

1R - 425-63

**REPORTS**

**DATE:**

8-1-13

# Rice Environmental Consulting & Safety

P.O. Box 5630 Hobbs, NM 88241  
Phone 575.393.4411 Fax 575.393.0293

CERTIFIED MAIL  
RETURN RECEIPT NO. 7007 2560 0000 4569 9538

**August 1<sup>st</sup>, 2013**

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

**RE: ICP Report and Termination Request  
Rice Operating Company – Vacuum SWD System  
Vacuum G-33 EOL (1R425-63): UL/G sec. 33 T17S R35E**

Mr. Hansen:

RICE Operating Company (ROC) has retained Rice Environmental Consulting and Safety (RECS) to address potential environmental concerns at the above-referenced site in the abandoned Vacuum Salt Water Disposal (SWD) system.

ROC is the service provider (agent) for the abandoned Vacuum SWD System and has no ownership of any portion of the pipeline, well, or facility. The system is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis.

## **Background and Previous Work**

The site is located approximately 2 miles east of Buckeye, New Mexico at UL/G sec. 33 T17S R35E as shown on the Site Location Map (Figure 1). NM OSE records indicate that groundwater will likely be encountered at a depth of approximately 80 +/- feet.

In 2007, ROC initiated work on the former Vacuum G-33 EOL junction box as part of the system abandonment. The site was delineated using a backhoe to form an excavation 30 x 25 x 12 feet deep and soil samples were screened at regular intervals for both hydrocarbons and chlorides. Laboratory tests of the site showed a gasoline range organics (GRO) and a diesel range organics (DRO) reading of non-detect. However, chloride concentrations from the excavation did not relent with depth. The 4-wall composite yielded a chloride reading of 1,390 mg/kg. The bottom composite yielded a chloride reading of 912 mg/kg, and the backfill composite yielded a chloride reading of 1,150 mg/kg. The excavated soil was returned to the excavation to 4 feet below ground surface (bgs). At 4 feet bgs, a geo-synthetic clay liner, padded above and below with clean, imported blow sand, was installed to inhibit chloride migration to groundwater. The remaining soil was placed in the excavation and contoured to the surrounding landscape. An identification plate was placed on the surface of the site to mark its

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2013 AUG - 5 PM 2:12

location for future environmental considerations. NMOCD was notified of potential groundwater impact on December 8<sup>th</sup>, 2008 and a junction box disclosure report was submitted to NMOCD with all the 2008 junction box closures and disclosures.

### **Investigation and Characterization Plan Report**

As part of the Investigation and Characterization Plan (ICP) submitted to NMOCD on September 20<sup>th</sup>, 2010 and approved on September 23<sup>rd</sup>, 2010, ROC personnel were on site to conduct a soil bore investigation. Four soil bores were advanced on October 28<sup>th</sup>, 2010 and the soil was field tested for both chlorides and hydrocarbons (Figure 2). Representative samples from the bores were taken to a commercial laboratory for confirmation of field numbers. SB-1 returned chloride values of 1,090 mg/kg at 15 ft bgs which decreased to 32 mg/kg at 35 ft bgs. SB-2 returned chloride values of 848 mg/kg at 10 ft bgs which decreased to 64 mg/kg at 30 ft bgs. SB-3 returned chloride values of 352 mg/kg at 10 ft bgs which decreased to 112 mg/kg at 25 ft bgs and SB-4 returned chloride values of 592 mg/kg at 15 ft bgs which decreased to 48 mg/kg at 35 ft bgs. GRO and DRO readings in all bores at all depths were non-detect (Appendix A).

Surface samples were taken 5 ft south of the SB-1 and 5 ft north of SB-2 on June 13<sup>th</sup>, 2013 and taken to a commercial laboratory for analysis (Figure 2). The 5 ft south of SB-1 sample returned chloride laboratory results of 64 mg/kg and the 5 ft north of SB-2 sample returned chloride laboratory results of 32 mg/kg. GRO and DRO readings for both samples were non-detect (Appendix A).

In order to determine what affect the residual chlorides in the vadose zone would have on the groundwater beneath the site, ROC personnel ran the U.S. Environmental Protection Agency Exposure Assessment Multimedia Model – Multimed (Version 1.50, 2005). Based on the model parameters from the soil data at the site, the residual chlorides will peak at 83.83 mg/kg in the groundwater in 150 years (Appendix B). Given that this chloride level is below WQCC standards, no action is warranted for the vadose zone or for groundwater at the site.

Based on the Multimedia Model analysis, it is evident that the residual chlorides in the vadose zone will not impair groundwater beneath the site. The existing 30 x 25 x 12 ft deep geo-synthetic clay layer installed at the site will inhibit further migration of constituents to groundwater. The site has returned to normal vegetative capacity, which will also inhibit the further migration of constituents at the site (Appendix C). Vegetation above the liner will also provide a natural infiltration barrier for the site since plants capture water through their roots thereby reducing the volume of water moving through the vadose zone to groundwater.

Therefore, ROC respectfully requests ‘remediation termination’ or similar closure status of the site.

RECS appreciates the opportunity to work with you on this project. Please call Hack Conder at (575) 393-2967 or me if you have any questions or wish to discuss the site.

Sincerely,

A handwritten signature in black ink, appearing to read 'L. Weinheimer', with a long horizontal flourish extending to the right.

