1R - 426-09

REPORTS

DATE:

1-5-11

Hansen, Edward J., EMNRD

From: Katie Jones [kjones@riceswd.com]
Sent: Monday, April 11, 2011 11:16 AM
To: Hansen, Edward J., EMNRD
Cc: Hack Conder; Hall, Sharon
Subject: BD H-19 vent (1R426-09) CAP Addendum
Attachments: BD H-19 vent (1R426-09) Additional Delineation - Figure 4.jpg; BD H-19 vent (1R426-09) Proposed Liner - Figure 5.jpg; BD H-19 vent (1R426-09) SB-9 and SB-10 Logs.pdf; BD H-19 vent LAB 3.23.11.pdf; BD H-19 vent (1R426-09) CAP 1.5.11.pdf

Mr. Hansen,

This email is an Addendum to the BD H-19 vent site (1R426-09) Corrective Action Plan (CAP), submitted to the NMOCD on January 5, 2011. Page 3, section: Proposed Soil Remediation, paragraphs 1 and 2: text in blue lettering, below, will be added to the paragraph. Red lettering marked with a strike-through will be deleted. A plat showing the additional delineation (Figure 4), a plat showing the proposed liner in relation to the surrounding area (Figure 5), an aerial photo of the H-19 vent area, soil bore logs and laboratory results of the additional delineation, and the previously submitted CAP are attached. If you need any further information, please let me or Hack know.

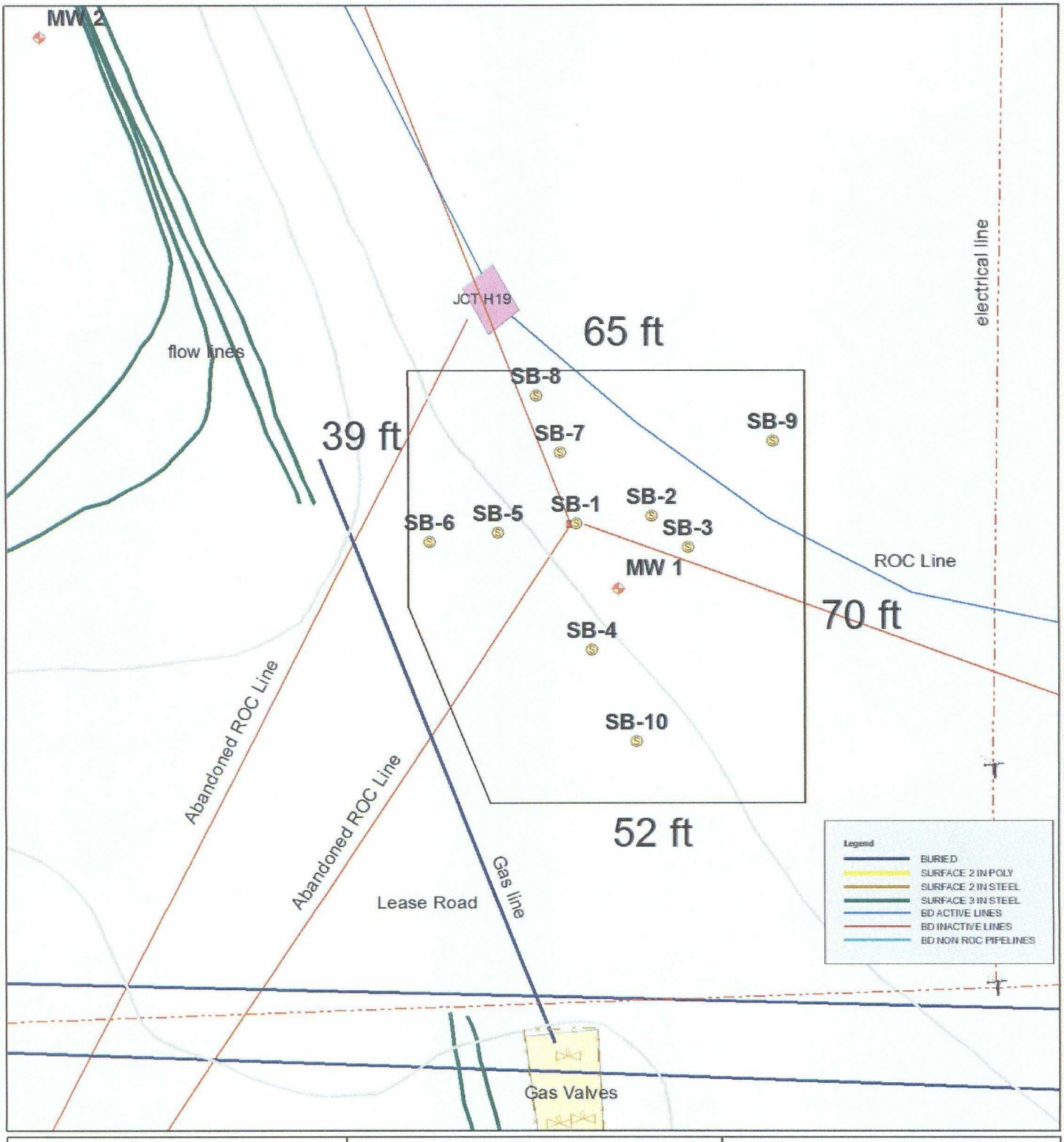
"With elevated chlorides and negligible levels of TPH, ROC proposes to excavate an area measuring ~~50~~65 feet by ~~50~~70 feet (avoiding the southwest corner to remain a safe distance to the nearby gas pipeline) by 4 to 5 feet deep and place a 20 mil polyethylene liner at 4 feet bgs in order to impede further vertical migration of the remaining chlorides within the soil. To verify these proposed liner dimensions, additional delineation was conducted on March 23, 2011. A soil bore was drilled 35 ft east of the former junction box (SB-9) and 37 ft south of the former junction box (SB-10). Field and laboratory results for the additional delineation are attached. The liner will extend from the initial junction box and cover all the soil borings. See attached Figures 4 and 5 for the proposed soil liner location and dimensions. Note the location of the proposed liner in relation to the active lines and lease road (figure 5). The site will be backfilled with soils containing a chloride concentration of less than 500 mg/kg and a PID reading of 100 parts per million (ppm) or less. Excavated soil will be evaluated for use as backfill and any soil requiring disposal will be properly disposed of at a NMOCD approved facility. Upon completion of the liner and backfilling, ROC proposes to revegetate the site with native grasses.

Installation of a synthetic liner below the existing root zone will inhibit downward migration of water thereby slowing the movement of chloride through the vadose zone. Natural vegetation captures water through their root systems, which further reduces the volume of water infiltrating below the root zone. This natural 'infiltration barrier' will also help to protect groundwater from further vertical migration of chloride through the vadose zone."

Thank you.

Katie Jones
Environmental Project Coordinator
RICE *Operating Company*

Proposed liner



RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC

RECS

BD H-19 vent

Legals: UL/H sec. 19
T21S R37E

Case #: 1R426-09

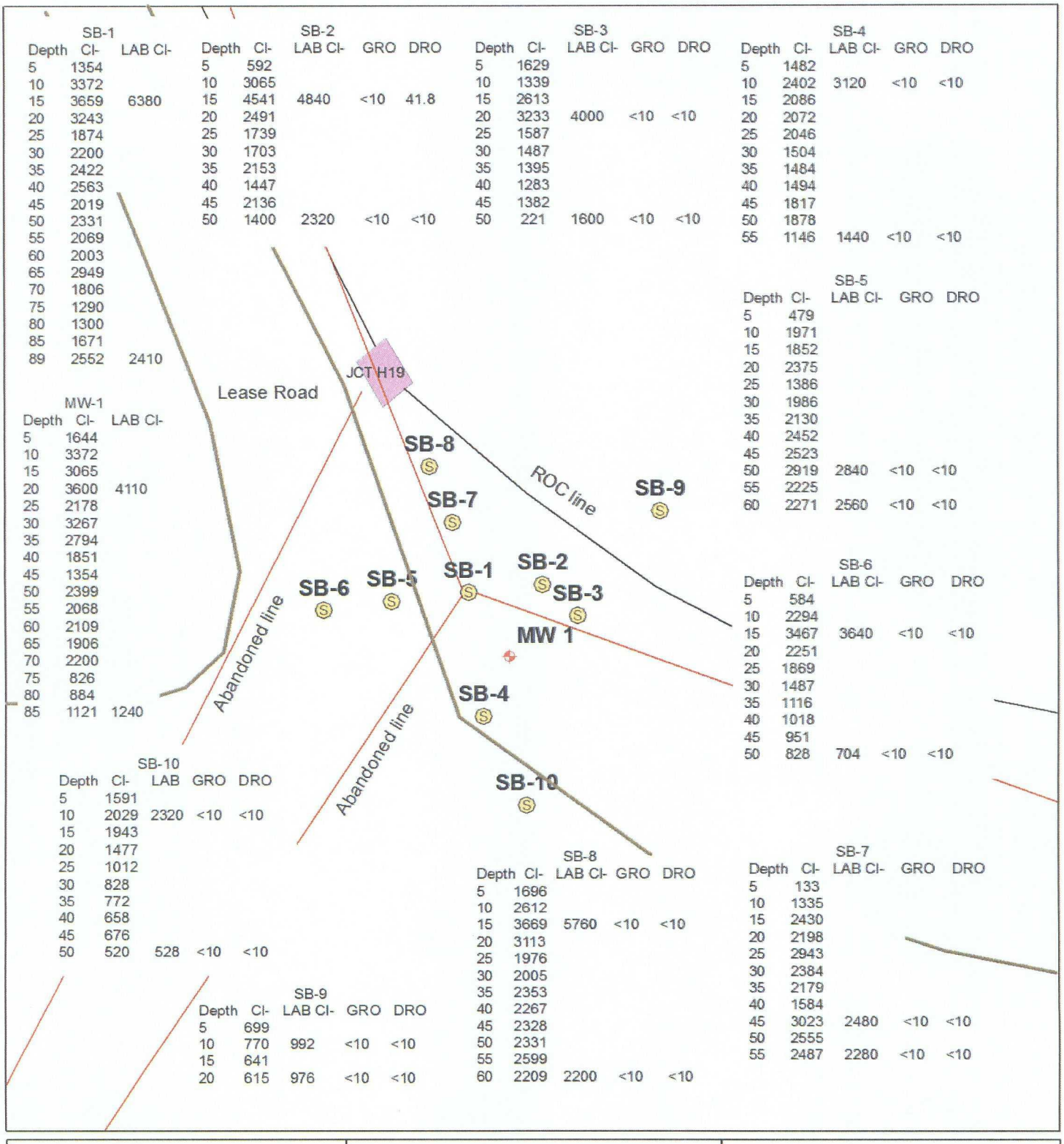
Figure 5

N W E S

0 10 20 40 Feet

Drawing date: 4-7-11
Drafted by: L. Weinheimer

Soil Bore Information



SB-1

Depth	Cl-	LAB Cl-
5	1354	
10	3372	
15	3659	6380
20	3243	
25	1874	
30	2200	
35	2422	
40	2563	
45	2019	
50	2331	
55	2069	
60	2003	
65	2949	
70	1806	
75	1290	
80	1300	
85	1671	
89	2552	2410

SB-2

Depth	Cl-	LAB Cl-	GRO	DRO
5	592			
10	3065			
15	4541	4840	<10	41.8
20	2491			
25	1739			
30	1703			
35	2153			
40	1447			
45	2136			
50	1400	2320	<10	<10

SB-3

Depth	Cl-	LAB Cl-	GRO	DRO
5	1629			
10	1339			
15	2613			
20	3233	4000	<10	<10
25	1587			
30	1487			
35	1395			
40	1283			
45	1382			
50	221	1600	<10	<10

SB-4

Depth	Cl-	LAB Cl-	GRO	DRO
5	1482			
10	2402	3120	<10	<10
15	2086			
20	2072			
25	2046			
30	1504			
35	1484			
40	1494			
45	1817			
50	1878			
55	1146	1440	<10	<10

SB-5

Depth	Cl-	LAB Cl-	GRO	DRO
5	479			
10	1971			
15	1852			
20	2375			
25	1386			
30	1986			
35	2130			
40	2452			
45	2523			
50	2919	2840	<10	<10
55	2225			
60	2271	2560	<10	<10

MW-1

Depth	Cl-	LAB Cl-
5	1644	
10	3372	
15	3065	
20	3600	4110
25	2178	
30	3267	
35	2794	
40	1851	
45	1354	
50	2399	
55	2068	
60	2109	
65	1906	
70	2200	
75	826	
80	884	
85	1121	1240

SB-6

Depth	Cl-	LAB Cl-	GRO	DRO
5	584			
10	2294			
15	3467	3640	<10	<10
20	2251			
25	1869			
30	1487			
35	1116			
40	1018			
45	951			
50	828	704	<10	<10

SB-10

Depth	Cl-	LAB	GRO	DRO
5	1591			
10	2029	2320	<10	<10
15	1943			
20	1477			
25	1012			
30	828			
35	772			
40	658			
45	676			
50	520	528	<10	<10

SB-9

Depth	Cl-	LAB Cl-	GRO	DRO
5	699			
10	770	992	<10	<10
15	641			
20	615	976	<10	<10

