **Matrix:** SOIL **Received Date:** 11/19/2016 8:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS						Analyst: **LGT**	
Chloride	210	30		mg/Kg	20	11/29/2016 1:56:51 PM	28901
EPA METHOD 8015M/D: DIESEL RANGE ORGANICS						Analyst: **TOM**	
Diesel Range Organics (DRO)	360	93		mg/Kg	10	11/23/2016 4:04:00 PM	28807
Surr: DNOP	0	70-130	S	%Rec	10	11/23/2016 4:04:00 PM	28807
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **NSB**	
Gasoline Range Organics (GRO)	ND	4.7		mg/Kg	1	11/23/2016 1:20:09 PM	28828
Surr: BFB	99.4	68.3-144		%Rec	1	11/23/2016 1:20:09 PM	28828
EPA METHOD 8021B: VOLATILES						Analyst: **NSB**	
Methyl tert-butyl ether (MTBE)	ND	0.093		mg/Kg	1	11/23/2016 1:20:09 PM	28828
Benzene	ND	0.023		mg/Kg	1	11/23/2016 1:20:09 PM	28828
Toluene	ND	0.047		mg/Kg	1	11/23/2016 1:20:09 PM	28828
Ethylbenzene	ND	0.047		mg/Kg	1	11/23/2016 1:20:09 PM	28828
Xylenes, Total	ND	0.093		mg/Kg	1	11/23/2016 1:20:09 PM	28828
Surr: 4-Bromofluorobenzene	106	80-120		%Rec	1	11/23/2016 1:20:09 PM	28828

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Souder, Miller & Associates
Client Sample ID: L3-1
Project: Young Deep Unit 3 Fed #1
Collection Date: 11/15/2016 7:00:00 AM
Lab ID: 1611A97-002 **Matrix:** SOIL **Received Date:** 11/19/2016 8:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS						Analyst: **LGT**	
Chloride	9500	750		mg/Kg	500	11/30/2016 9:50:23 PM	28901
EPA METHOD 8015M/D: DIESEL RANGE ORGANICS						Analyst: **TOM**	
Diesel Range Organics (DRO)	420	9.2		mg/Kg	1	11/28/2016 7:42:37 PM	28807
Motor Oil Range Organics (MRO)	340	46		mg/Kg	1	11/28/2016 7:42:37 PM	28807
Surr: DNOP	101	70-130		%Rec	1	11/28/2016 7:42:37 PM	28807
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **NSB**	
Gasoline Range Organics (GRO)	ND	4.7		mg/Kg	1	11/22/2016 3:17:30 PM	28828
Surr: BFB	107	68.3-144		%Rec	1	11/22/2016 3:17:30 PM	28828

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Souder, Miller & Associates
Client Sample ID: L1-1
Project: Young Deep Unit 3 Fed #1
Collection Date: 11/15/2016 7:00:00 AM
Lab ID: 1611A97-003 **Matrix:** SOIL **Received Date:** 11/19/2016 8:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS						Analyst: **LGT**	
Chloride	5600	300		mg/Kg	200	12/2/2016 6:29:52 PM	28901
EPA METHOD 8015M/D: DIESEL RANGE ORGANICS						Analyst: **TOM**	
Diesel Range Organics (DRO)	2800	96		mg/Kg	10	11/28/2016 8:36:05 PM	28807
Motor Oil Range Organics (MRO)	3200	480		mg/Kg	10	11/28/2016 8:36:05 PM	28807
Surr: DNOP	0	70-130	S	%Rec	10	11/28/2016 8:36:05 PM	28807
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **NSB**	
Gasoline Range Organics (GRO)	ND	4.7		mg/Kg	1	11/22/2016 5:38:20 PM	28828
Surr: BFB	92.0	68.3-144		%Rec	1	11/22/2016 5:38:20 PM	28828

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1611A97**

06-Dec-16

Client: Souder, Miller & Associates

Project: Young Deep Unit 3 Fed #1

Sample ID	**MB-28901**	SampType:	**MBLK**	TestCode:	**EPA Method 300.0: Anions**					
Client ID:	**PBS**	Batch ID:	**28901**	RunNo:	**39040**					
Prep Date:	**11/29/2016**	Analysis Date:	**11/29/2016**	SeqNo:	**1221142**	Units:	**mg/Kg**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	1.5								

Sample ID	**LCS-28901**	SampType:	**LCS**	TestCode:	**EPA Method 300.0: Anions**					
Client ID:	**LCSS**	Batch ID:	**28901**	RunNo:	**39040**					
Prep Date:	**11/29/2016**	Analysis Date:	**11/29/2016**	SeqNo:	**1221143**	Units:	**mg/Kg**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	14	1.5	15.00	0	95.4	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1611A97**

06-Dec-16

Client: Souder, Miller & Associates

Project: Young Deep Unit 3 Fed #1

Sample ID	**LCS-28807**	SampType:	**LCS**		TestCode:	**EPA Method 8015M/D: Diesel Range Organics**				
Client ID:	**LCSS**	Batch ID:	**28807**		RunNo:	**38942**				
Prep Date:	**11/22/2016**	Analysis Date:	**11/23/2016**		SeqNo:	**1217667**	Units:	**mg/Kg**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Diesel Range Organics (DRO)	44	10	50.00	0	87.8	62.6	124			
Surr: DNOP	4.4		5.000		88.8	70	130			