Lara Weinheimer  
Project Scientist  
RECS  
(575) 441-0431

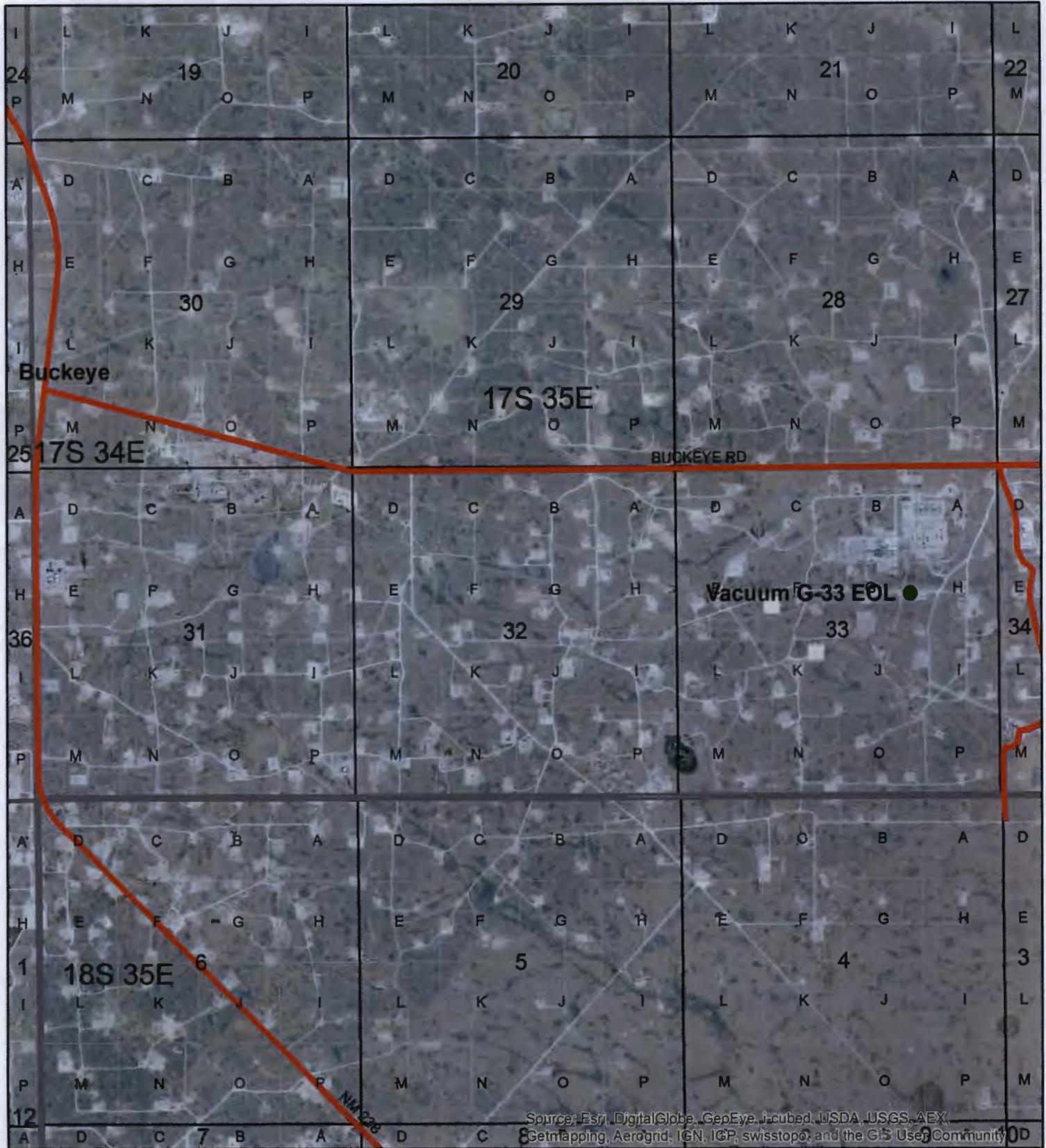
Attachments:

- Figure 1 – Site Location Map
- Figure 2 – Soil Bore Installation Map
- Appendix A – Soil Bore Logs and Lab Confirmation and Surface Sample Lab Confirmation
- Appendix B – Multimed Model
- Appendix C – Site Photos

# Figures

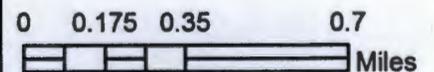
**RICE Environmental Consulting and Safety (RECS)**  
P.O. Box 5630 Hobbs, NM 88241  
Phone 575.393.4411 Fax 575.393.0293