SB-8

Depth	Cl-	LAB Cl-	GRO	DRO
5	1696			
10	2612			
15	3669	5760	<10	<10
20	3113			
25	1976			
30	2005			
35	2353			
40	2267			
45	2328			
50	2331			
55	2599			
60	2209	2200	<10	<10

SB-7

Depth	Cl-	LAB Cl-	GRO	DRO
5	133			
10	1335			
15	2430			
20	2198			
25	2943			
30	2384			
35	2179			
40	1584			
45	3023	2480	<10	<10
50	2555			
55	2487	2280	<10	<10

RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

BD H-19 vent

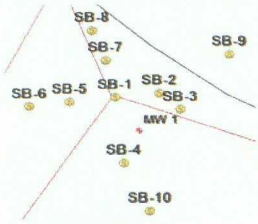
Legals: UL/H sec. 19
T21S R37E
NMOCD Case #: 1R426-09

Figure 4

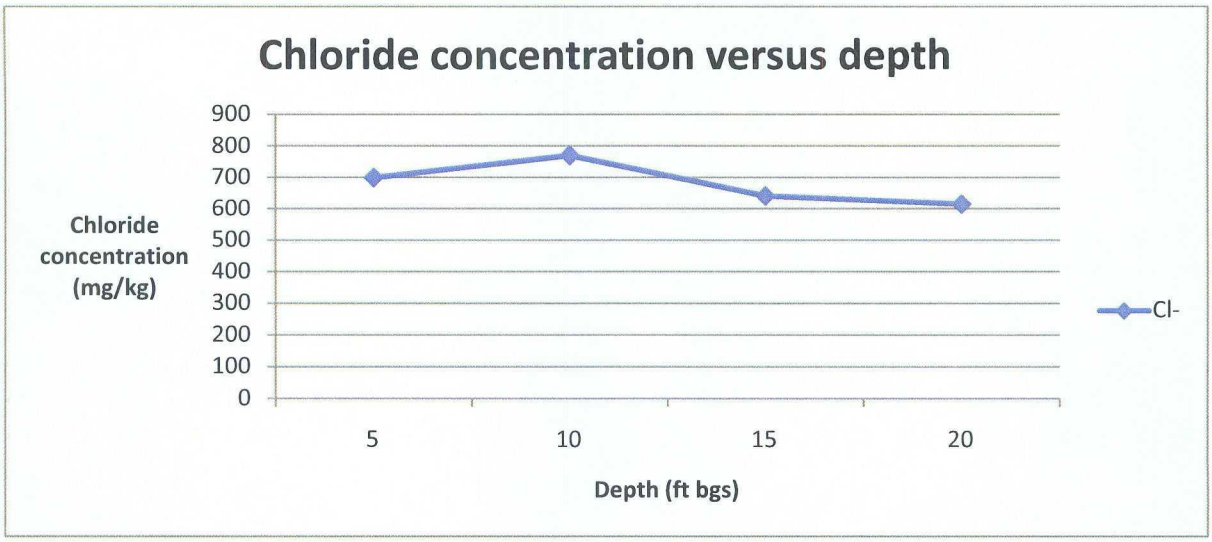
N W E S

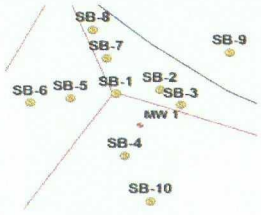
0 10 20 40 Feet

Drawing date: 3-30-11
Drafted by: L. Weinheimer

Logger:	Jordan Woodfin		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		**Project Name:** BD H-19 vent **Well ID:** SB-9
Start Date:	3/23/2011		
End Date:	3/23/2011		**Project Consultant:** Tetra Tech
Comments: All samples were from cuttings. Located 35 ft east of the former junction box site. **DRAFTED BY: L. Weinheimer** TD = 20 ft GW = 120 ft			**Location:** UL/H sec. 19 T21S R37E **Lat:** 32°28'0.494"N **Long:** 103°11'45.252"W **County**: LEA **State**: NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Tan fine silty caliche		
5 ft	699		0.9			
				Light brown fine silty sand with caliche		bentonite seal
10 ft	770	Cl- 992	1.7			
		GRO <10				
		DRO <10				
15 ft	641		1.3			
20 ft	615	Cl- 976	0.3			
		GRO <10				
		DRO <10				


Chloride concentration versus depth
Chloride concentration (mg/kg)
900
800
700
600
500
400
300
200
100
0
5
10
15
20
Depth (ft bgs)
Cl-

Logger:	Jordan Woodfin		**Project Name:** BD H-19 vent **Well ID:** SB-10
Driller:	Harrison & Cooper, Inc.		**Project Consultant:** Tetra Tech
Drilling Method:	Air rotary		
Start Date:	3/23/2011		
End Date:	3/23/2011		

Comments: All samples were from cuttings. Located 37 ft south of the former junction box site.

DRAFTED BY: L. Weinheimer

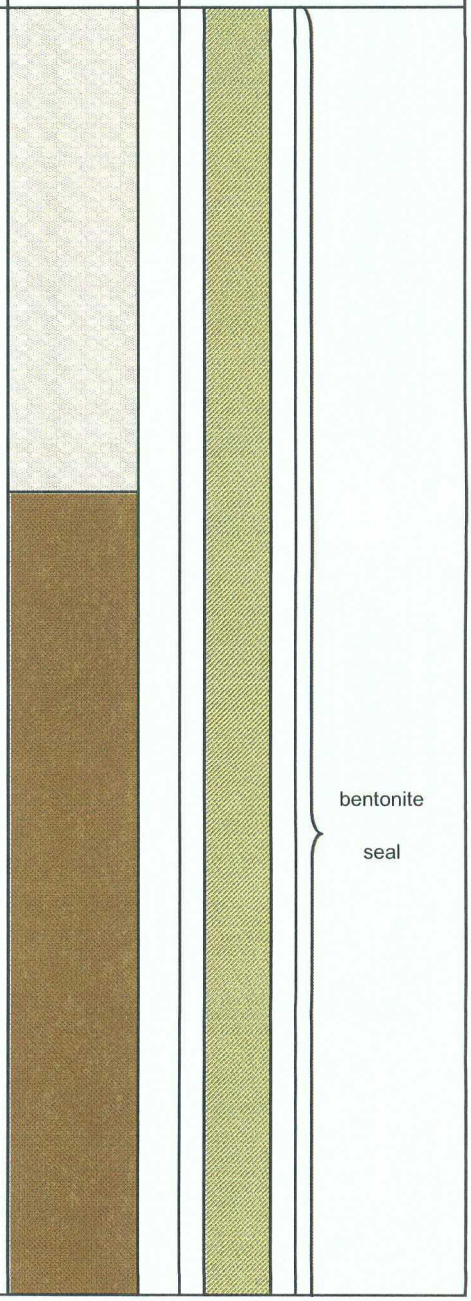
TD = 50 ft GW = 120 ft

Location: UL/H sec. 19 T21S R37E

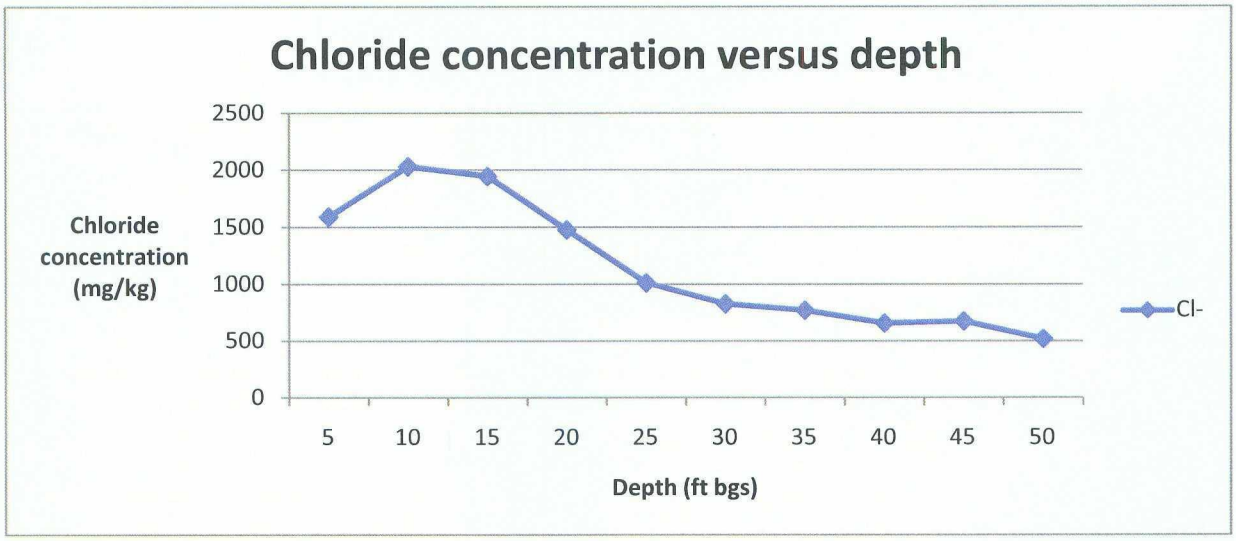
Lat: 32°28'0.001"N **County**: LEA

Long: 103°11'45.521"W **State**: NM

Depth (feet)	chloride field tests	LAB	PID	Description
				Tan silty caliche
5 ft	1591		0.2	
10 ft	2029	Cl- 2320	0.1	
		GRO <10		
		DRO <10		
15 ft	1943		0.2	
				Light brown very fine silty sand
20 ft	1477		0.1	
25 ft	1012		0.2	
30 ft	828		0.3	
35 ft	772		0.1	
40 ft	658		0.1	



Depth (feet)	chloride field tests	LAB	PID	Description		Lithology		Well Construction
				Tan very fine silty sand				
45 ft	676		0.1					
50 ft	520	Cl-528	0.3					
		GRO <10						
		DRO <10						


Chloride concentration versus depth
Chloride concentration (mg/kg)
2500
2000
1500
1000
500
0
5
10
15
20
25
30
35
40
45
50
Depth (ft bgs)
Cl-

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

March 29, 2011

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: BD H-19 VENT (SOIL)

Enclosed are the results of analyses for samples received by the laboratory on 03/24/11 8:40.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydorcarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Rice Operating Company
Hack Conder
112 W. Taylor
Hobbs NM, 88240
Fax To: (575) 397-1471

Received:	03/24/2011	Sampling Date:	03/23/2011
Reported:	03/29/2011	Sampling Type:	Soil
Project Name:	BD H-19 VENT (SOIL)	Sampling Condition:	Cool & Intact
Project Number:	NOT GIVEN	Sample Received By:	Jodi Henson
Project Location:	BD H-19 VENT		

Sample ID: SB 9 @ 10' (H100563-01)

Chloride, SM4500Cl-B mg/kg **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**992**	16.0	03/28/2011	ND	400	100	400	7.69	

TPH 8015M mg/kg **Analyzed By: AB**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	03/27/2011	ND	219	110	200	2.79	
DRO >C10-C28	<10.0	10.0	03/27/2011	ND	224	112	200	1.19	

Surrogate: 1-Chlorooctane	*103 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*90.6 %*	*70-130*

Sample ID: SB 9 @ 20' (H100563-02)

Chloride, SM4500Cl-B mg/kg **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**976**	16.0	03/28/2011	ND	400	100	400	7.69	

TPH 8015M mg/kg **Analyzed By: AB**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	03/27/2011	ND	219	110	200	2.79	
DRO >C10-C28	<10.0	10.0	03/27/2011	ND	224	112	200	1.19	

Surrogate: 1-Chlorooctane	*99.0 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*93.3 %*	*70-130*

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

Rice Operating Company
Hack Conder
112 W. Taylor
Hobbs NM, 88240
Fax To: (575) 397-1471

Received:	03/24/2011	Sampling Date:	03/23/2011
Reported:	03/29/2011	Sampling Type:	Soil
Project Name:	BD H-19 VENT (SOIL)	Sampling Condition:	Cool & Intact
Project Number:	NOT GIVEN	Sample Received By:	Jodi Henson
Project Location:	BD H-19 VENT		

Sample ID: SB 10 @ 10' (H100563-03)

Chloride, SM4500Cl-B mg/kg **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2320**	16.0	03/28/2011	ND	400	100	400	7.69	

TPH 8015M mg/kg **Analyzed By: AB**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	03/27/2011	ND	219	110	200	2.79	
DRO >C10-C28	<10.0	10.0	03/27/2011	ND	224	112	200	1.19	

Surrogate: 1-Chlorooctane	*97.0 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*92.9 %*	*70-130*

Sample ID: SB 10 @ 50' (H100563-04)

Chloride, SM4500Cl-B mg/kg **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**528**	16.0	03/28/2011	ND	400	100	400	7.69	

TPH 8015M mg/kg **Analyzed By: AB**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	03/27/2011	ND	219	110	200	2.79	
DRO >C10-C28	<10.0	10.0	03/27/2011	ND	224	112	200	1.19	

Surrogate: 1-Chlorooctane	*106 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*102 %*	*70-130*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Notes and Definitions

ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL LABORATORIES

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240 2111 Beechwood, Abilene, TX 79603
(505) 393-2326 FAX (505) 393-2476 (325) 673-7001 FAX (325)673-7020