Sample ID	**MB-28807**	SampType:	**MBLK**		TestCode:	**EPA Method 8015M/D: Diesel Range Organics**				
Client ID:	**PBS**	Batch ID:	**28807**		RunNo:	**38942**				
Prep Date:	**11/22/2016**	Analysis Date:	**11/23/2016**		SeqNo:	**1217668**	Units:	**mg/Kg**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Diesel Range Organics (DRO)	ND	10								
Motor Oil Range Organics (MRO)	ND	50								
Surr: DNOP	9.6		10.00		96.4	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1611A97**

06-Dec-16

Client: Souder, Miller & Associates

Project: Young Deep Unit 3 Fed #1

Sample ID	**MB-28828**	SampType:	**MBLK**	TestCode:	**EPA Method 8015D: Gasoline Range**					
Client ID:	**PBS**	Batch ID:	**28828**	RunNo:	**38913**					
Prep Date:	**11/21/2016**	Analysis Date:	**11/22/2016**	SeqNo:	**1216601**	Units:	**mg/Kg**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	ND	5.0								
Surr: BFB	860		1000		85.9	68.3	144			

Sample ID	**LCS-28828**	SampType:	**LCS**	TestCode:	**EPA Method 8015D: Gasoline Range**					
Client ID:	**LCSS**	Batch ID:	**28828**	RunNo:	**38913**					
Prep Date:	**11/21/2016**	Analysis Date:	**11/22/2016**	SeqNo:	**1216602**	Units:	**mg/Kg**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	26	5.0	25.00	0	103	74.6	123			
Surr: BFB	910		1000		91.4	68.3	144			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1611A97**

06-Dec-16

Client: Souder, Miller & Associates

Project: Young Deep Unit 3 Fed #1

Sample ID **MB-28828**	SampType: **MBLK**	TestCode: **EPA Method 8021B: Volatiles**
Client ID: **PBS**	Batch ID: **28828**	RunNo: **38913**
Prep Date: **11/21/2016**	Analysis Date: **11/22/2016**	SeqNo: **1216628** Units: **mg/Kg**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Methyl tert-butyl ether (MTBE)	ND	0.10								
Benzene	ND	0.025								
Toluene	ND	0.050								
Ethylbenzene	ND	0.050								
Xylenes, Total	ND	0.10								
Surr: 4-Bromofluorobenzene	1.0		1.000		102	80	120			

Sample ID **LCS-28828**	SampType: **LCS**	TestCode: **EPA Method 8021B: Volatiles**
Client ID: **LCSS**	Batch ID: **28828**	RunNo: **38913**
Prep Date: **11/21/2016**	Analysis Date: **11/22/2016**	SeqNo: **1216629** Units: **mg/Kg**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Methyl tert-butyl ether (MTBE)	1.1	0.10	1.000	0	112	65.7	116			
Benzene	1.1	0.025	1.000	0	113	75.2	115			
Toluene	1.0	0.050	1.000	0	103	80.7	112			
Ethylbenzene	0.99	0.050	1.000	0	98.9	78.9	117			
Xylenes, Total	2.9	0.10	3.000	0	97.0	79.2	115			
Surr: 4-Bromofluorobenzene	1.1		1.000		107	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: SMA-CARLSBAD | Work Order Number: 1611A97 | RcptNo: 1

Received by/date: CM 11/19/16

Logged By: Anne Thorne 11/19/2016 8:15:00 AM Anne Thorne

Completed By: Anne Thorne 11/21/2016 Anne Thorne

Reviewed By: aJ 11/21/16

Chain of Custody

1. Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
2. Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
3. How was the sample delivered?	Courier		

Log In

4. Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
5. Were all samples received at a temperature of >0° C to 6.0°C	Yes ☑	No ☐	NA ☐
6. Sample(s) in proper container(s)?	Yes ☑	No ☐	
7. Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
8. Are samples (except VOA and ONG) properly preserved?	Yes ☑	No ☐	
9. Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
10. VOA vials have zero headspace?	Yes ☐	No ☐	No VOA Vials ☑
11. Were any sample containers received broken?	Yes ☐	No ☑	
12. Does paperwork match bottle labels? (Note discrepancies on chain of custody)	Yes ☑	No ☐	
13. Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
14. Is it clear what analyses were requested?	Yes ☑	No ☐	
15. Were all holding times able to be met? (If no, notify customer for authorization.)	Yes ☑	No ☐	

# of preserved bottles checked for pH: _____ (<2 or >12 unless noted)

Adjusted? _____

Checked by: _____

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☑ NA ☐

Person Notified: _____ Date _____

By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person

Regarding: _____

Client Instructions: _____

17. Additional remarks:

18. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	1.8	Good	Yes			

Chain-of-Custody Record

Client: SMA - Carlsbad

Mailing Address:

Phone #:

email or Fax#:

QA/QC Package:
☐ Standard ☐ Level 4 (Full Validation)

Accreditation:
☐ NELAP ☐ Other_____
☐ EDD (Type) _____

Turn-Around Time:
☑ Standard ☐ Rush_____

Project Name: Young Deep Unit 3 Fed #1

Project #: 5B24624 - B623

Project Manager:

Sampler: LCM

On Ice: ☑ Yes ☐ No

Sample Temperature: 1.8

HALL ENVIRONMENTAL ANALYSIS LABORATORY
www.hallenvironmental.com
4901 Hawkins NE - Albuquerque, NM 87109
Tel. 505-345-3975 Fax 505-345-4107

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1611497	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH Method 8015B (Gas/Diesel)	TPH (Method 418.1)	EDB (Method 504.1)	8310 (PNA or PAH)	RCRA 8 Metals	Anions ($F, Cl, NO_3, NO_2, PO_4, SO_4$)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)					Air Bubbles (Y or N)
11/5/16	2:00	Soil	L4-3S			001	X		X					X								
			L3-1			002			X					X								
			L1-1			003			X					X								

Analysis Request

Date:	Time:	Relinquished by:	Received by:	Date	Time	Remarks:
				11/9/16	0815	
Date:	Time:	Relinquished by:	Received by:	Date	Time	

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

APPENDIX B:

FORM C141 FINAL

APPENDIX C:

GEOPHYSICAL INVESTIGATION AT THE YOUNG DEEP WATER FLOOD MALJAMAR, NEW MEXICO

SUNBELT GEOPHYSICS P.O. Box 208 Socorro, New Mexico 87801 (575) 838-2941

Geophysical Investigation at the Young Deep Water Flood Maljamar, New Mexico

Prepared for:

Souder, Miller & Associates
201 S. Halagueno
Carlsbad, NM 88220

David A. Hyndman

June 2017

Introduction

A geophysical investigation has been conducted at the Young Deep Water Flood facility near Maljamar in Lea County, New Mexico. The objective of this investigation was to characterize the lateral and vertical extent of a recent release of brine (produced water) at the facility. The investigation consisted of two parts, a ground conductivity survey and direct current (DC) earth resistivity soundings.

The recent brine release is described as small, on the order of 2000 gallons (50 standard barrels) or less. The tanks, lines, and pumphouse are enclosed by an earthen containment berm. The near-surface soil inside the berm has been excavated to remove the released brine and then backfilled to approximate grade. The berm has been breached by earthmoving equipment on the south, west and north side of the berm, presumably as part of this surface clean-up.

The field surveys were conducted on 17 May, 2017. Labor, instrumentation, and technical expertise for the surveys were provided by Sunbelt Geophysics of Socorro, New Mexico. Guidance, coordination and oversight were provided by Souder, Miller & Associates of Carlsbad, New Mexico.

Methods

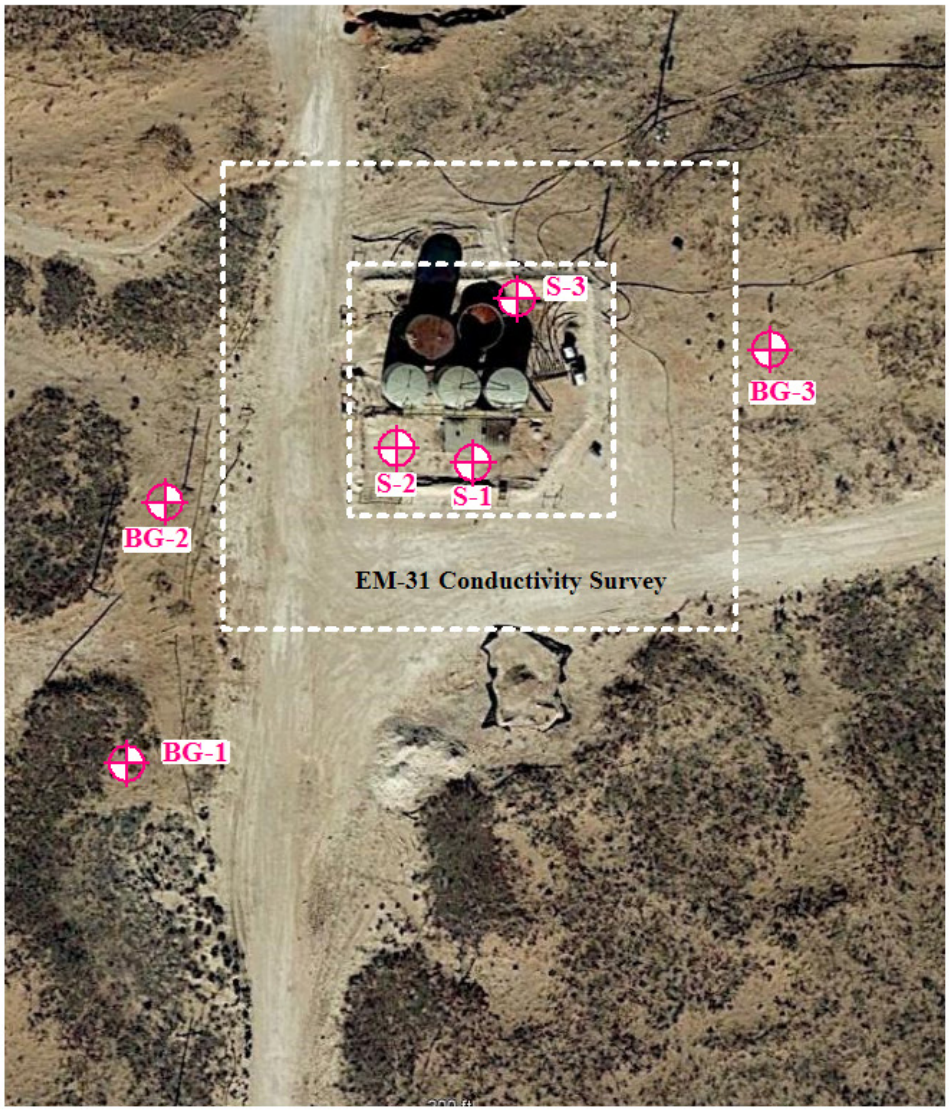
A spatial control grid was placed around the perimeter of the Water Flood facility with a transit and tape. This grid established parallel data acquisition lines separated by 10 ft. that extended 50 ft. beyond the perimeter fence to the south, east and west of the facility. The survey extended only 40 ft. to the north of the facility, constrained by marked pipelines. The containment berm is located approximately 5 ft. to the inside of the perimeter fence.