# Site Location



**Vacuum  
G-33 EOL**  
 Legals: UL/G sec. 33  
 T17S R35E  
 LEA COUNTY, NM  
 Case #: 1R-425-63

**Figure 1**



Drawing date: 7-25-12  
 Drafted by: L. Weinheimer

# Soil Bore Installation

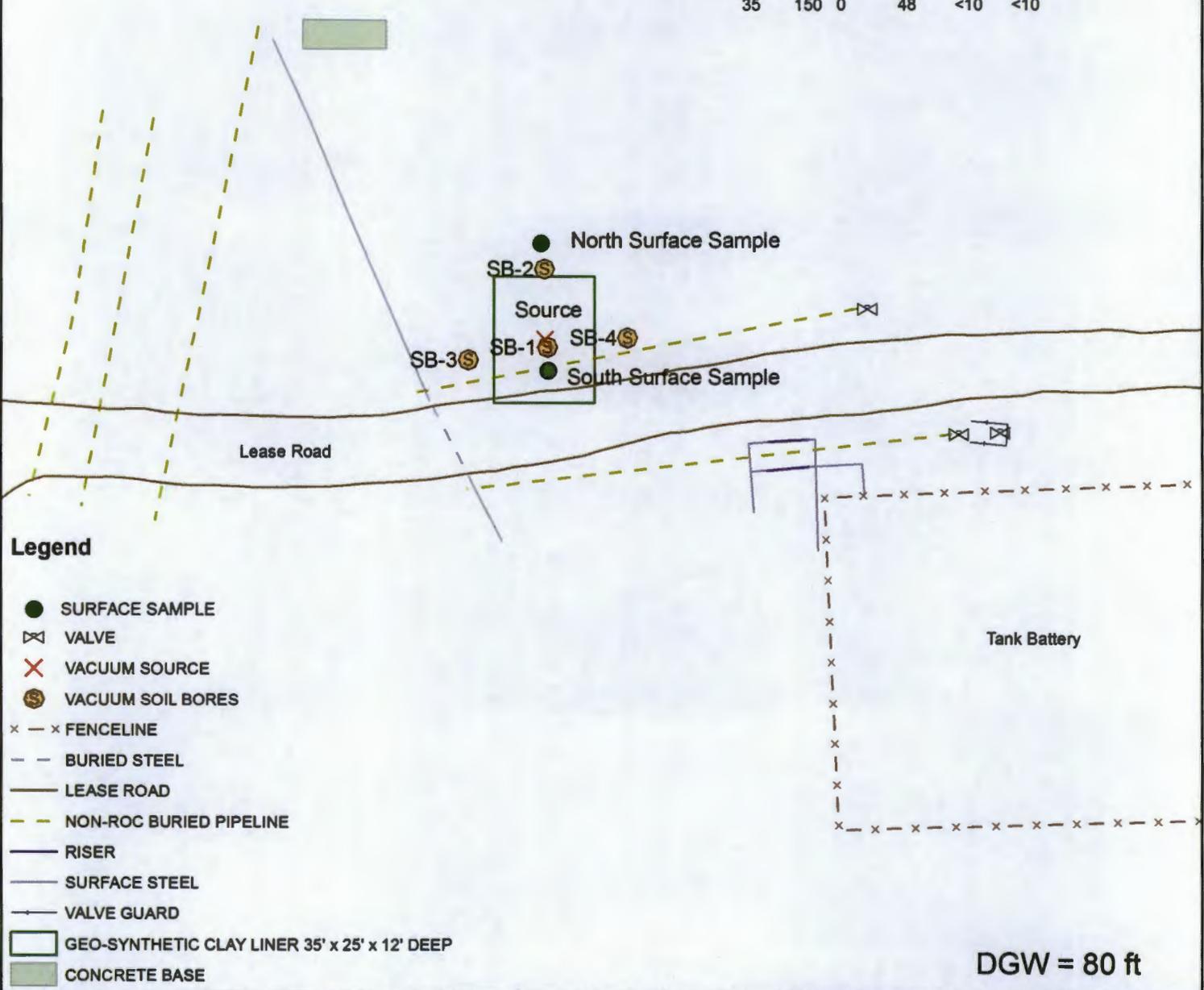
SB-1						SB-2					SB-3						
Depth	Cl-	PID	LAB Cl-	GRO	DRO	Depth	Cl-	PID	LAB Cl-	GRO	DRO	Depth	Cl-	PID	LAB Cl-	GRO	DRO
15	1121	0.2	1090	<10	<10	5	630	0				5	352	0			
20	1042	0				10	725	0	848	<10	<10	10	450	0	352	<10	<10
25	403	0				15	425	0				15	320	0			
30	211	0				20	363	0				20	252	0			
35	147	0	32	<10	<10	25	316	0				25	176	0	112	<10	<10
						30	171	0	64	<10	<10						

SB-4					
Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	413	0.1			
10	358	0			
15	604	0	592	<10	<10
20	513	0			
25	287	0			
30	176	0			
35	150	0	48	<10	<10

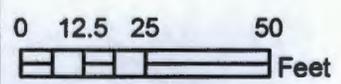
SURFACE SAMPLE					
Location	Cl-	PID	LAB Cl-	GRO	DRO
5 ft N of SB-2	176	0.5	32	<10	<10
5 ft S of SB-1	207	0.1	64	<10	<10