Company Name: Rice Operating Company	**BILL TO**
Project Manager: Hack Conder	**P.O. #:**
Address: 122 West Taylor	**Company:**
City: Hobbs **State:** NM **Zip:** 88240	**Attn:**
Phone #: 575-393-9174 **Fax #:** 575-397-1471	**Address:**
Project #: **Project Owner:**	**City:**
Project Name: BD H-19 Vent	**State:** **Zip:**
Project Location: BD H-19 Vent	**Phone #:**
Sampler Name: Jordan Woodfin	**Fax #:**

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST										
Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME	Chlorides	TPH 8015 M	BTEX	Texas TPH	Complete Cations/Anions	TPH 8015 M Extended Thru C40						
H10563-1	SB 9 @ 10'		1			✓					✓		3/23/11	11:00	✓	✓									
2	SB 9 @ 20'		1			✓					✓		3/23/11	11:30	✓	✓									
3	SB 10 @ 10'		1			✓					✓		3/23/11	12:00	✓	✓									
4	SB 10 @ 50'					✓					✓		3/23/11	12:30	✓	✓									

Relinquished By: Jordan Woodfin	**Date:** 3/24/11 **Time:** 7:30	**Received By:**	
Relinquished By:	**Date:** 3/24/11 **Time:** 8:40	**Received By:** Jodi Henson	
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	**Sample Condition** Cool: ☐ Yes ☐ No Intact: ☑ Yes ☐ No	**CHECKED BY: (Initials)**	

Phone Result: ☐ Yes ☑ No Add'l Phone #:
Fax Result: ☐ Yes ☑ No Add'l Fax #:
REMARKS:

email results

Hconder@riceswd.com; jwoodfin@rice-ecs.com;
Lweinheimer@rice-ecs.com kjones@riceswd.com

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

#26

NEED SAMPLES BACK, PLEASE

TETRA TECH

CERTIFIED MAIL
RETURN RECEIPT NO. 7005 1160 0005 3780 8751

January 5, 2011

Mr. Edward Hansen
New Mexico Energy, Minerals, & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 S. St. Francis Drive
Santa Fe, New Mexico 87505

Re: Corrective Action Plan (CAP), Rice Operating Company, Blinebry Drinkard (BD) Saltwater Disposal System (SWD) H-19 Vent, Unit H, Section 19, T-21-S, R-37-E, Lea County, New Mexico, NMOCD CASE #1R0426-09

Mr. Hansen:

Tetra Tech Inc. (Tetra Tech) submits the following Corrective Action Plan for the Rice Operating Company (ROC), H-19 Vent, located in the Blinebry Drinkard (BD) Salt Water Disposal System in Unit H, Section 19, T-21-S, R-37-E in Lea County, New Mexico. See Figures 1, 2, and 3 for site location. ROC is the service provider (agent) for the BD Salt Water Disposal System and has no ownership of any portion of the pipeline, well, or facility. The BD SWD system is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis. In general, project funding is not forthcoming until NMOCD approves the work plan. Therefore, your timely review of this submission is requested.

For all environmental projects, ROC will choose a path forward that:

- protects public health,
- provides the greatest net environmental benefit,
- complies with NMOCD Rules, and
- is supported by good science.

Each site shall have three submissions or a combination of:

1. An **Investigation and Characterization Plan** (ICP) is a proposal for data gathering and site characterization and assessment.

Tetra Tech
1910 North Big Spring, Midland,TX 79705
Tel 432.682.4559 Fax 432.682.3946 www.tetratech.com

2. Upon evaluating the data and results from the ICP, a recommended remedy will be submitted in a **Corrective Action Plan** (CAP).

3. Finally, after implementing the remedy, a **Closure Report** with final documentation will be submitted.

1.0 BACKGROUND & PREVIOUS WORK

As part of the ROC Junction Box Upgrade Workplan, starting on July 14, 2003, the H-19 was moved 25 feet to the northwest. The former junction box site was investigated vertically and horizontally with a trench utilizing a backhoe. The site was delineated to 12 feet below ground surface (bgs) whereby chlorides were 9,570 milligrams per kilograms (mg/kg) and TPH was 1,550 mg/kg. Upon completion of the excavation, the trench was backfilled and contoured to the surrounding surface. On September 16, 2003, ROC submitted a Junction Box Disclosure Report to the NMOCD.

On August 3, 2007, ROC submitted the Investigation and Characterization Plan (ICP) to Mr. Wayne Price of the NMOCD-Santa Fe office for review. Mr. Price granted approval of the ICP in a letter dated August 13, 2007.

On April 4, 2008, Tetra Tech personnel were onsite to oversee the installation of one soil boring (SB-1) within the former junction box location. Soil samples were collected every 5 feet beginning at a depth of 5 feet bgs within the excavated area. Samples were collected utilizing a split spoon sampler and were field screened for TPH utilizing a photoionization detector (PID) and for chlorides with a field sampling kit. Field results indicate the soils are impacted with chlorides to a depth of 90 feet bgs with no PID readings to indicate TPH within the soils.

In order to determine if groundwater was impacted from the former junction box, one monitor well (MW-1) was installed to the southeast of the excavated junction box to a depth of 133 feet bgs. Upon completion, the monitor well was gauged, developed and samples submitted to Cardinal Labs of Hobbs, New Mexico for analysis of chlorides utilizing EPA method 4500-CL^-B and BTEX utilizing EPA method 8021B. The results of the groundwater sampling and subsequent sampling events are included in Table 1. Referring to Table 1, no BTEX was detected in the groundwater, while chloride concentrations have ranged from 444 mg/L to 560 mg/L.

On June 3, 2008, ROC submitted a Notification of Groundwater Impact to Mr. Wayne Price of the NMOCD-Santa Fe office.

On February 25, 2010, Tetra Tech personnel were onsite to oversee the installation of seven soil borings (SB-2 through SB-8), to a maximum depth of 60

feet, located adjacent to the former junction box location See Figure 4 for soil boring location. Soil samples were collected every 5 feet beginning at a depth of 5 foot bgs. Samples were collected from cuttings, with select samples placed into laboratory supplied containers and delivered to the laboratory under chain-of-custody control for chloride analysis by EPA Std. method 4500-CL B and for TPH analysis by EPA method 8015 modified. All collected samples were screened for chlorides with a field sampling kit, while select samples were analyzed for TPH utilizing a photoionization detector (PID).

Analytical results indicate that soil boring chloride concentrations ranged from 133 mg/kg at 5 feet bgs in SB-7 to 4,541 mg/kg at 15 feet bgs in SB-2 with an average chloride concentration of 2,138.4 mg/kg throughout the seven borings. Soil boring SB-2 located immediately adjacent to the former junction box was field screened for TPH. The PID meter readings for TPH were all at or below 2.2 parts per million. Laboratory confirmation samples were <10 mg/kg for TPH Gro/Dro for all samples with the exception of soil boring SB-2 at 15 feet bgs which had a TPH Gro/Dro total of 41.8 mg/kg. See attached soil boring logs (Appendix A) which includes both field and laboratory analysis. The soil boring locations are shown on Figure 4.

Proposed Soil Remediation

With elevated chlorides and negligible levels of TPH, ROC proposes to excavate an area measuring 50 feet by 50 feet by 4 feet deep and place a 20 mil polyethylene liner at 4 feet bgs in order to impede further vertical migration of the remaining chlorides within the soil. The liner will extend from the initial junction box and cover all the soil borings. See attached Figures 4 and 5 for the proposed soil liner location and dimensions. Note the location of the proposed liner in relation to the active lines and lease road (Figure 5). The site will be backfilled with soils containing a chloride concentration of less than 500 mg/kg and a PID reading of 100 parts per million (ppm) or less. Upon completion of the liner and backfilling, ROC proposes to revegetate the site with native grasses.

Installation of a synthetic liner below the existing root zone will inhibit downward migration of water thereby slowing the movement of chloride through the vadose zone. Natural vegetation captures water through their root systems, which further reduces the volume of water infiltrating below the root zone. This natural 'infiltration barrier' will also help to protect groundwater from further vertical migration of chloride through the vadose zone.

Chloride Impacted Groundwater

To date, three monitor wells have been installed at the site in order to define the extent of chloride impacts to the groundwater from the former junction box. Up-gradient monitor well MW-2 has shown an average chloride concentration of 290 mg/L, indicating some up-gradient impairment when compared to down gradient MW-3. MW-1 located near the former junction box

has shown an average chloride concentration of 486 mg/L. No BTEX constituents have been detected in any of the monitor well sampling events.

Proposed Groundwater Remediation

Since it appears from the up-gradient monitor well that there is some regional impairment of the groundwater underlying the ROC site, ROC proposes to provide a mass calculation scenario of impact to groundwater from the former junction box. If we average the chloride concentrations from the monitor well at the former junction box (MW-1) and subtract the average chloride concentration from the up-gradient monitor well (MW-2), it will give the net contribution from the junction box. If we use a rectangular area of impact, box extending halfway between MW-1 and MW-2 to halfway between MW-1 and MW-3, it measures 160' long. Using a rectangle 160' x 80' and assume a regional aquifer thickness of 25 feet thick and the porosity of the underlying formation (very fine sand) of 0.2 then the volume of impacted groundwater underlying the site is calculated as follows:

12,800 ft^3 x 25 ft x 0.2 = 64,000 ft^3

Converting to liters, we multiply the above by 28.3168 L/ft^3 which gives us a result of 1,812,275 L.

Subtracting the average chloride concentration from monitor well MW-2 from MW-1 we end up with a concentration of 196 mg/L.

If we multiply the two parameters together we get the following:

196 mg/L x 1,812,275 L = 355,205,939 mg of total chloride mass or 355 kg.

Considering the relatively negligible impact to MW-1, and estimated volume of water which would need to be removed in order to remove even a small amount of net chloride mass, ROC proposes to pump water from the first available recovery system located at the nearby site BD O-23 vent or BD O-23-1 vent (Figure 6). This mitigation would have far greater benefit per volume of water removed. In the most recent sampling event for the BD O-23 vent site, MW-1 had a chloride concentration of 7,000 mg/L.

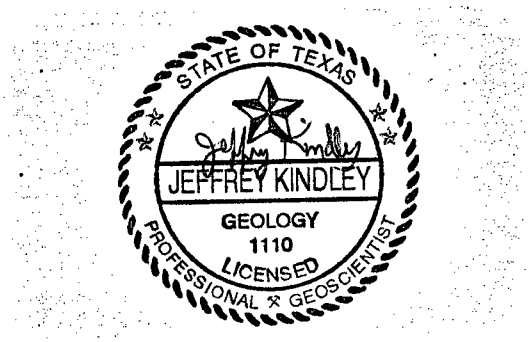
To convert to gallons we take the chloride mass and divide by (7,000 mg/L x 3.7854 L/gal)

355,205,939 mg / (7,000 mg/L x 3.7854 L/gal) = 13,405 gallons

Therefore, ROC proposes to remove 355 kg of chloride or approximately 13,405 gallons of chloride impacted groundwater from the BD O-23 vent or BD O-23-1 vent site. Removed groundwater will be utilized for pipeline and well maintenance.

TETRA TECH

If you have any questions or comments regarding the above proposed remediation methods for the onsite soils and groundwater, please do not hesitate to contact us at (432) 682-4559 or Hack Conder of ROC at (575) 393-9174.



Respectfully Submitted,
Tetra Tech, Inc.