A conductivity survey for brine contamination beyond the containment berm (perimeter fence) was performed using a Geonics EM-31 ground conductivity meter. EM-31 data were acquired approximately every 2.5 ft. along the parallel lines.

A total of six DC resistivity soundings were made using an Advanced Geosceinces Inc. (AGI) miniSting earth resistivity/IP meter. The soundings were made using an expanding Wenner Array with electrode spacings ("A" spacings) of 2, 4, 6, 8, 10, 12, 14, 16, 20, and sometimes 24 ft. Three of the soundings were positioned away from the Water Flood facility and marked pipelines to gain a "background" characterization. Three soundings were placed inside the containment berm to capture a vertical resistivity profile where the brine had been released on the surface.

Figure 1 shows the position of the spatial control grid around the facility. The limits of the grid are indicated by dashed white lines. The location of the six resistivity soundings are also given on Figure 1. The background soundings are designated BG-1, BG-2, and BG-3. The soundings inside the containment berm are designated as S-1, S-2, and S-3.

Data from the EM-31 and miniSting were transferred to a computer for analysis and mapping. The DAT31 program (Geonics Ltd.) was used for basic EM-31 data processing. The IX1D program (Interpex) was used for modeling the resistivity data. The Oasis montaj mapping package (Geosoft Ltd.) was used for image preparation.



= Resistivity Sounding

Figure 1. Young Deep Water Flood

Locations of EM-31 Conductivity Survey and DC Resistivity Soundings

N

50 0 50

(feet)

Results

EM-31 Ground Conductivity Survey

The EM-31 ground conductivity meter acquires two measurements as the operator carries the instrument along the data acquisition lines. The primary measurement is the ground conductivity in units of milliSiemen/meter (mS/m). A secondary measurement is the so called "In-Phase" response. The in-phase is a measure of the shift in phase between the primary (input) signal from the instrument and the returned signal generated in the ground.

The in-phase is measured in parts per thousand (ppt) and is intentionally tuned to approximately zero (0) at the start of a survey. Mild changes in the in-phase response can occur with lateral changes in the physical parameters of the ground. Large (greater than a few ppt) and abrupt changes indicate the presence of subsurface or above ground metal that is interfering with the proper operation of the instrument. Thus, the in-phase response is very useful for determining where the measurement of ground conductivity should be suspected of error.

The in-phase response is shown on Figure 2. Buried pipes are found running to/from the northeast and southeast corners of the facility. Additional interference is generated by the eastern and southern perimeter fence and product loading fixtures along the western side of the facility. The measured conductivity can be assumed to be inaccurate near these areas of interference.

The ground conductivity data are presented on Figure 3. Please note that the conductivity units (mS/m) have been converted to resistivity units (ohm-ft) to be consistent with subsequent DC resistivity data (conductivity = inverse of resistivity). The color scale has been set so that very low resistivity, indicating the presence of brine, is red to pink. High resistivity indicating background is blue. As expected, the EM-31 data are distorted by the influence of the pipelines, fences and product loading fixtures where indicated by the in-phase response on Figure 2. Despite this interference, low resistivity is observed outside the containment in three areas. These areas are marked as "Brine?".

There is an area of depressed resistivity (green) extending beyond the northern fence with a "finger" of low resistivity (orange) coincident with a breach in the containment berm. Vehicle tracks indicate traffic by light duty equipment, presumably from the recent spill clean-up.

There is a modest resistivity low (green) on the western side of the facility. This feature seems to run from the product loading fixtures to the south along the road. This suggests drips from trucks hauling away product.

Low resistivity is found along the eastern boundary of the facility. The pipelines and fence interfere with the measurements in much of this area, but there are places at the edge of the survey with depressed (green) and low (orange) resistivity that are 40 ft. to 50 ft. away from this interference. This is far enough away to accept these measurements as valid. There is no indication that the recent brine release flowed over the containment in this area. A deeper source is suspected.

