1R - 425-65

WORKPLANS

Date:

10-22-13

Rice Environmental Consulting & Safety
P.O. Box 2948, Hobbs, NM 88241
Phone 575.393.2967

CERTIFIED MAIL
RETURN RECEIPT NO. 7007 2560 0000 4569 8326

October 22nd, 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 Corrective Action Plan (CAP)**
Rice Operating Company – Vacuum SWD System
Vacuum G-28 vent (1R425-65): UL/G sec. 28 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 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 2.5 miles northeast of Buckeye, New Mexico at UL/G sec. 28 T17S R35E as shown on the Site Location Map and Geographical Location Map (Figure 1 and 2). NM OSE records indicate that groundwater would likely be encountered at a depth of approximately 70 +/- feet.

In 2007, ROC initiated work on the Vacuum G-28 vent junction box as part of the system abandonment. The site was delineated using a backhoe and soil samples were screened at regular intervals for both hydrocarbons and chlorides. The excavation reached dimensions of 20 x 20 x 12 feet bgs where composite samples were collected for laboratory verification. Laboratory tests of the site showed gasoline range organics (GRO) and diesel range organics (DRO) readings of non-detect in the 4-wall composite, the bottom composite, and the backfill. Chlorides at the site ranged from 9,040 mg/kg in the 4-wall composite, 8,000 mg/kg in the bottom composite at 12 ft bgs, and 6,880 mg/kg in the backfill. The excavated soil was returned to the excavation up to 4 feet below ground surface and a 4 foot deep shelf was excavated 10 feet in each direction. At 4 feet bgs, a geosynthetic liner, padded above and below with clean, imported blow sand, was installed to inhibit further chloride migration. The remaining soils were then backfilled into the excavation. Clean soil was imported to cap the site and contoured it to the surrounding landscape. An identification plate was placed on the surface of the site to

mark its location for future environmental considerations. A new junction box was not required at the site since the system is abandoned.

NMOCD was notified of potential groundwater impact on December 1st, 2008 and a junction box disclosure report was submitted to NMOCD with all the 2008 junction box closures and disclosures. The attached Figure 3 summarizes the junction box delineation vertical data.

As part of the Investigation and Characterization Plan (ICP) submitted to NMOCD on September 20th, 2010 and approved on September 22nd, 2010, eight soil bores were installed at the site in October 27th, 2010, February 29th, 2012 and March 1st, 2012 (Figure 4). As the bores were advanced, samples were taken at regular intervals and field tested for chlorides and hydrocarbons. Representative samples from each bores were taken to a commercial laboratory for analysis (Appendix A). SB-1 returned laboratory chloride results of 2,720 mg/kg at 25 ft bgs, which decreased to 64 mg/kg at 50 ft bgs. SB-2 returned laboratory chloride results of 5,760 mg/kg at 10 ft bgs, which decreased to 96 mg/kg at 35 ft bgs. SB-3 returned laboratory chloride results of 5,840 mg/kg at 10 ft bgs, which decreased to 144 mg/kg at 50 ft bgs. SB-4 returned laboratory chloride results of 6,880 mg/kg at 10 ft bgs, which decreased to 64 mg/kg at 35 ft bgs. SB-5 returned laboratory chloride results of 2,160 mg/kg at 5 ft bgs, which decreased to 224 mg/kg at 10 ft bgs. SB-6 returned laboratory chloride results of 7,000 mg/kg at 10 ft bgs, which decreased to 192 mg/kg at 25 ft bgs. SB-7 returned laboratory chloride results of 5,360 mg/kg at 10 ft bgs, which decreased to 544 mg/kg at 20 ft bgs. SB-8 returned laboratory chloride results of 240 mg/kg at the surface, 1,230 mg/kg at 5 ft bgs, which decreased to 608 mg/kg at 10 ft bgs. GRO and DRO readings in all bores at all depth were non-detect.

Due to the presence of high line electrical wires to the west of the site, soil bores could not be installed in that direction. Therefore, a surface sample was collected 15 ft west of the source. The sample was field tested for hydrocarbons and returned a result of 55.9 ppm. The sample was then taken to a commercial laboratory for analysis and returned a chloride result of 128 mg/kg. Surface samples were also taken 29 ft north and 24 ft east of SB-1. Both samples were submitted to a commercial laboratory and the 29 ft north sample returned a chloride result of 48 mg/kg and the 24 ft east sample returned a chloride result of 32 mg/kg. Both samples returned GRO and DRO readings of non-detect (Appendix A).