Jeffrey Kindley, P.G.
Senior Project Manager

cc: Hack Conder – ROC
Enclosures: Tables, Graphs, Boring Logs, Figures

FIGURES

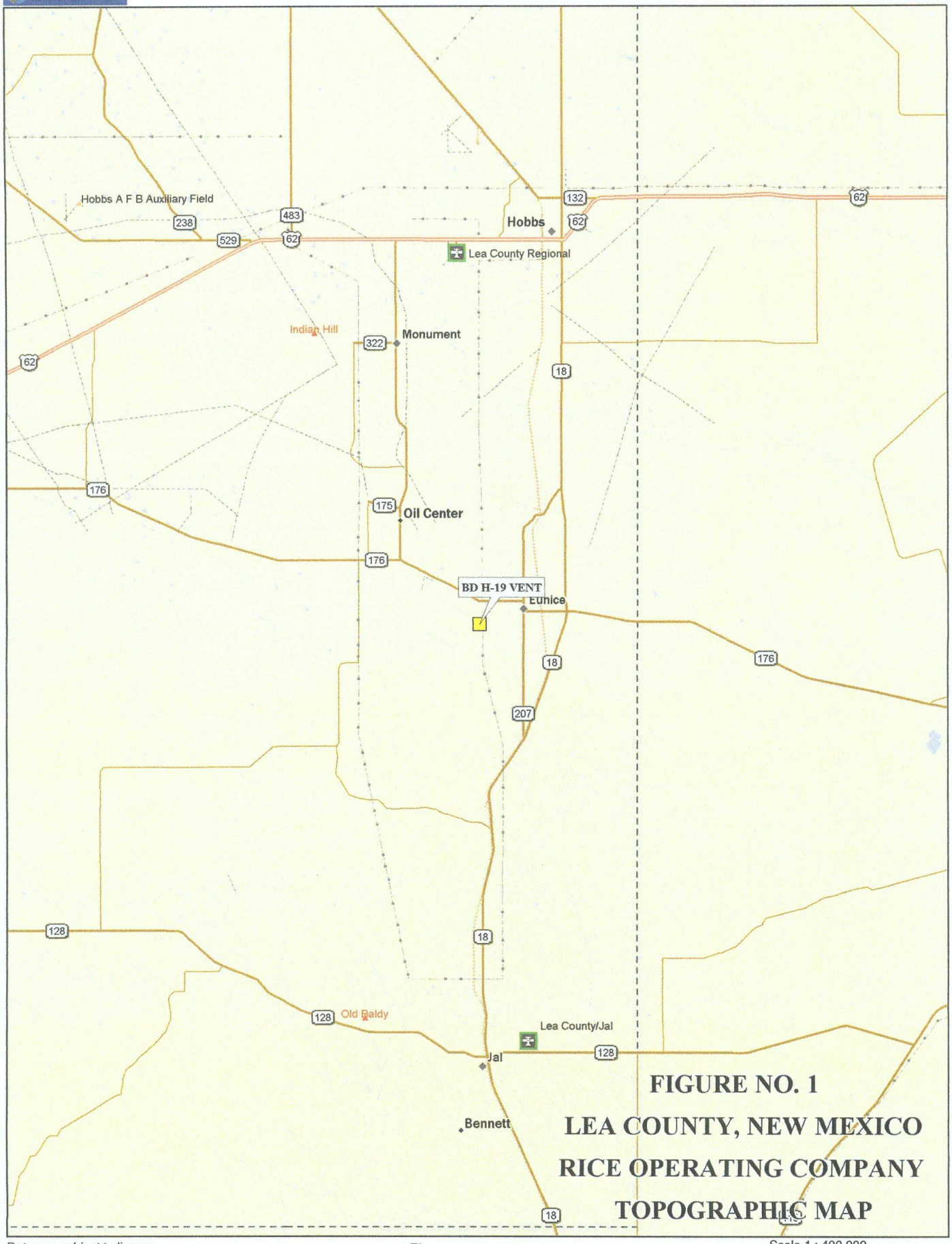


FIGURE NO. 1
LEA COUNTY, NEW MEXICO
RICE OPERATING COMPANY
TOPOGRAPHIC MAP

TN
MN (7.5°E)

Scale 1 : 400,000
1" = 6.31 mi
Data Zoom 9-0

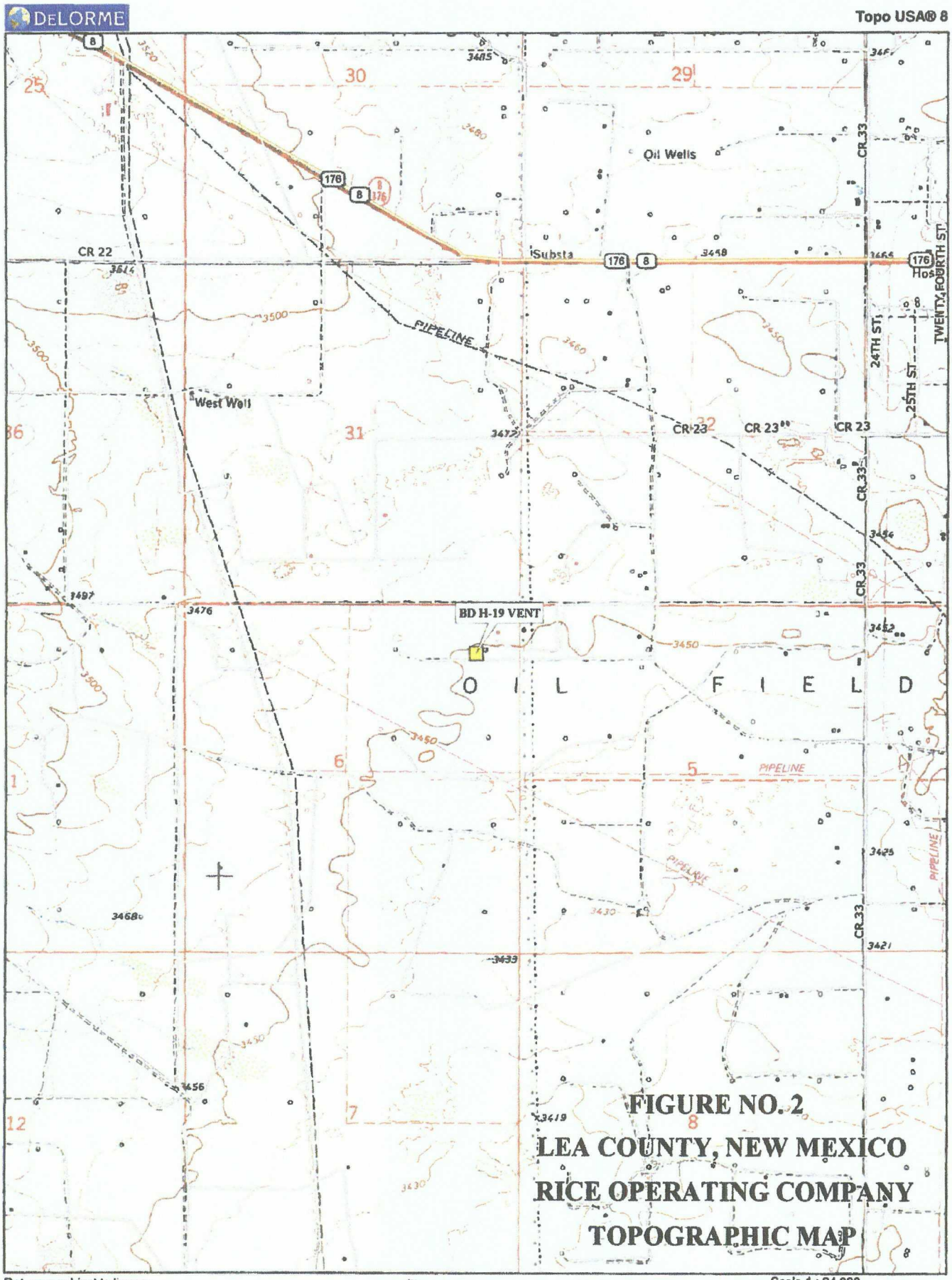


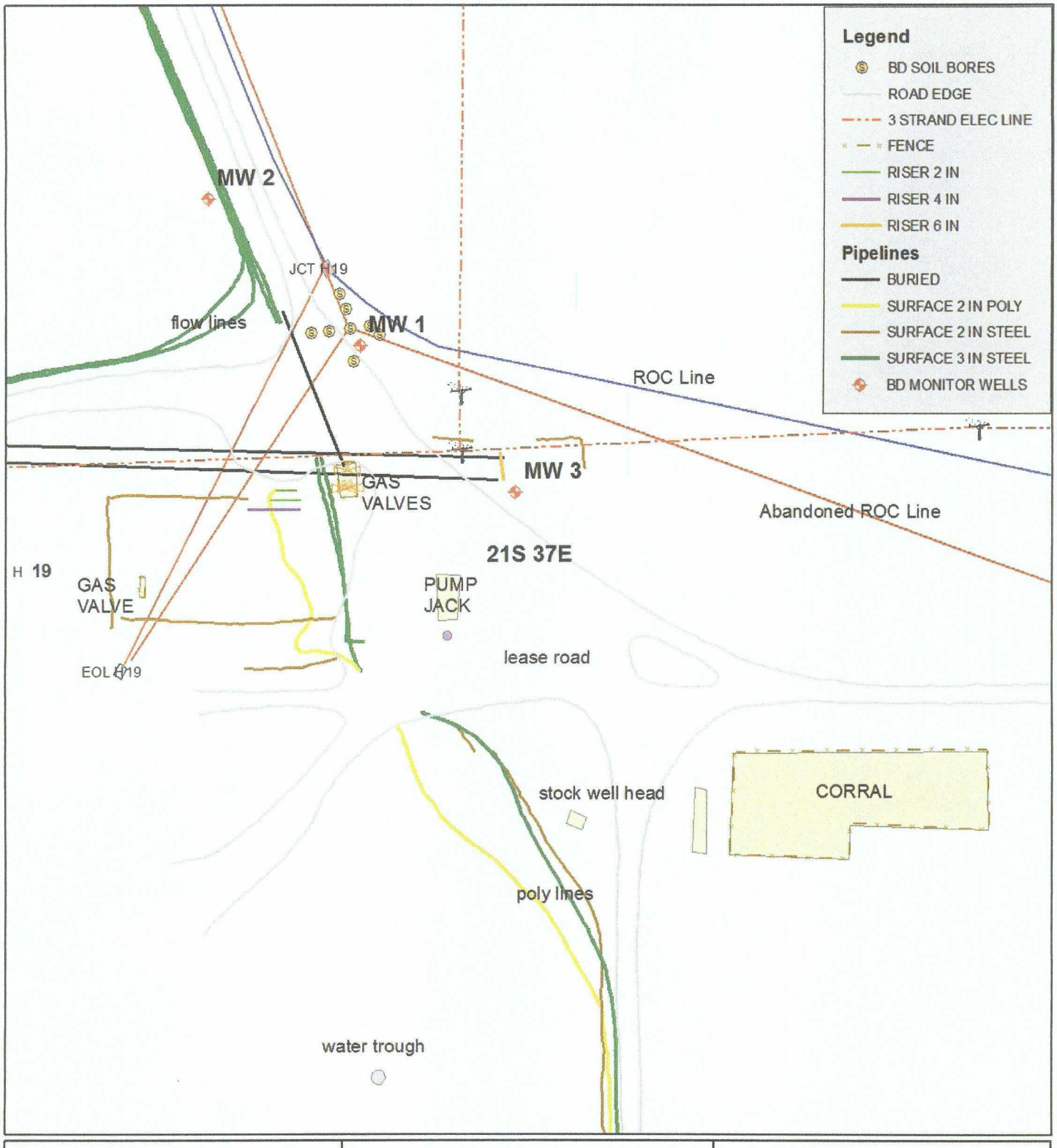
FIGURE NO. 2

LEA COUNTY, NEW MEXICO

RICE OPERATING COMPANY

TOPOGRAPHIC MAP

Site Map



RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

BD H-19 vent

Legals: UL/H sec. 19
T21S R37E
NMOCD Case #: 1R426-09

Figure 3

N W E S

0 40 80 160 Feet

Drawing date:9-28-10
Drafted by: L. Weinheimer & Tony Grieco

Soil Bore Information and Proposed Infiltration Barrier

SB-1

Depth	Cl-	LAB Cl-
5	1354	
10	3372	
15	3659	6380
20	3243	
25	1874	
30	2200	
35	2422	
40	2563	
45	2019	
50	2331	
55	2069	
60	2003	
65	2949	
70	1806	
75	1290	
80	1300	
85	1671	
89	2552	2410

MW-1

Depth	Cl-	LAB Cl-
5	1644	
10	3372	
15	3065	
20	3600	4110
25	2178	
30	3267	
35	2794	
40	1851	
45	1354	
50	2399	
55	2068	
60	2109	
65	1906	
70	2200	
75	826	
80	884	
85	1121	1240

SB-2

Depth	Cl-	LAB Cl-	GRO	DRO
5	592			
10	3065			
15	4541	4840	<10	41.8
20	2491			
25	1739			
30	1703			
35	2153			
40	1447			
45	2136			
50	1400	2320	<10	<10

SB-3

Depth	Cl-	LAB Cl-	GRO	DRO
5	1629			
10	1339			
15	2613			
20	3233	4000	<10	<10
25	1587			
30	1487			
35	1395			
40	1283			
45	1382			
50	221	1600	<10	<10

SB-4

Depth	Cl-	LAB Cl-	GRO	DRO
5	1482			
10	2402	3120	<10	<10
15	2086			
20	2072			
25	2046			
30	1504			
35	1484			
40	1494			
45	1817			
50	1878			
55	1146	1440	<10	<10

SB-5

Depth	Cl-	LAB Cl-	GRO	DRO
5	479			
10	1971			
15	1852			
20	2375			
25	1386			
30	1986			
35	2130			
40	2452			
45	2523			
50	2919	2840	<10	<10
55	2225			
60	2271	2560	<10	<10