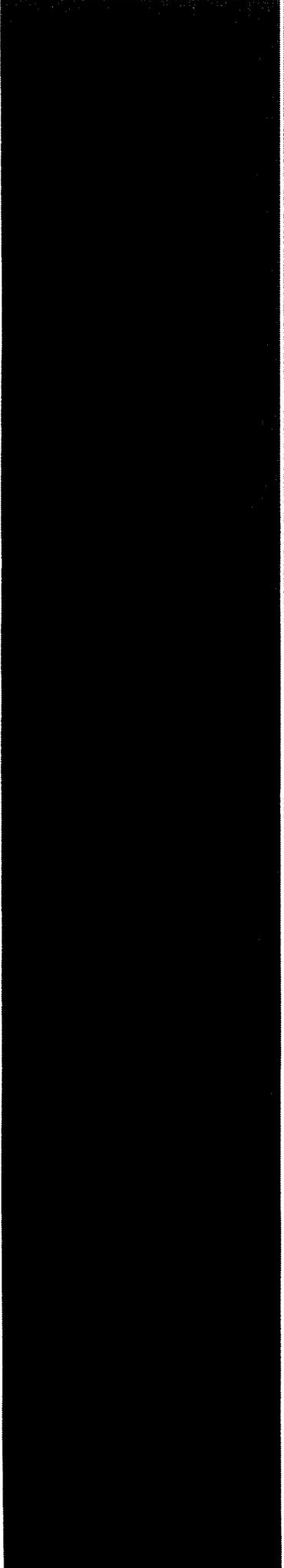
**Vacuum  
G-33 EOL**

Legals: UL/G sec. 33  
T17S R35E  
LEA COUNTY, NM  
Case #: 1R-425-63

**Figure 2**



Drawing date: 7-25-13  
Drafted by: L. Weinheimer



# Appendix A

Soil Bore Logs and Lab Confirmation  
Surface Sample Lab Confirmation

**RICE Environmental Consulting and Safety (RECS)**

P.O. Box 5630 Hobbs, NM 88241  
Phone 575.393.4411 Fax 575.393.0293



<b>Logger:</b>	Jordan Woodfin		
<b>Driller:</b>	Harrison & Cooper, Inc.		
<b>Drilling Method:</b>	Air rotary		
<b>Start Date:</b>	10/28/2010		
<b>End Date:</b>	10/28/2010		<b>Project Name:</b> Vacuum G-33 EOL <b>Well ID:</b> SB - 2 <b>Project Consultant:</b> RECS
<b>Comments:</b> Located 17 ft north of the former junction box site. All samples were from cuttings. <b>DRAFTED BY:</b> L. Weinheimer TD = 30 ft                      GW = 80 ft			<b>Location:</b> UL/G sec. 33 T17S R35E <b>Lat:</b> 32°47'35.068" <b>Long:</b> 103°27'31.747" <b>County:</b> LEA <b>State:</b> NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Light brown coarse sand and caliche mix.		
5 ft	630		0			
10 ft	725	CI-848	0	Caliche and sandstone mix (hard drilling).		bentonite seal
		GRO <10				
		DRO <10				
15 ft	425		0			
				Tan very fine sand.		
20 ft	363		0			
25 ft	316		0			
				Tan very fine sand.		
30 ft	171	CI-64	0			
		GRO <10				
		DRO <10				





November 02, 2010

Hack Conder  
Rice Operating Company  
112 W. Taylor  
Hobbs, NM 88240

RE: VACUUM G-33 EOL

Enclosed are the results of analyses for samples received by the laboratory on 10/28/10 16:52.

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 Hydrocarbons

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

Cardinal Laboratories is accredited 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  
Lab Director/Quality Manager

### Analytical Results For:

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

Received: 10/28/2010  
 Reported: 11/02/2010  
 Project Name: VACUUM G-33 EOL  
 Project Number: NONE GIVEN  
 Project Location: VACUUM G-33 EOL

Sampling Date: 10/28/2010  
 Sampling Type: Soil  
 Sampling Condition: Cool & Intact  
 Sample Received By: Jodi Henson

#### Sample ID: SB #1 @ 15 FT (H021178-01)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
<b>Chloride</b>	<b>1090</b>	16.0	10/29/2010	ND	464	116	400	3.51		
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	10/30/2010	ND	178	88.9	200	7.41		
DRO >C10-C28	<10.0	10.0	10/30/2010	ND	178	88.9	200	7.46		

Surrogate: 1-Chlorooctane 90.2 % 70-130

Surrogate: 1-Chlorooctadecane 89.9 % 70-130

#### Sample ID: SB #1 @ 35 FT (H021178-02)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
<b>Chloride</b>	<b>32.0</b>	16.0	10/29/2010	ND	464	116	400	3.51		
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	10/31/2010	ND	178	88.9	200	7.41		
DRO >C10-C28	<10.0	10.0	10/31/2010	ND	178	88.9	200	7.46		

Surrogate: 1-Chlorooctane 102 % 70-130

Surrogate: 1-Chlorooctadecane 102 % 70-130



### Analytical Results For:

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

Received: 10/28/2010  
 Reported: 11/02/2010  
 Project Name: VACUUM G-33 EOL  
 Project Number: NONE GIVEN  
 Project Location: VACUUM G-33 EOL

Sampling Date: 10/28/2010  
 Sampling Type: Soil  
 Sampling Condition: Cool & Intact  
 Sample Received By: Jodi Henson

#### Sample ID: SB #2 @ 10 FT (H021178-03)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
<b>Chloride</b>	<b>848</b>	16.0	10/29/2010	ND	464	116	400	3.51		
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	10/31/2010	ND	178	88.9	200	7.41		
DRO >C10-C28	<10.0	10.0	10/31/2010	ND	178	88.9	200	7.46		

Surrogate: 1-Chlorooctane 87.9 % 70-130

Surrogate: 1-Chlorooctadecane 86.3 % 70-130

#### Sample ID: SB #2 @ 30 FT (H021178-04)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
<b>Chloride</b>	<b>64.0</b>	16.0	10/29/2010	ND	464	116	400	3.51		
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	10/31/2010	ND	178	88.9	200	7.41		
DRO >C10-C28	<10.0	10.0	10/31/2010	ND	178	88.9	200	7.46		

Surrogate: 1-Chlorooctane 92.9 % 70-130

Surrogate: 1-Chlorooctadecane 93.7 % 70-130

Cardinal Laboratories

\*=Accredited Analyte

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of the services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise. Results relate only to the samples identified above. This report shall not be reproduced except in full with written approval of Cardinal Laboratories.