Chloride concentrations in the 5 ft and 10 ft west verticals were similar to that of the north, east and south verticals (Figure 3). Soil bores installed in those directions, and in the verticals of the highest chloride concentrations, resulted in chlorides that decreased with depth to concentrations below 250 mg/kg. This suggests that chloride concentrations west of the source will follow the same trend. The west surface sample further confirms this.

To determine if the residual chlorides in the vadose zone pose a threat to groundwater quality, ROC ran the U.S. Environmental Protection Agency Exposure Assessment Multimedia Model (MULTIMED Version 1.5, 2005). With the proposed infiltration

barrier measuring 55 ft x 57 ft, data inputs and model outputs are included in Appendix B. The model output concludes that the peak concentration of chlorides in groundwater contributed by the vadose zone soils would be approximately 139 mg/L in 396 years. Since the estimated increase in chloride concentrations in groundwater from residual chloride migration is below the WQCC standard of 250 mg/L, no further action will be warranted for the groundwater at this site.

Corrective Action Plan (CAP)

It is evident from the soil bore data and multimed analysis of that soil data that residual chlorides in the vadose zone will not affect groundwater beneath the site with the installation of a 20-mil reinforced poly liner. Therefore, RECS recommends that ROC install a 55 ft x 57 ft 20-mil reinforced poly liner at approximately 3 ft bgs (Figure 3). The liner will cover the previously installed 40 ft x 40 ft x 4 ft deep liner. These liners will inhibit the downward migration of constituents to groundwater. The soils placed above the liner will have a laboratory chloride reading no greater than 500 mg/kg and a field PID reading below 100 ppm. Excavated soil will be evaluated for use as backfill and any soils requiring disposal will be properly disposed of at a NMOCD approved facility. Upon completion of backfilling, the site will be seeded with a native vegetative mix and soil amendments will be added as necessary. Vegetation provides an infiltration barrier for the site, since plants capture water through their roots thereby reducing the amount of water traveling through the vadose zone to groundwater.

Once the CAP activities are completed, ROC will submit a report detailing the CAP activities and a request for 'remediation termination' or site closure.