SB-6

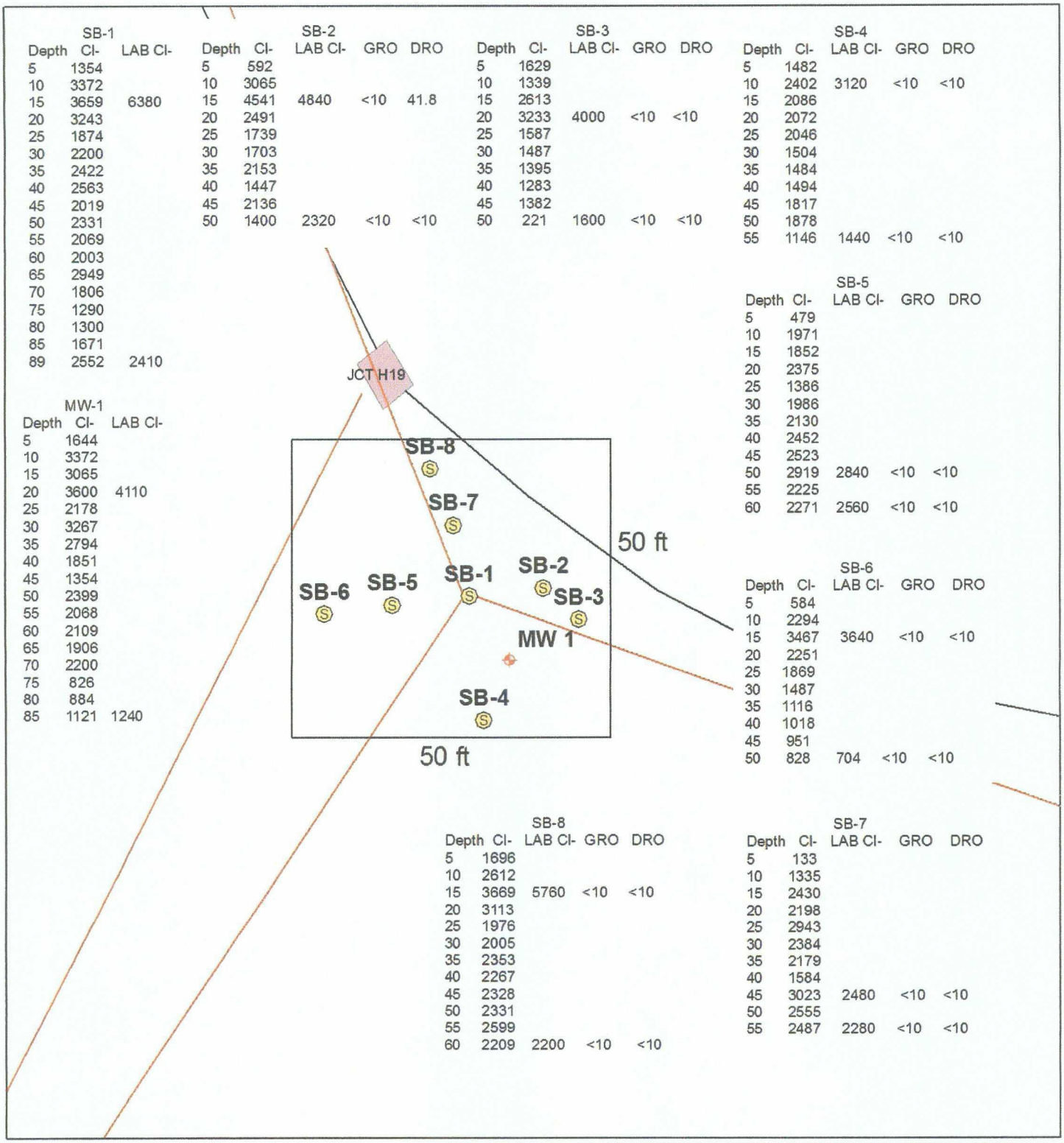
Depth	Cl-	LAB Cl-	GRO	DRO
5	584			
10	2294			
15	3467	3640	<10	<10
20	2251			
25	1869			
30	1487			
35	1116			
40	1018			
45	951			
50	828	704	<10	<10

SB-8

Depth	Cl-	LAB Cl-	GRO	DRO
5	1696			
10	2612			
15	3669	5760	<10	<10
20	3113			
25	1976			
30	2005			
35	2353			
40	2267			
45	2328			
50	2331			
55	2599			
60	2209	2200	<10	<10

SB-7

Depth	Cl-	LAB Cl-	GRO	DRO
5	133			
10	1335			
15	2430			
20	2198			
25	2943			
30	2384			
35	2179			
40	1584			
45	3023	2480	<10	<10
50	2555			
55	2487	2280	<10	<10



RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

BD H-19 vent

Legals: UL/H sec. 19
T21S R37E
NMOCD Case #: 1R426-09

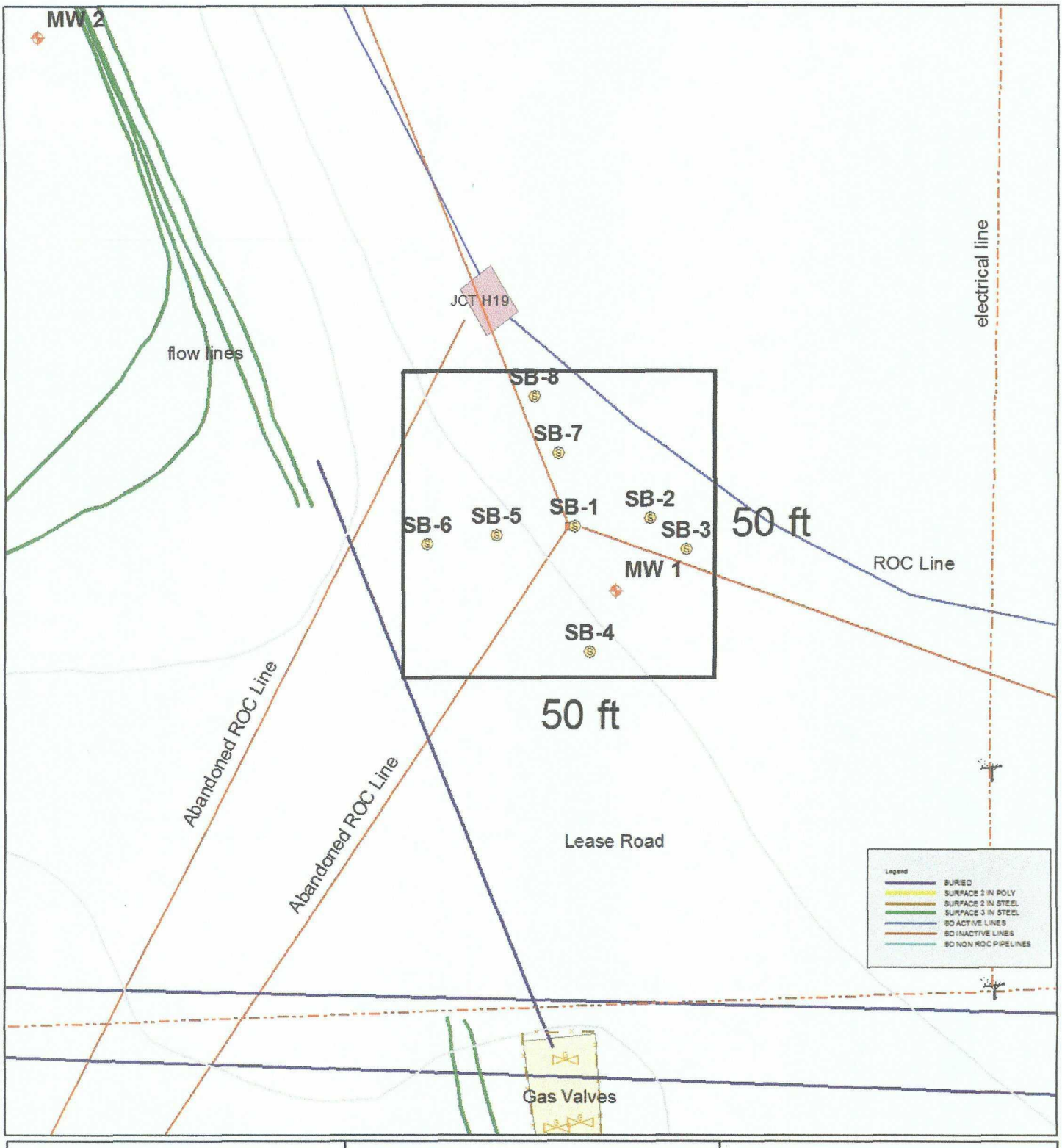
Figure 4

N W E S

0 10 20 40 Feet

Drawing date: 10-7-10
Drafted by: L. Weinheimer

Proposed liner



RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

BD H-19 vent

Legals: UL/H sec. 19
T21S R37E

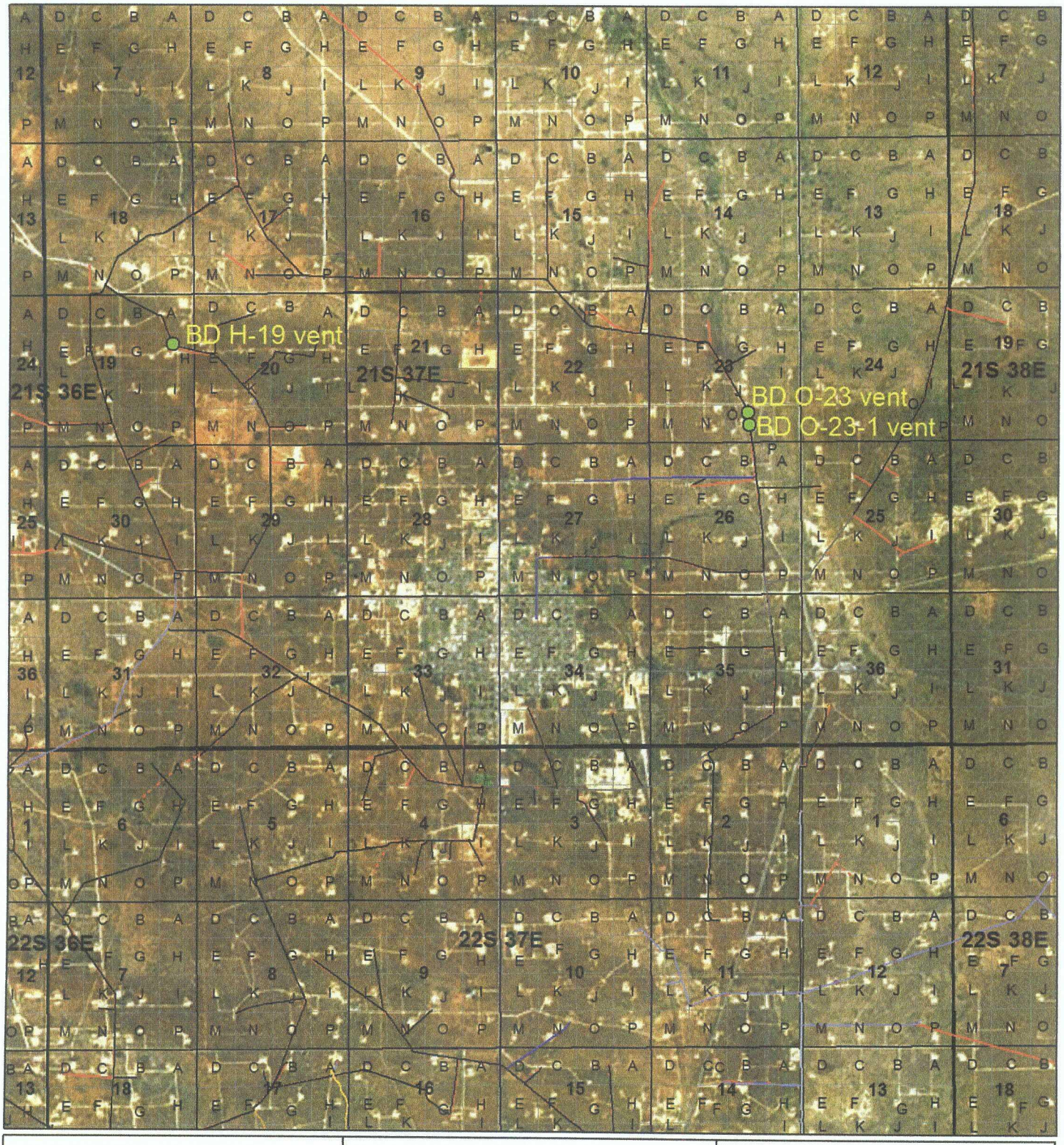
Case #: 1R426-09

Figure 5

N W E S

0 10 20 40 Feet

Drawing date:11-17-10
Drafted by: L. Weinheimer



RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC
RECS

BD H-19 vent
BD O-23 vent
BD O-23-1 vent

Legals: T21S R37E

Figure 6

N
W E
S

0 2,300 4,600 9,200
Feet

Drawing date: 12-3-10
Drafted by: L. Weinheimer

TABLES

Table 1
Rice Operating Company
BD H-19 Vent
Lea County, New Mexico

MW	Depth to Water	Total Depth	Well Volume	Volume Purged	Sample Date	Cl	TDS	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Sulfate	Comments
1	120.78	137.25	2.60	10	04/23/08	516	1270	<0.001	<0.001	<0.001	<0.003	106	Clear no odor
1	120.96	137.25	2.60	10	07/08/08	560	1400	<0.001	<0.001	<0.001	<0.006	95.5	Clear no odor
1	120.92	137.25	2.60	10	10/09/08	468	1210	<0.001	<0.001	<0.001	<0.003	86	Clear no odor
1	120.89	137.19	2.60	10	01/12/09	492	1240	<0.001	<0.001	<0.001	<0.003	91	Clear no odor
1	120.87	137.19	2.60	10	04/20/09	444	1160	<0.001	<0.001	<0.001	<0.003	86.3	Clear no odor
1	120.93	137.19	2.60	10	07/24/09	530	1310	<0.001	<0.001	<0.001	<0.003	82.4	Clear no odor
1	120.92	137.19	2.60	10	10/15/09	476	1130	<0.001	<0.001	<0.001	<0.003	82.4	Clear no odor
1	120.90	137.15	2.60	10	01/21/10	464	2280	<0.001	<0.001	<0.001	<0.003	95.3	Clear no odor
1	120.90	137.15	2.60	10	04/21/10	450	1150	<0.001	<0.001	<0.001	<0.003	97	Sand to clear
1	120.93	137.15	2.60	10	07/22/10	460	1150	<0.001	<0.001	<0.001	<0.003	76.2	Sand to clear
													(no odor)