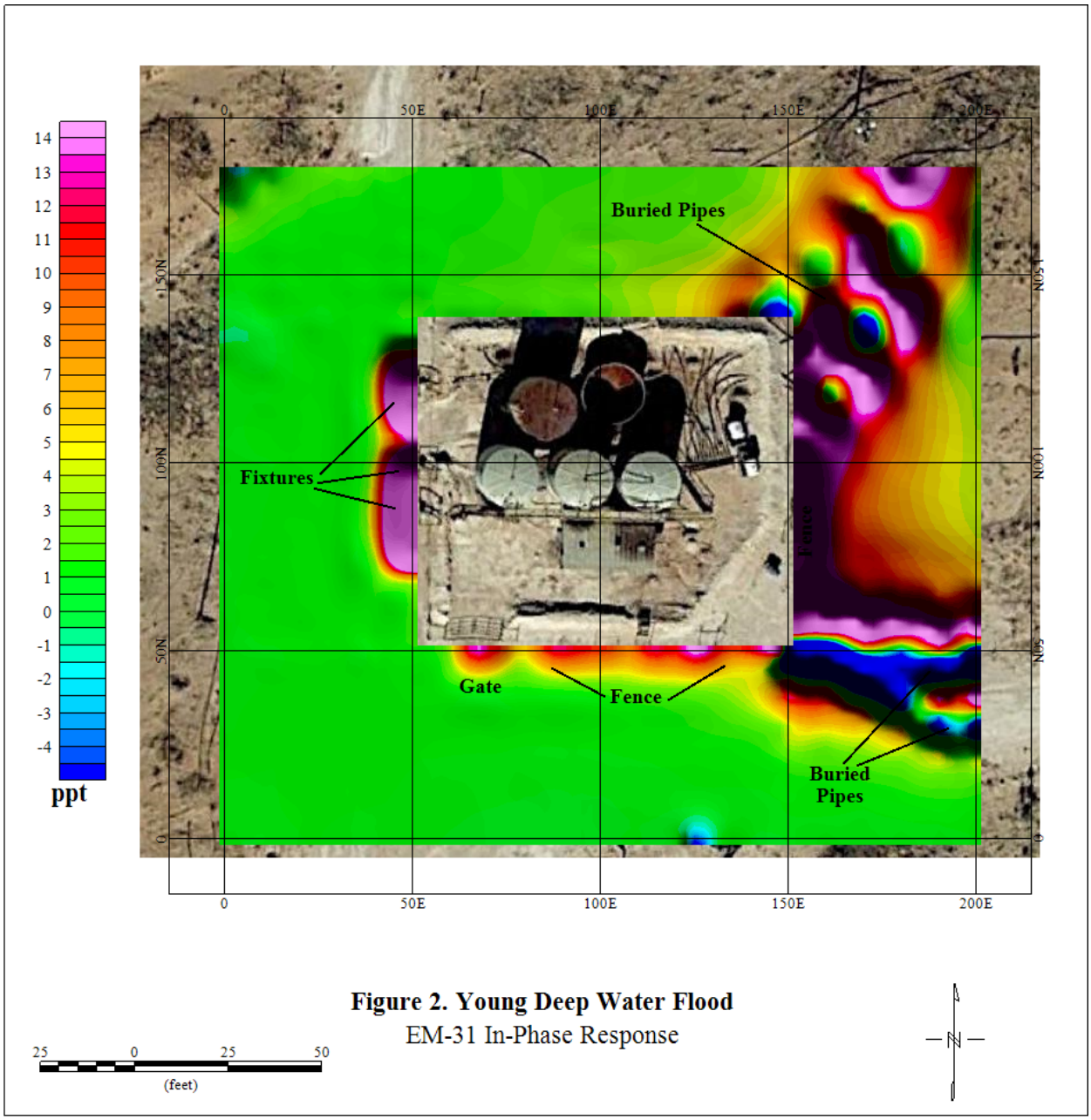


Figure 2. Young Deep Water Flood
EM-31 In-Phase Response

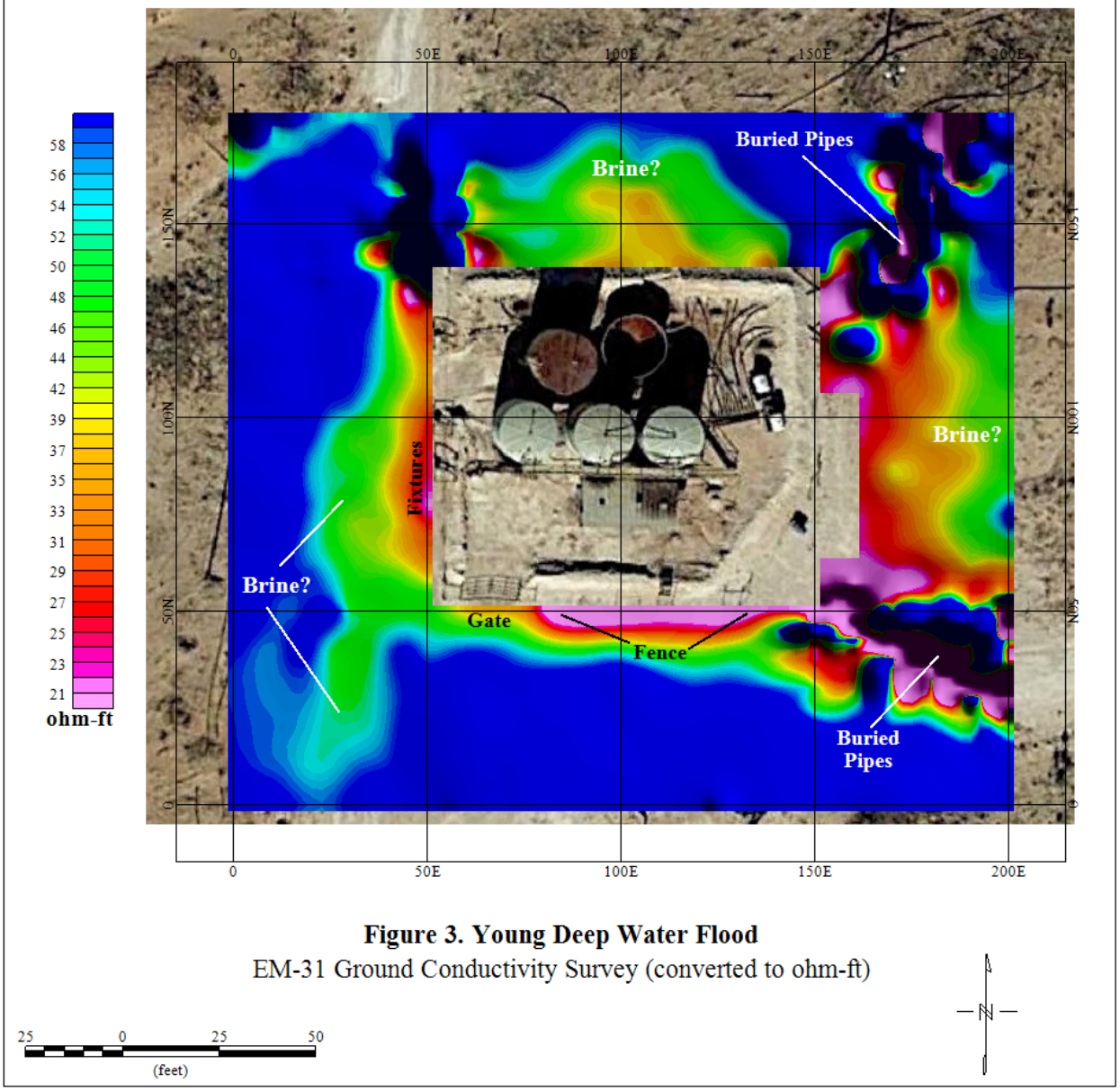


Figure 3. Young Deep Water Flood

EM-31 Ground Conductivity Survey (converted to ohm-ft)

DC Resistivity Soundings

The DC resistivity soundings were acquired using an expanding array of equally spaced electrodes. Each array set-up measures the bulk resistivity of a volume of earth. Ever larger volumes are measured as the array expands. The series of resistivity measurements taken at a center point are numerically modeled to approximate the vertical resistivity profile below the point.

The three background soundings are show on Figure 4, and the locations are given on Figure 1. Each sounding is presented as the field measurements of apparent resistivity vs. electrode spacing on the left and the numerical model of resistivity as a function of depth on the right. A line is drawn through the field data to indicate the "fit" of the numerical model to the measurements.

There are various ways to model resistivity data. A "smooth" inversion using many small layers was chosen as best for representing the general vertical resistivity regime. There may be discrete layers that are not resolved by this method. The design of the resistivity soundings supports modeling to a depth of 20 ft.

Background Soundings

Background Sounding 1 was acquired on a sand dune to the south and west of the facility. The elevation is approximately 5 ft. higher than the facility due to a surface layer of dune sand. The vertical profile starts with relatively high resistivity that increases to a depth of approximately 9 ft., showing the influence of the dune sand. The resistivity then falls with depth to a value of 220 ohm-ft at 20 ft. below ground surface (bgs).