Celey D. Keene, Lab Director/Quality Manager

**Analytical Results For:**

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

Received: 10/28/2010  
 Reported: 11/02/2010  
 Project Name: VACUUM G-33 EOL  
 Project Number: NONE GIVEN  
 Project Location: VACUUM G-33 EOL

Sampling Date: 10/28/2010  
 Sampling Type: Soil  
 Sampling Condition: Cool & Intact  
 Sample Received By: Jodi Henson

**Sample ID: SB #3 @ 10 FT (H021178-05)**

Chloride, SM4500CI-B		mg/kg		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
<b>Chloride</b>	<b>352</b>	16.0	10/29/2010	ND	464	116	400	3.51		
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	10/31/2010	ND	178	88.9	200	7.41		
DRO >C10-C28	<10.0	10.0	10/31/2010	ND	178	88.9	200	7.46		

Surrogate: 1-Chlorooctane 89.1 % 70-130  
 Surrogate: 1-Chlorooctadecane 90.7 % 70-130

**Sample ID: SB #3 @ 25 FT (H021178-06)**

Chloride, SM4500CI-B		mg/kg		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
<b>Chloride</b>	<b>112</b>	16.0	10/29/2010	ND	464	116	400	3.51		
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	10/31/2010	ND	178	88.9	200	7.41		
DRO >C10-C28	<10.0	10.0	10/31/2010	ND	178	88.9	200	7.46		

Surrogate: 1-Chlorooctane 176 % 70-130  
 Surrogate: 1-Chlorooctadecane 173 % 70-130



**Analytical Results For:**

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

Received: 10/28/2010  
 Reported: 11/02/2010  
 Project Name: VACUUM G-33 EOL  
 Project Number: NONE GIVEN  
 Project Location: VACUUM G-33 EOL

Sampling Date: 10/28/2010  
 Sampling Type: Soil  
 Sampling Condition: Cool & Intact  
 Sample Received By: Jodi Henson

**Sample ID: SB #4 @ 15 FT (H021178-07)**

Chloride, SM4500CI-B		mg/kg		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
<b>Chloride</b>	<b>592</b>	16.0	10/29/2010	ND	464	116	400	3.51		
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	10/31/2010	ND	178	88.9	200	7.41		
DRO >C10-C28	<10.0	10.0	10/31/2010	ND	178	88.9	200	7.46		
<i>Surrogate: 1-Chlorooctane</i>	<i>102 %</i>	<i>70-130</i>								
<i>Surrogate: 1-Chlorooctadecane</i>	<i>102 %</i>	<i>70-130</i>								

**Sample ID: SB #4 @ 35 FT (H021178-08)**

Chloride, SM4500CI-B		mg/kg		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
<b>Chloride</b>	<b>48.0</b>	16.0	10/29/2010	ND	464	116	400	3.51		
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	10/31/2010	ND	178	88.9	200	7.41		
DRO >C10-C28	<10.0	10.0	10/31/2010	ND	178	88.9	200	7.46		
<i>Surrogate: 1-Chlorooctane</i>	<i>92.6 %</i>	<i>70-130</i>								
<i>Surrogate: 1-Chlorooctadecane</i>	<i>94.5 %</i>	<i>70-130</i>								



### 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





June 18, 2013

Hack Conder  
Rice Operating Company  
112 W. Taylor  
Hobbs, NM 88240

RE: VACUUM G-33 EOL

Enclosed are the results of analyses for samples received by the laboratory on 06/14/13 8:00.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-11-3. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (\*). For a complete list of accredited analytes and matrices visit the TCEQ website at [www.tceq.texas.gov/field/qa/lab\\_accred\\_certif.html](http://www.tceq.texas.gov/field/qa/lab_accred_certif.html).

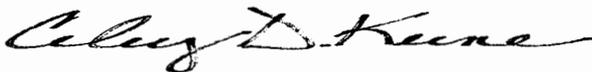
Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, 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  
Lab Director/Quality Manager

**Analytical Results For:**

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

 Received: 06/14/2013  
 Reported: 06/18/2013  
 Project Name: VACUUM G-33 EOL  
 Project Number: NONE GIVEN  
 Project Location: VACUUM G-33 EOL

 Sampling Date: 06/13/2013  
 Sampling Type: Soil  
 Sampling Condition: Cool & Intact  
 Sample Received By: Jodi Henson

**Sample ID: SURFACE SAMPLE - S OF SOIL BORE #1 (H301366-01)**

Chloride, SM4500CI-B		mg/kg	Analyzed By: DW						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
<b>Chloride</b>	<b>64.0</b>	16.0	06/18/2013	ND	432	108	400	3.77	
TPH 8015M		mg/kg	Analyzed By: MS						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/17/2013	ND	213	106	200	0.409	
DRO >C10-C28	<10.0	10.0	06/17/2013	ND	212	106	200	4.05	
Surrogate: 1-Chlorooctane	94.5 %	65.2-140							
Surrogate: 1-Chlorooctadecane	89.7 %	63.6-154							