Graph 1
Rice Operating Company
MW-1
BD H-19 Vent
Lea County, New Mexico

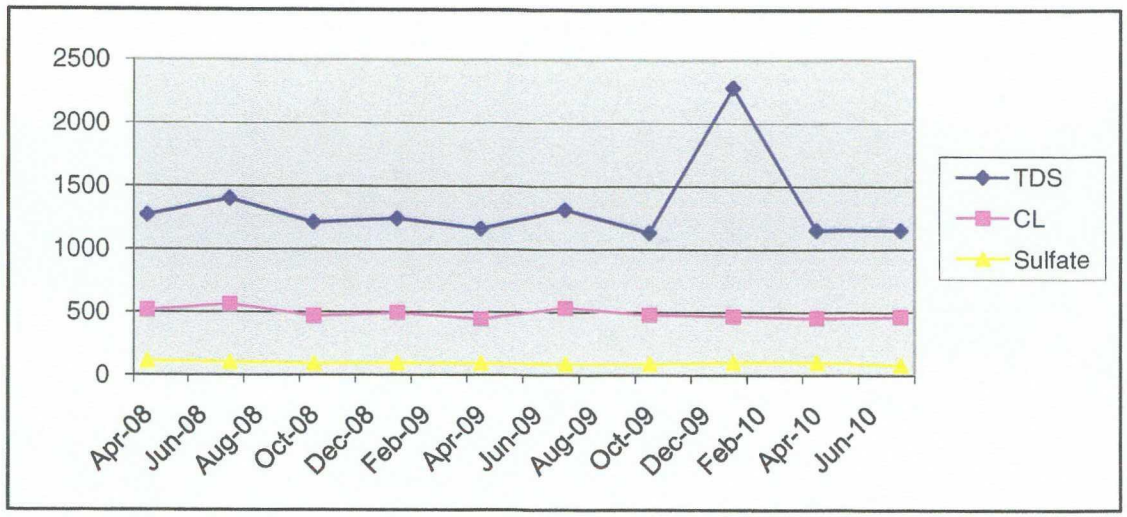


Table 2
Rice Operating Company
BD H-19 Vent
Lea County, New Mexico

MW	Depth to Water	Total Depth	Well Volume	Volume Purged	Sample Date	Cl	TDS	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Sulfate	Comments
2	121.50	135.85	2.30	10	04/21/10	280	808	<0.001	<0.001	<0.001	<0.003	67	Sand to clear
2	121.53	135.85	2.30	10	07/22/10	300	853	<0.001	<0.001	<0.001	<0.003	65	Sand to clear

Graph 2
Rice Operating Company
MW-2
BD H-19 Vent
Lea County, New Mexico

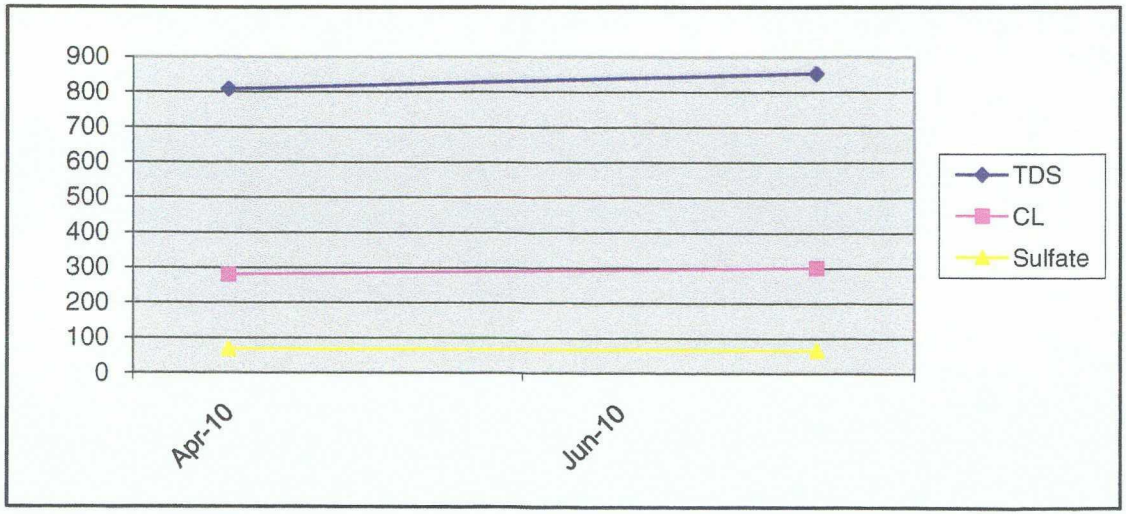
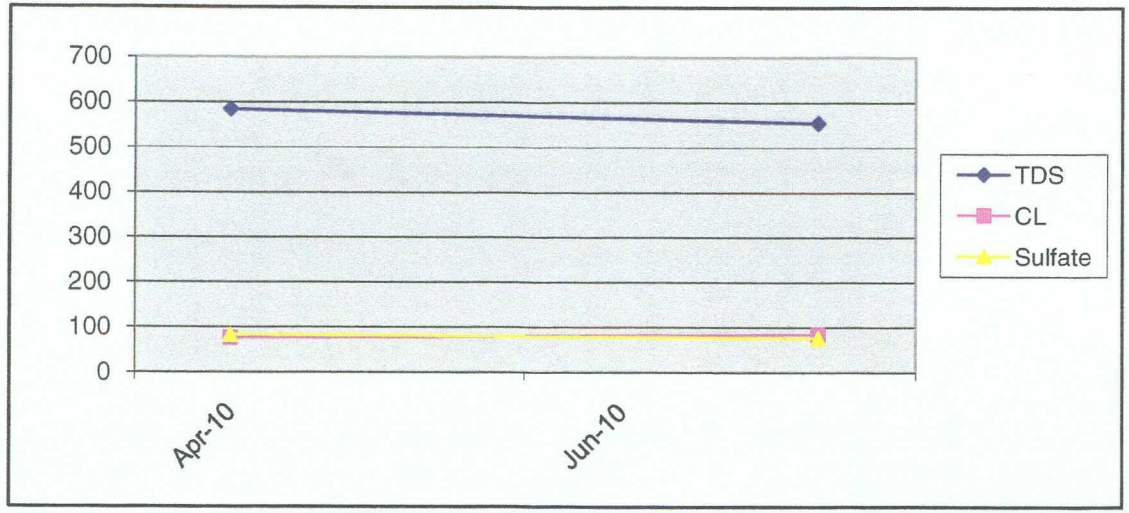


Table 3
Rice Operating Company
BD H-19 Vent
Lea County, New Mexico

MW	Depth to Water	Total Depth	Well Volume	Volume Purged	Sample Date	Cl	TDS	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Sulfate	Comments
3	119.97	134.31	2.30	10	04/21/10	76	584	<0.001	<0.001	<0.001	<0.003	83	Sand to clear
3	120.09	134.31	2.30	10	07/22/10	84	554	<0.001	<0.001	<0.001	<0.003	75.5	Sand to clear

Graph 2
Rice Operating Company
MW-3
BD H-19 Vent
Lea County, New Mexico



APPENDIX A
SOIL BORING LOGS

Logger:	Jeff Kindley
Driller:	Harrison & Cooper, Inc. Drilling
Consultant:	Tetra Tech
Drilling Method:	Air rotary
Start Date:	2/25/2010
End Date:	2/26/2010

RICE OPERATING COMPANY ROC SINCE 1955

Project Name: BD H-19 vent **Well ID:** SB-2

Location: UL/H sec. 19 T21S R37E
Lat: 32°28'0.371"N **County:** Lea
Long: 103°11'45.487" W **State:** NM

Comments: Split spoon sampling from 5,10, 20 ft. All other were from air rotary cuttings. Located 10' east of the former junction box site.

Drafted by: Lara Weinheimer

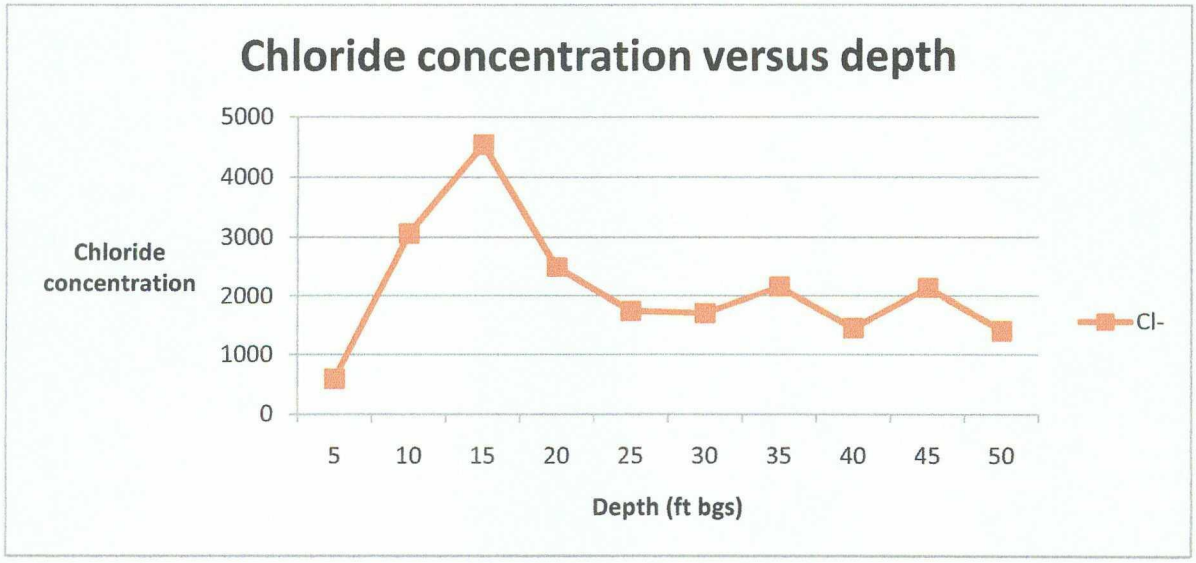
TD = 50 ft GW = 120 ft

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description
				5 - 12 ft FINE GRAIN SAND light brown
5	592		1.8	
10	3065		0.9	
15	4541	CI- 4840 GRO <10.0 DRO 41.8	1.7	15 - 17 ft FINE GRAIN CALCAREOUS SAND light brown
20	2491		2.2	20 - 32 ft FINE GRAIN SAND light brown
25	1739			
30	1703			
35	2153			35 - 37 ft FINE GRAIN SAND tan

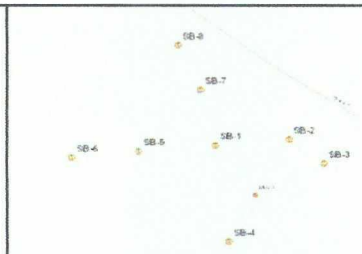
Lithology

Bore Construction: bentonite seal

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description	Lithology	Bore Construction
				40 - 42 ft		
40	1447			FINE GRAIN SAND INTERMIXED WITH SANDSTONE		
				tan		
				45 - 50 ft		
45	2136			FINE GRAIN SAND		
				tan		
50	1400	GRO 2320				
		GRO <10.0				
		DRO <10.0				



Logger:	Jeff Kindley
Driller:	Harrison & Cooper, Inc. Drilling
Consultant:	Tetra Tech
Drilling Method:	Air rotary
Start Date:	2/26/2010
End Date:	2/26/2010



RICE OPERATING COMPANY ROC SINCE 1955

Project Name: BD H-19 vent **Well ID:** SB-3

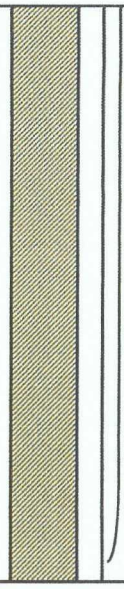
Comments: All samples from air rotary cuttings.
Located 20' east of the former junction box site.
Drafted by: Lara Weinheimer
TD = 50 ft GW = 120 ft