Background Sounding 2 was acquired to the west of the facility at approximately at the same elevation as the facility. This sounding mimics Background 1 in shape but starts at a lower value, showing the effect of less near-surface sand. The resistivity rises to a depth of about 5 ft. then falls to 180 ohm-ft at a depth of 20 ft. bgs.

Background Sounding 3 was acquired to the east of the facility on ground that appears to have been stripped of some surface material in the past, possible as fill for construction of the site. The resistivity starts at a high value, but lower than Background 1 and Background 2. This may be due to the stripped soil or modification of local rainfall drainage/infiltration. Background Sounding 3 falls to an abnormally low value at 10 ft. bgs, clearly indicating a layer of excess moisture, possible brine, before rising to 208 ohm-ft at 20 ft. bgs. The low resistivity "bulge" is comparable to the green color contour on Figure 3. This sounding is located well away from the containment berm and there is no surface indication that this resistivity anomaly is related to the recent brine release. A different source is indicated.

Soundings Inside Containment

The soundings inside the containment berm are shown on Figure 5. Please note a change of scale on the Resistivity (Ohm-ft) axis of the numerical model. The resistivity values are much lower than the background values.

Sounding 1 was acquired in front of the pumphouse where the near-surface has been excavated and backfilled. The resistivity starts at a low value, indicating some influence from the recent brine may remain, but rises with depth. This rise indicates that any infiltration of brine is lessening with depth. The maximum depth appears to be approximately 7 ft. The resistivity is essentially constant from 7 ft. bgs to 15 ft. at a low value, indicating excess moisture. The resistivity gently rises to from 15 ft. to 20 ft. bgs, possibly a decrease in moisture.