**Sample ID: SURFACE SAMPLE - N OF SOIL BORE #2 (H301366-02)**

Chloride, SM4500CI-B		mg/kg	Analyzed By: DW						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
<b>Chloride</b>	<b>32.0</b>	16.0	06/18/2013	ND	432	108	400	3.77	
TPH 8015M		mg/kg	Analyzed By: MS						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/17/2013	ND	213	106	200	0.409	
DRO >C10-C28	<10.0	10.0	06/17/2013	ND	212	106	200	4.05	
Surrogate: 1-Chlorooctane	84.0 %	65.2-140							
Surrogate: 1-Chlorooctadecane	81.1 %	63.6-154							

Cardinal Laboratories

\*=Accredited Analyte

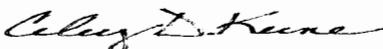
PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of the services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise. Results relate only to the samples identified above. This report shall not be reproduced except in full with written approval of Cardinal Laboratories.



Celey D. Keene, Lab Director/Quality Manager

**Notes and Definitions**

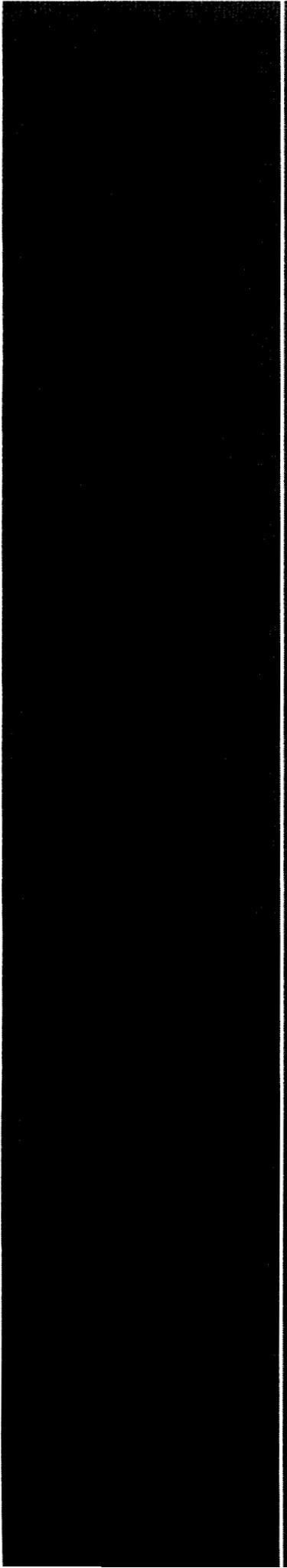
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C Samples reported on an as received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



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Celey D. Keene, Lab Director/Quality Manager





# Appendix B

Multimed Model

**RICE Environmental Consulting and Safety (RECS)**  
P.O. Box 5630 Hobbs, NM 88241  
Phone 575.393.4411 Fax 575.393.0293

U. S. ENVIRONMENTAL PROTECTION AGENCY

EXPOSURE ASSESSMENT

MULTIMEDIA MODEL

MULTIMED (Version 1.50, 2005)

Options  
-----

Medium G-33 EOL

Chemical simulated is Chloride

Flow Model Chosen: Saturated and unsaturated zone models  
Flow Model was: DETERMINISTIC  
Darcy Filtration Specified By User: 3.048E-02 m/yr  
Flow Model was transient  
Number of Time Steps: Entered Explicitly  
Flow Model runs if Y coordinate outside plume  
Flow Model runs if Z coordinate outside plume  
Gaussian source used in saturated zone model

SATURATED ZONE FLOW MODEL PARAMETERS

(Input parameter description and value)

- Total number of nodal points	240
ISAT - Number of different porous materials	1
ISROP - Van Genuchten or Brooks and Corey	1
ISSHGN - Spatial discretization option	1
ISFLAYR - Number of layers in flow model	1

OPTIONS CHOSEN

Flow Model: Van Genuchten functional coefficients  
Coordinate System: User defined coordinate system

Layer information

LAYER NO.	LAYER THICKNESS	MATERIAL PROPERTY
1	15.54	1

VADOSE ZONE MATERIAL VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Saturated hydraulic conductivity	cm/hr	CONSTANT	3.60	-999.	-999.	-999.
Unsaturated zone porosity	--	CONSTANT	0.250	-999.	-999.	-999.
Air entry pressure head	m	CONSTANT	0.700	-999.	-999.	-999.
Depth of the unsaturated zone	m	CONSTANT	15.5	0.000	0.000	0.000

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Residual water content	--	CONSTANT	0.116	-999.	-999.	-999.
Brook and Corey exponent, EN	--	CONSTANT	-999.	-999.	-999.	-999.
ALFA coefficient	1/cm	CONSTANT	0.500E-02	-999.	-999.	-999.
Van Genuchten exponent, ENN	--	CONSTANT	1.09	-999.	-999.	-999.