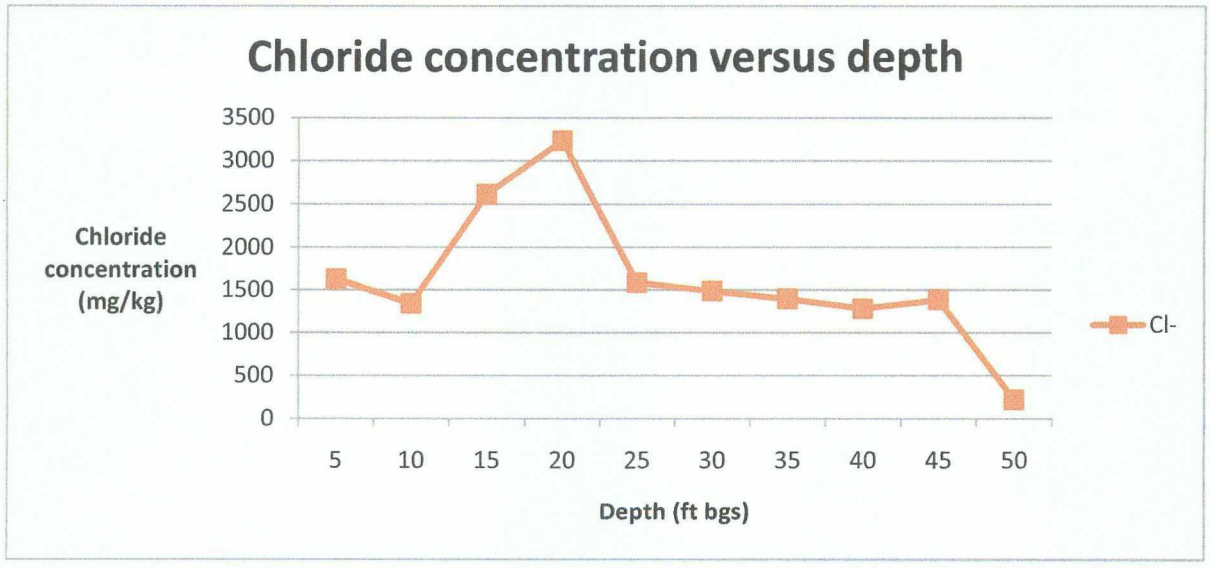
Location: UL/H sec. 19 T21S R37E
Lat: 32°28'0.318"N **County:** Lea
Long: 103°11'45.413" W **State:** NM

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description
				5 - 12 ft FINE GRAIN SAND light brown
5	1629			
10	1339			
15	2613			15 - 21 ft FINE GRAIN SAND INTERMIXED WITH CHERT light brown
20	3233	Cl- 4000		
		GRO <10.0		25 - 32 FINE GRAIN SAND light brown
		DRO <10.0		
25	1587			
30	1487			
35	1395			35 - 37 ft FINE GRAIN SAND tan

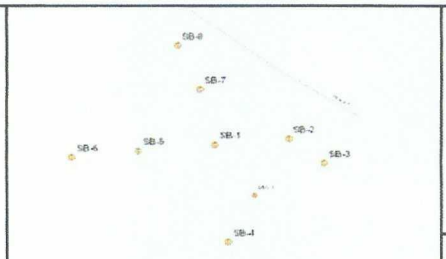
Lithology

Bore Construction: bentonite seal

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description	Lithology	Bore Construction
				40 - 50 ft FINE GRAIN SAND INTERMIXED WITH SANDSTONE tan		
40	1283					
45	1382					
50	221	GRO 1600				
		GRO <10.0				
		DRO <10.0				



Logger:	Jeff Kindley
Driller:	Harrison & Cooper, Inc. Drilling
Consultant:	Tetra Tech
Drilling Method:	Air rotary
Start Date:	2/26/2010
End Date:	2/26/2010



RICE OPERATING COMPANY ROC SINCE 1955

Project Name: BD H-19 vent **Well ID:** SB-4

Comments: All samples from air rotary cuttings.
Located 20' south of the former junction box site.

Drafted by: Lara Weinheimer

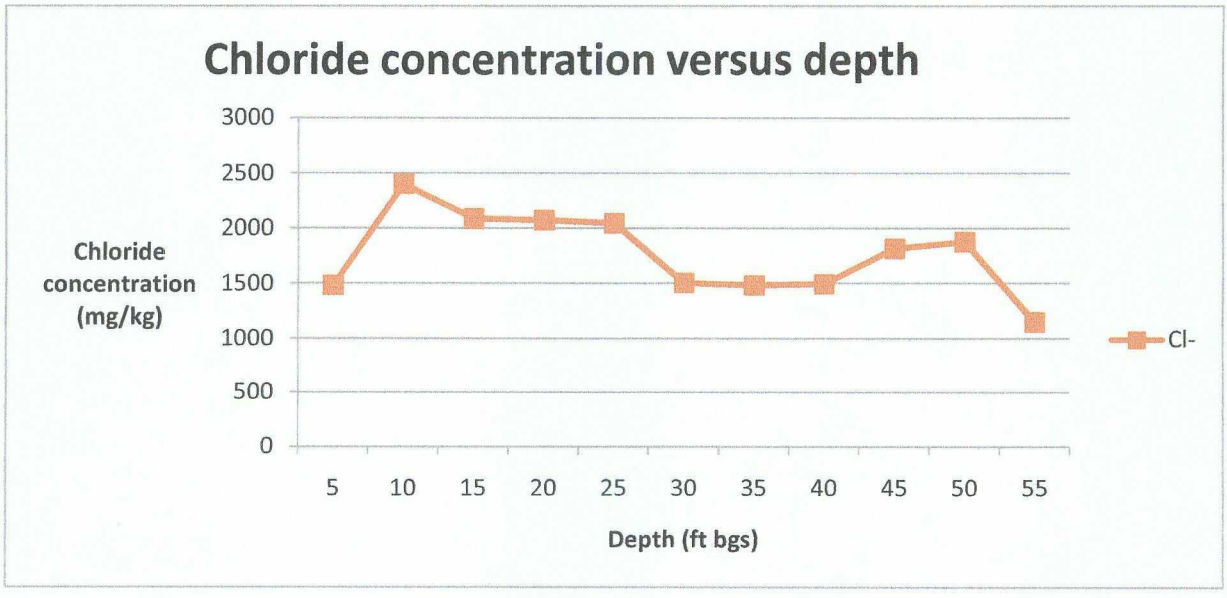
TD = 55 ft GW = 120 ft

Location: UL/H sec. 19 T21S R37E
Lat: 32°28'0.154"N **County:** Lea
Long: 103°11'45.601" W **State:** NM

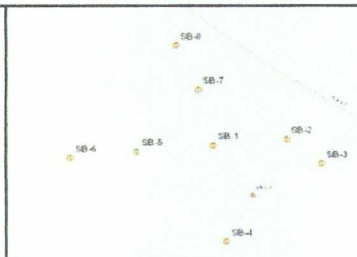
Depth (feet)	chloride field tests (ppm)	LAB	PID	Description	Lithology	Bore Construction
5	1482			5 - 17 ft FINE GRAIN SAND WITH LIMESTONE light brown		
10	2402	Cl- 3120				
		GRO <10.0				
		DRO <10.0				
15	2086					
20	2072			20 - 32 ft FINE GRAIN SAND lght brown		
25	2046					
30	1504					
35	1484					

bentonite seal

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description	Lithology	Bore Construction
40	1494					
				35 - 55 ft		
				FINE GRAIN SAND		
45	1817			tan		
50	1878					
55	1146	GRO 1440				
		GRO <10.0				
		DRO <10.0				



Logger:	Jeff Kindley
Driller:	Harrison & Cooper, Inc. Drilling
Consultant:	Tetra Tech
Drilling Method:	Air rotary
Start Date:	2/26/2010
End Date:	2/26/2010



RICE OPERATING COMPANY ROC SINCE 1955

Project Name: BD H-19 vent **Well ID:** SB-5

Location: UL/H sec. 19 T21S R37E
Lat: 32°28'0.346"N **County:** Lea
Long: 103°11'45.781" W **State:** NM

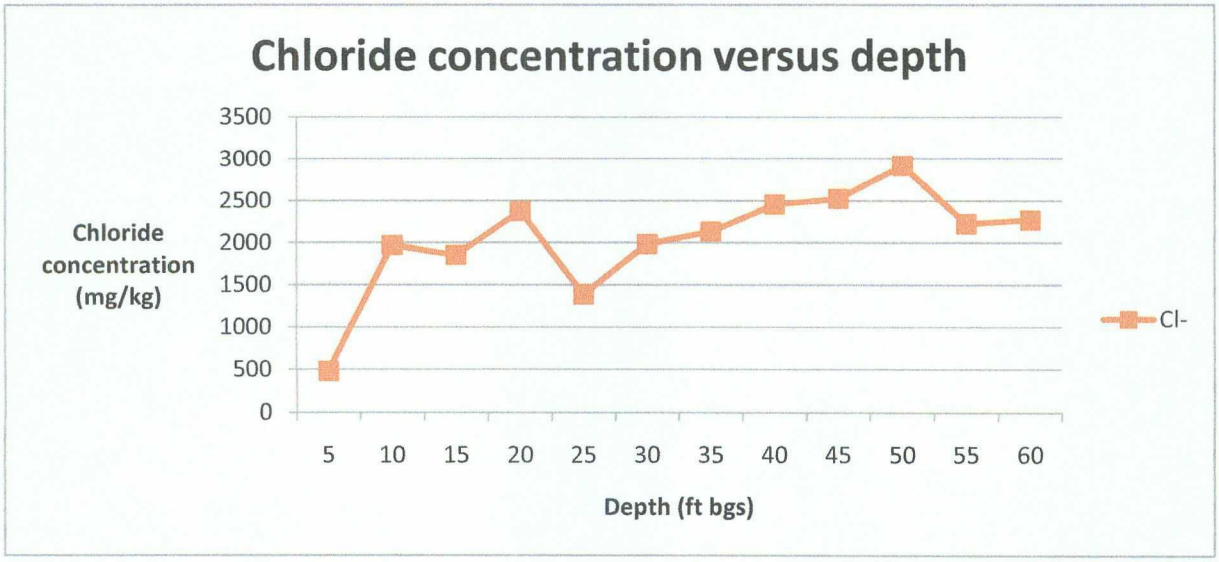
Comments: All samples from air rotary cuttings.
Located 10' west of the former junction box site.
Drafted by: Lara Weinheimer
TD = 60 ft GW = 120 ft

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description
5	479			5 - 21 ft FINE GRAIN SAND light brown
10	1971			
15	1852			
20	2375			
25	1386			25 - 32 ft FINE GRAIN SAND INTERMIXED WITH SANDSTONE light brown
30	1986			
35	2130			35 - 37 ft FINE GRAIN SAND INTERMIXED WITH SANDSTONE tan

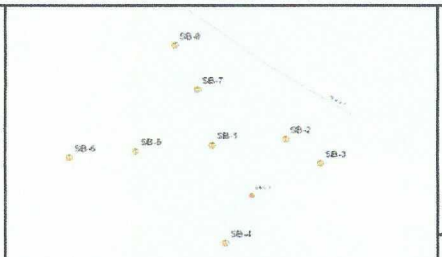
Lithology

Bore Construction: bentonite seal

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description	Lithology	Bore Construction
				40 - 60 ft FINE GRAIN SAND tan		
40	2452					
45	2523					
50	2919	GRO 2840				
		GRO <10.0				
		DRO <10.0				
55	2225					
60	2271	GRO 2560				
		GRO <10.0				
		DRO <10.0				



Logger:	Jeff Kindley
Driller:	Harrison & Cooper, Inc. Drilling
Consultant:	Tetra Tech
Drilling Method:	Air rotary
Start Date:	2/26/2010
End Date:	2/26/2010



RICE OPERATING COMPANY ROC SINCE 1955

Project Name: BD H-19 vent **Well ID:** SB-6

Location: UL/H sec. 19 T21S R37E
Lat: 32°28'0.332"N **County:** Lea
Long: 103°11'45.914" W **State:** NM

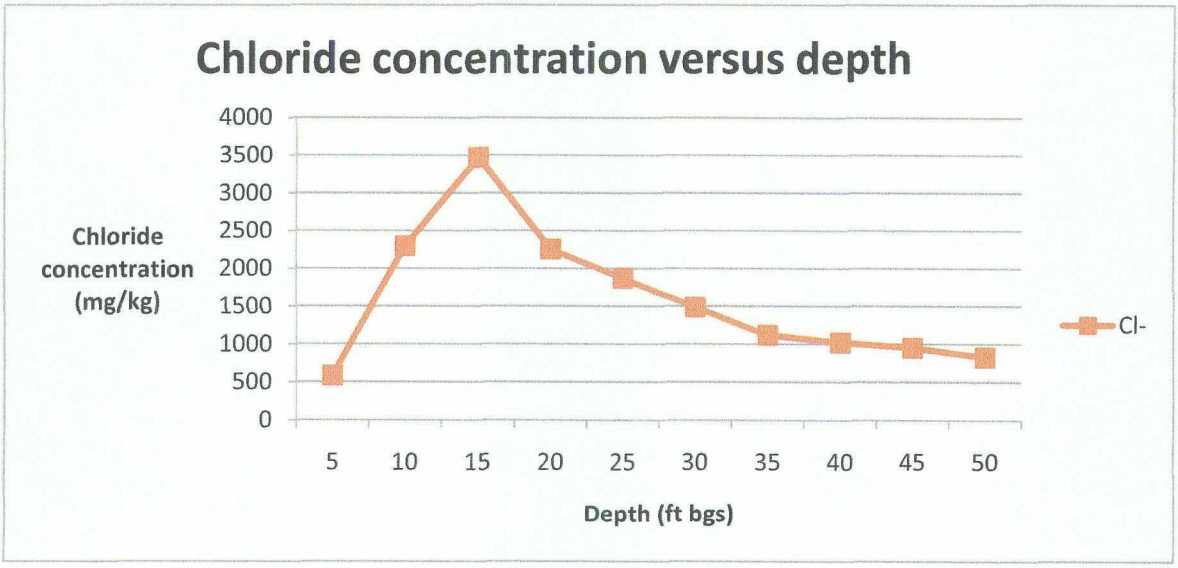
Comments: All samples from air rotary cuttings.
Located 20' west of the former junction box site.
Drafted by: Lara Weinheimer
TD = 50 ft GW = 120 ft