Sounding 2 was acquired near the southwest corner of the facility. The resistivity starts at a high number and increases to a depth of 5 ft. This indicates that all of the recent brine release has been excavated. The resistivity then falls to a very low number at 15 ft. bgs, indicating a deeper zone of excess moisture. Sounding 2 is similar to Background Sounding 3 which detected a zone of excess moisture at approximately 10 ft.

Sounding 3 was acquired on the north side of the facility near the breach in the containment berm and near the area of anomalous resistivity detected by the EM-31 (see Figure 3). This profile starts at a low value but rapidly increases to relatively high value at 8 ft. bgs. This shape is similar to both Sounding 1 and Sounding 2 and indicates that infiltration is no deeper than 8 ft. bgs. Sounding 3 then fall rapidly from 8 ft. to 20 ft. bgs, to values similar to the excess moisture detected by Sounding 1 and Background Sounding 3.

Conclusions

The EM-31 survey detected three areas of anomalous resistivity along the perimeter of the facility. Only the area to the north of the facility (see Figure 3) seems to be related to the recent brine release. A deeper source is suspected for an area to the east. Dribble from vehicles is assumed for the faint anomaly along the road.

Most of the recent brine release has been excavated. DC resistivity soundings inside the containment berm show that infiltration from this release penetrated no deeper than 8 ft. bgs.

DC resistivity soundings inside the berm and Background Sounding 3 indicate there is a zone of excess moisture under the facility that is not related to the recent brine release. Background Sounding 3 and Sounding 2 indicate a discrete zone between 10 ft. and 15 ft. bgs. Sounding 1 and Sounding 3 indicate excess moisture beyond the 20-ft. depth of investigation.