SATURATED ZONE TRANSPORT MODEL PARAMETERS

LAY	- Number of different layers used		1
STPS	- Number of time values concentration calc		40
MMY	- Not presently used		1
COL	- Type of scheme used in unsaturated zone		2
	- Stehfest terms or number of increments		18
DEL	- Points in Lagrangian interpolation		3
PTS	- Number of Gauss points		104
T	- Convolution integral segments		2
BOUND	- Type of boundary condition		3
SGEN	- Time values generated or input		1
MAX	- Max simulation time	--	0.0
WFUN	- Weighting factor	--	1.2

OPTIONS CHOSEN

convolution integral approach  
 exponentially decaying continuous source  
 computer generated times for computing concentrations

DATA FOR LAYER 1

VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Thickness of layer	m	CONSTANT	15.5	-999.	-999.	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	-999.	-999.
Percent organic matter	--	CONSTANT	0.000	-999.	-999.	-999.
Bulk density of soil for layer	g/cc	CONSTANT	1.99	-999.	-999.	-999.
Biological decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.

CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Solid phase decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Dissolved phase decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Overall chemical decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Acid catalyzed hydrolysis rate	1/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Neutral hydrolysis rate constant	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Base catalyzed hydrolysis rate	1/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Reference temperature	C	CONSTANT	25.0	-999.	-999.	-999.
Normalized distribution coefficient	ml/g	CONSTANT	0.000	-999.	-999.	-999.
Distribution coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Biodegradation coefficient (sat. zone)	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Air diffusion coefficient	cm <sup>2</sup> /s	CONSTANT	-999.	-999.	-999.	-999.
Reference temperature for air diffusion	C	CONSTANT	-999.	-999.	-999.	-999.
Molecular weight	g/M	CONSTANT	-999.	-999.	-999.	-999.
Mole fraction of solute	--	CONSTANT	-999.	-999.	-999.	-999.
Vapor pressure of solute	mm Hg	CONSTANT	-999.	-999.	-999.	-999.
Henry's law constant	atm-m <sup>3</sup> /M	CONSTANT	-999.	-999.	-999.	-999.
Overall 1st order decay sat. zone	1/yr	DERIVED	0.000	0.000	0.000	1.00
Not currently used		CONSTANT	0.000	0.000	0.000	0.000
Not currently used		CONSTANT	0.000	0.000	0.000	0.000

SOURCE SPECIFIC VARIABLES

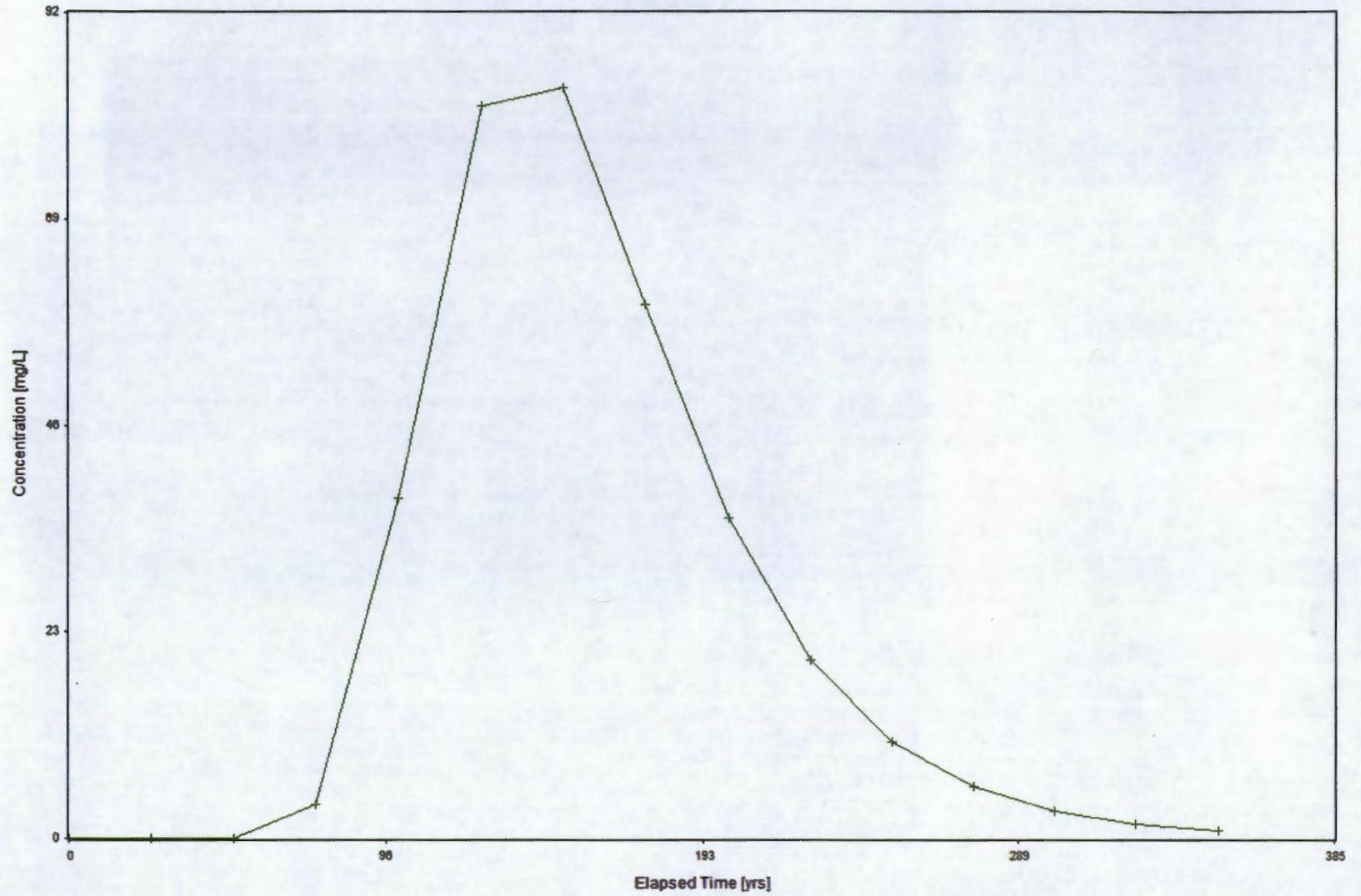
VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Infiltration rate	m/yr	CONSTANT	0.305E-01	-999.	-999.	-999.
Area of waste disposal unit	m <sup>2</sup>	DERIVED	133.	-999.	-999.	-999.
Duration of pulse	yr	DERIVED	50.0	-999.	-999.	-999.
Spread of contaminant source	m	DERIVED	-999.	-999.	-999.	-999.
Recharge rate	m/yr	CONSTANT	0.000	-999.	-999.	-999.
Source decay constant	1/yr	CONSTANT	0.250E-01	0.000	0.000	0.000
Initial concentration at landfill	mg/l	CONSTANT	418.	-999.	-999.	-999.
Length scale of facility	m	CONSTANT	9.45	-999.	-999.	-999.
Width scale of facility	m	CONSTANT	14.0	-999.	-999.	-999.
Near field dilution		DERIVED	1.00	0.000	0.000	1.00