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description
5	584			5 - 17 ft
				FINE GRAIN SAND WITH LIMESTONE
				light brown
10	2294			
15	3467	Cl- 3640		
		GRO <10.0		
		DRO <10.0		
20	2251			20 - 32 ft
				FINE GRAIN SAND
				light brown
25	1869			
30	1487			
				35 - 37 ft
35	1116			FINE GRAIN SAND INTERMIXED WITH SANDSTONE
				light brown

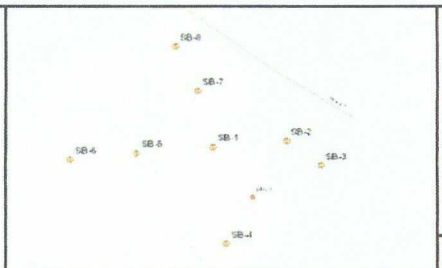
Lithology

Bore Construction: bentonite seal

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description	Lithology	Bore Construction
				40 - 42 ft		
40	1018			FINE GRAIN SAND INTERMIXED WITH SANDSTONE		
				tan		
				45 - 50 ft		
45	951			FINE GRAIN SAND		
				tan		
50	828	Cl- 704				
		GRO <10.0				
		DRO <10.0				



Logger:	Jeff Kindley
Driller:	Harrison & Cooper, Inc. Drilling
Consultant:	Tetra Tech
Drilling Method:	Air rotary
Start Date:	2/26/2010
End Date:	2/26/2010



RICE OPERATING COMPANY ROC SINCE 1955

Project Name: BD H-19 vent **Well ID:** SB-7

Location: UL/H sec. 19 T21S R37E
Lat: 32°28'0.476"N **County:** Lea
Long: 103°11'45.659" W **State:** NM

Comments: All samples from air rotary cuttings.
Located 10' north of the former junction box site.
Drafted by: Lara Weinheimer
TD = 55 ft GW = 120 ft

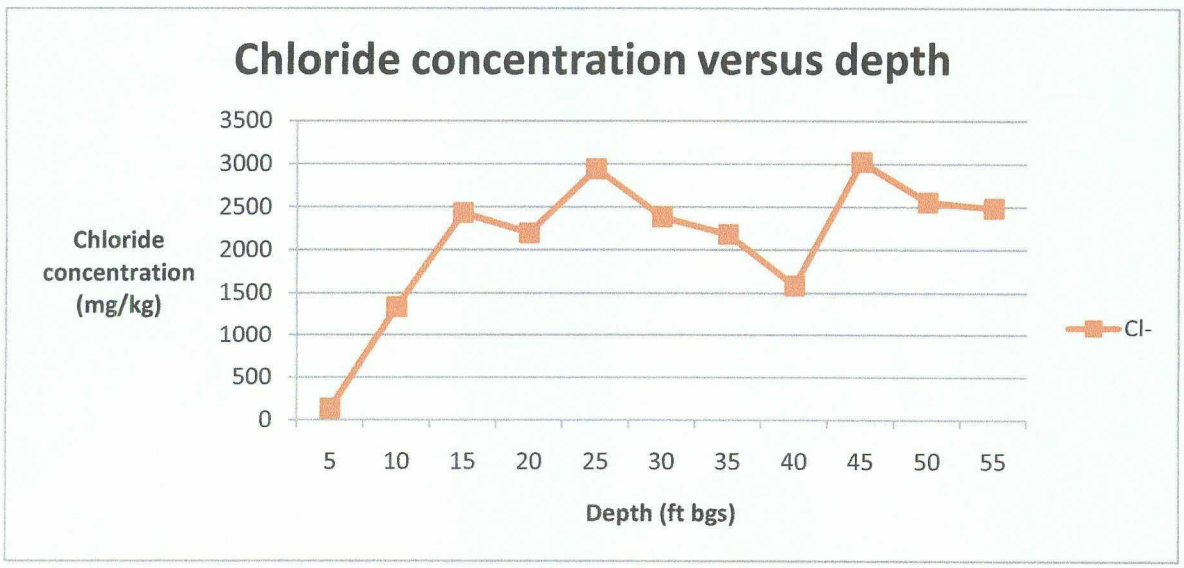
Depth (feet)	chloride field tests (ppm)	LAB	PID	Description
				5 - 32 ft FINE GRAIN SAND light brown
5	133			
10	1335			
15	2430			
20	2198			
25	2943			
30	2384			
35	2179			35 - 37 ft FINE GRAIN SAND INTERMIXED WITH SANDSTONE light brown

Lithology

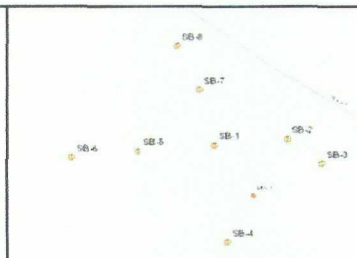
Bore Construction

bentonite seal

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description	Lithology	Bore Construction
40	1584					
45	3023	Cl- 2480		40 - 55 ft FINE GRAIN SAND tan		
		GRO <10.0				
		DRO <10.0				
50	2555					
55	2487	Cl- 2280				
		GRO <10.0				
		DRO <10.0				



Logger:	Jeff Kindley
Driller:	Harrison & Cooper, Inc. Drilling
Consultant:	Tetra Tech
Drilling Method:	Air rotary
Start Date:	2/26/2010
End Date:	2/26/2010



RICE OPERATING COMPANY ROC SINCE 1955

Project Name: BD H-19 vent **Well ID:** SB-8

Location: UL/H sec. 19 T21S R37E
Lat: 32°28'0.571"N **County:** Lea
Long: 103°11'45.703" W **State:** NM

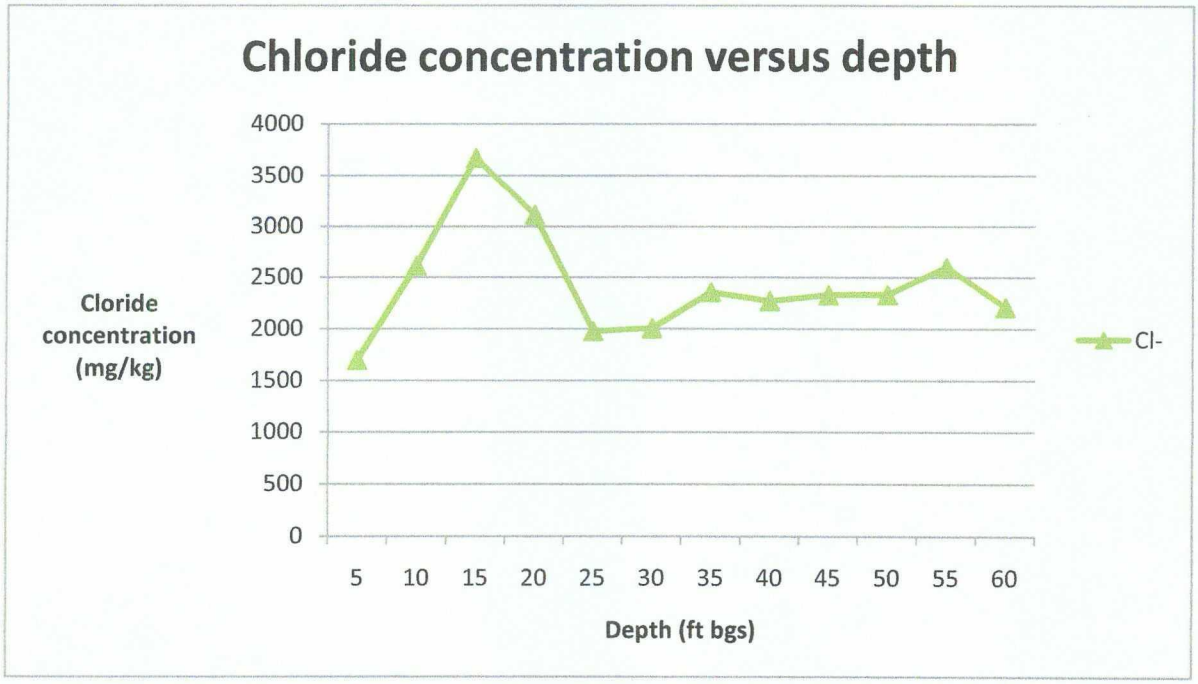
Comments: All samples from air rotary cuttings.
Located 20' north of the former junction box site.
Drafted by: Lara Weinheimer
TD = 60 ft GW = 120 ft

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description
				5 - 12 ft FINE GRAIN SAND WITH LIMESTONE light brown
5	1696			
10	2612			
15	3669	Cl- 5760 GRO <10.0 DRO <10.0		20 - 32 ft FINE GRAIN SAND light brown
20	3113			
25	1976			
30	2005			
35	2353			35 - 37 ft FINE GRAIN SAND INTERMIXED WITH SANDSTONE light brown

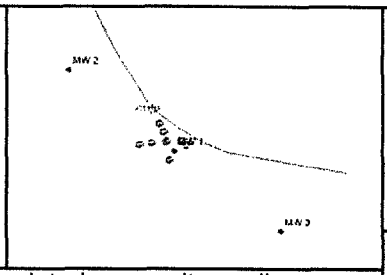
Lithology

Bore Construction: bentonite seal

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description	Lithology	Bore Construction
				40 - 61 ft FINE GRAIN SAND tan		
40	2267					
45	2328					
50	2331					
55	2599					
60	2209	Cl- 2200				
		GRO <10.0				
		DRO <10.0				



Logger:	Jeff Kindley
Driller:	Harrison & Cooper, Inc. Drilling
Consultant:	Tetra Tech
Drilling Method:	Air rotary
Start Date:	2/25/2010
End Date:	2/25/2010



RICE OPERATING COMPANY ROC SINCE 1955

Project Name: BD H-19 vent **Well ID:** MW-2

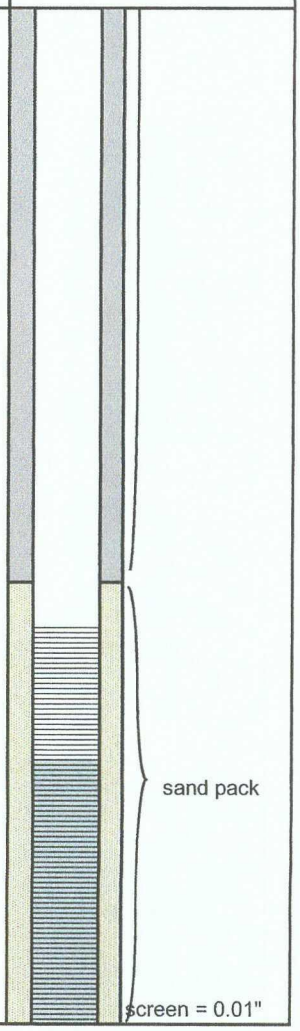
Comments: No sampling completed on monitor well. Located 120 ft NW of former junction box site.

TD = 133 ft GW = 120 ft

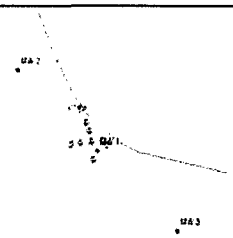
Location: UL/H sec. 19 T21S R37E
Lat: N32°28'1.174" County: LEA
Long: W103°11'46.654" State: NM

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description	Lithology	Well Construction
				NO SAMPLES TAKEN		2 x 2 ft concrete pad on surface
5						
10						
15						
20						
25						
30						
35						
40						
45						
50						bentonite seal
55						
60						2 in diameter PVC
65						
70						
75						

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description	Lithology	Well Construction
80						
85						
90						
95						
100						
105						
110						
115						
120						
125						
130						
135						



Logger:	Jeff Kindley
Driller:	Harrison & Cooper, Inc. Drilling
Consultant:	Tetra Tech
Drilling Method:	Air rotary
Start Date:	2/25/2010
End Date:	2/25/2010



RICE OPERATING COMPANY ROC SINCE 1955

Project Name: BD H-19 vent **Well ID:** MW-3

Comments: No sampling completed on monitor well.
Located 146 ft SE of former junction box site.

TD = 132 ft GW = 120 ft

Location: UL/H sec. 19 T21S R37E
Lat: N32°27'59.323" County: LEA
Long: W103°11'44.422" State: NM

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description	Lithology	Well Construction
				NO SAMPLES TAKEN		2 x 2 ft concrete pad on surface
5						
10						
15						
20						
25						
30						
35						
40						
45						
50						bentonite seal
55						
60						
65						
70						
						2 in diameter PVC

Depth (feet)	chloride field tests (ppm)	LAB	PID	Description		Lithology		Well Construction
75								
80								
85								
90								
95								
100								
105								
110								
115								
120								
125								
130