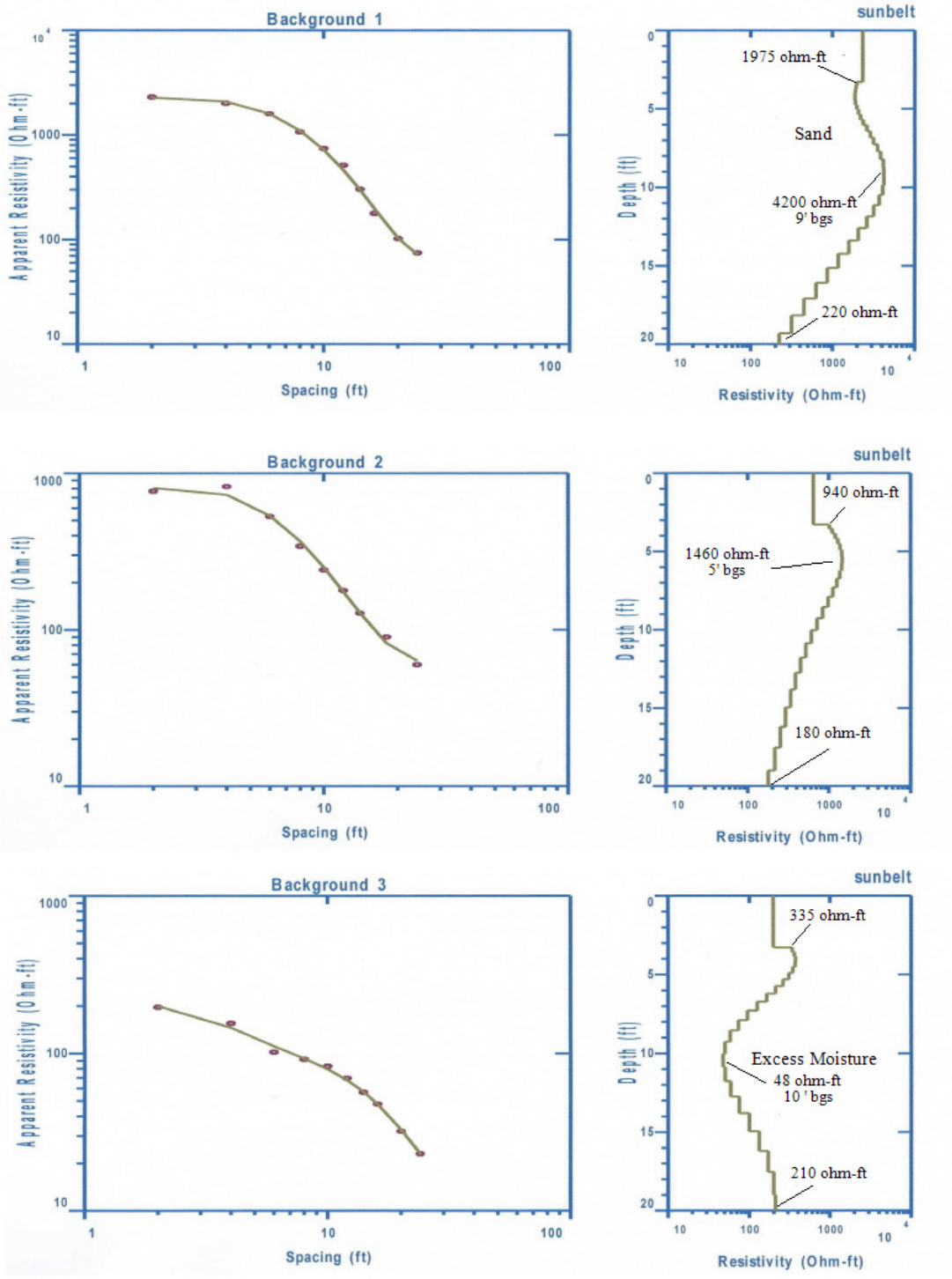


Figure 4. Young Deep Water Flood
Background Resistivity Soundings

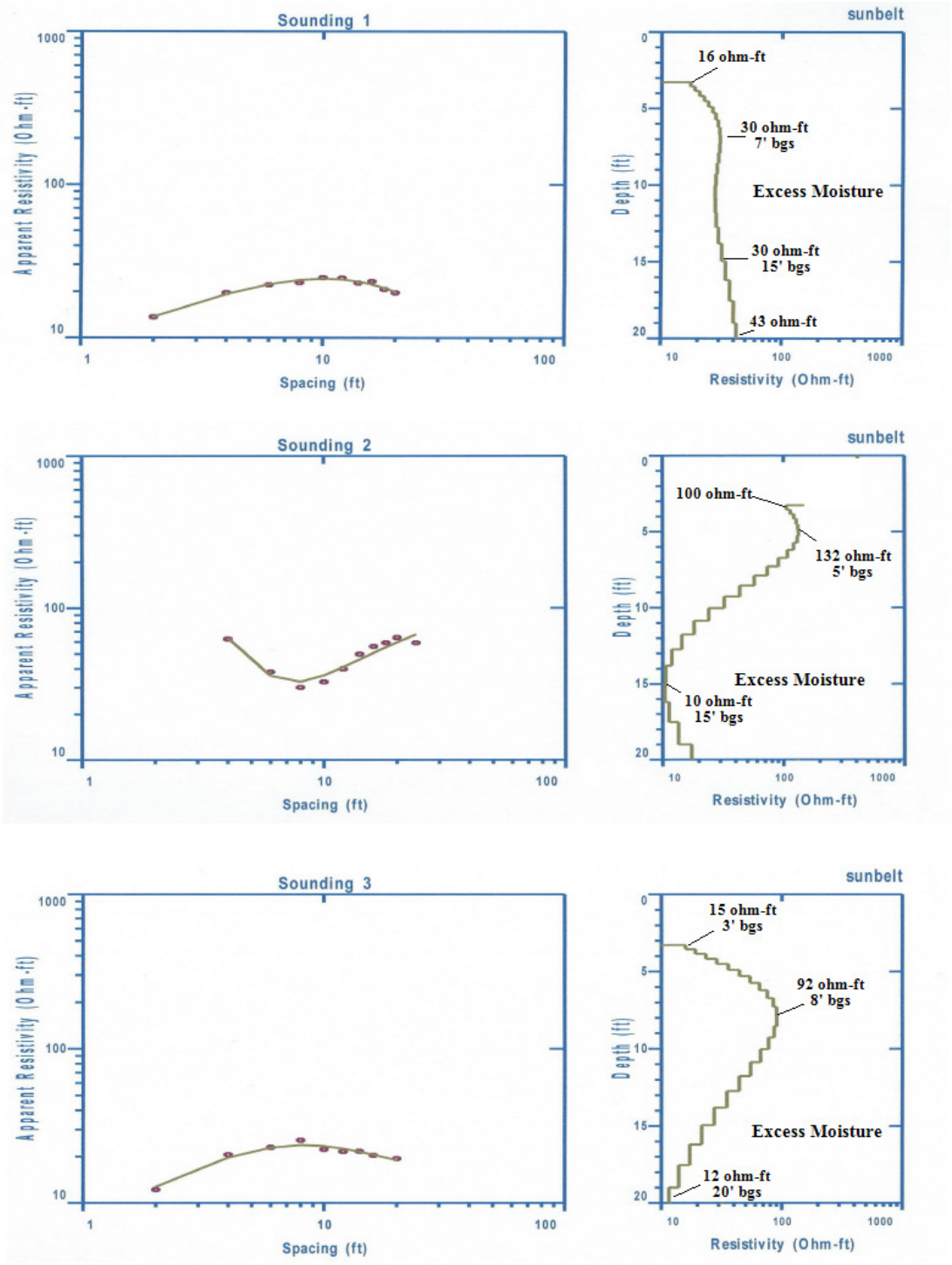


Figure 5. Young Deep Water Flood
DC Resistivity Soundings Inside Containment Berm

APPENDIX D:

NMOSE WELL RECORD

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Billy Williams Owner's Well No. TH #1

Street or Post Office Address

City and State Malaga, N. Mx.

Well was drilled under Permit No. and is located in the:

a. SE ¼ SW ¼ NE ¼ NE ¼ of Section 16 Township 18S Range 32E N.M.P.M.

b. Tract No. of Map No. of the

c. Lot No. of Block No. of the Subdivision, recorded in County.

d. X= feet, Y= feet, N.M. Coordinate System Zone in the Grant.

(B) Drilling Contractor Larry Felkins License No.

Address Hobbs, N. Mx.

Drilling Began 9/3/91 Completed 9/3/91 Type tools Rotary Size of hole 5¼ in.

Elevation of land surface or at well is ft. Total depth of well 100 ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well Dry ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			