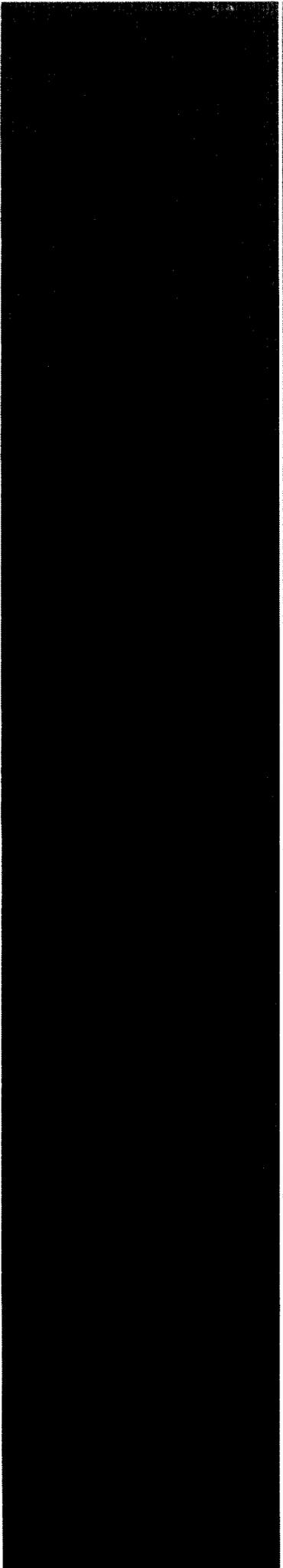
AQUIFER SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Particle diameter	cm	CONSTANT	-999.	-999.	-999.	-999.
Aquifer porosity	--	CONSTANT	0.300	-999.	-999.	-999.
Bulk density	g/cc	CONSTANT	1.86	-999.	-999.	-999.
Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
Source thickness (mixing zone depth)	m	DERIVED	-999.	-999.	-999.	-999.
Conductivity (hydraulic)	m/yr	CONSTANT	315.	-999.	-999.	-999.
Gradient (hydraulic)		CONSTANT	0.300E-02	-999.	-999.	-999.
Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.	-999.	-999.
Retardation coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Longitudinal dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Transverse dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Vertical dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Temperature of aquifer	C	CONSTANT	20.0	-999.	-999.	-999.
pH	--	CONSTANT	7.00	-999.	-999.	-999.
Organic carbon content (fraction)		CONSTANT	0.000	-999.	-999.	-999.
Well distance from site	m	CONSTANT	1.00	-999.	-999.	-999.
Angle off center	degree	CONSTANT	0.000	-999.	-999.	-999.
Well vertical distance	m	CONSTANT	0.000	-999.	-999.	-999.

TIME	CONCENTRATION
0.000E+00	0.00000E+00
0.250E+02	0.00000E+00
0.500E+02	0.10635E-01
0.750E+02	0.37660E+01
0.100E+03	0.37853E+02
0.125E+03	0.81729E+02
0.150E+03	0.83831E+02
0.175E+03	0.59605E+02
0.200E+03	0.35689E+02
0.225E+03	0.19824E+02
0.250E+03	0.10772E+02
0.275E+03	0.57928E+01
0.300E+03	0.31041E+01
0.325E+03	0.16592E+01
0.350E+03	0.88487E+00

Chloride Concentration At The Receptor Well  
Vacuum G-33 EOL





# Appendix C

Site Photos

**RICE Environmental Consulting and Safety (RECS)**  
P.O. Box 2948 Hobbs, NM 88241  
Phone 575.393.2967

**Vacuum G-33 EOL (1R425-63)**  
Unit Letter G, Section 33, T17S, R35E



Facing north

6/24/2013



Facing south

6/24/2013