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,

Lara Weinheimer
Project Scientist
RECS
(575) 441-0431

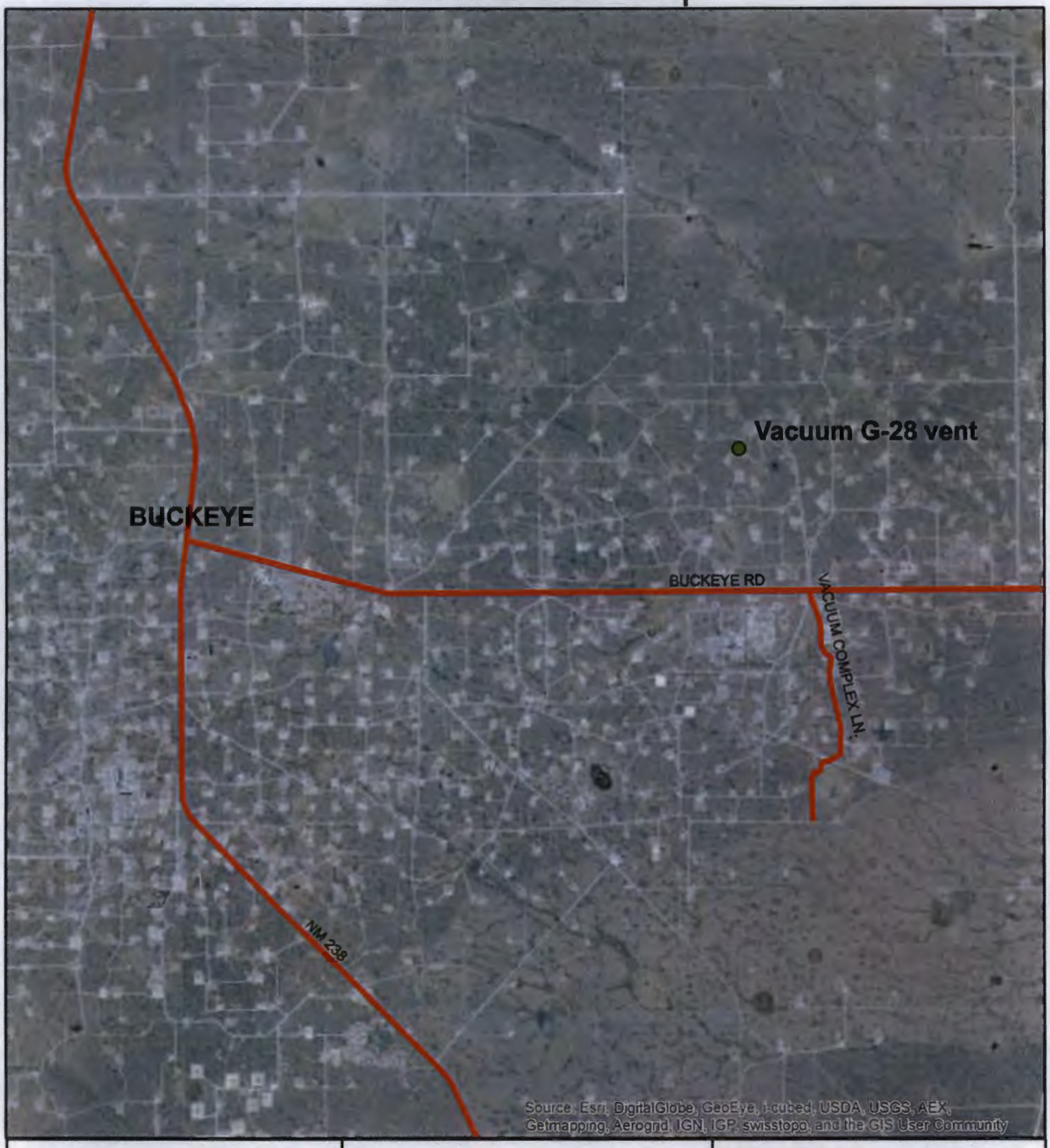
Attachments:

- Figure 1 – Site Location Map
- Figure 2 – Geographical Location Map
- Figure 3 – Junction Box Delineation Verticals
- Figure 4 – Soil Bore Installation and Proposed Liner
- Appendix A – Soil Bore Installation and Surface Sample Documentation
- Appendix B – Multimed Documentation

Figures

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

Site Location Map



RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

Vacuum G-28 vent

Legals: UL/G sec. 28
T17S R35E
LEA COUNTY, NM

NMOCD Case #: 1R425-65

Figure 1

N W E S

0 0.5 1 Miles

Drawing date: 8-15-13
Drafted by: L. Weinheimer

Geographical Location Map

RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC

RECS

Vacuum G-28 vent

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T17S R35E
LEA COUNTY, NM

NMOCD Case #: 1R425-65

Figure 2

N
W E
S

0 485 970
Feet

Drawing date: 8-15-13
Drafted by: L. Weinheimer

Junction Box Delineation Verticals

Source

Depth	Cl-	PID
2	146	0.5
3	148	0
4	353	0.2
5	962	0
6	2708	0
7	375	0.8
8	5980	0.3
9	6247	0.2
10	9730	0
11	9216	0
12	12501	0

5' N

Depth	Cl-	PID
3	1980	0
4	788	0
5	7356	0
6	7420	0
7	8493	0
8	11120	0
9	12602	0
10	13900	0
11	17217	0
12	11629	0

5' S

Depth	Cl-	PID
3	1993	0
4	757	0
5	856	0
6	1455	0
7	4780	0
8	1605	0
9	2483	0
10	5122	0
11	10099	0
12	13314	0

5' E

Depth	Cl-	PID
3	1448	0
4	1678	0
5	1836	0
6	3652	0
7	4449	0
8	4467	0
9	6734	0
10	9852	0
11	11176	0
12	12472	0

5' W

Depth	Cl-	PID
3	858	0
4	480	0
5	940	0
6	1890	0
7	3441	0
8	4889	0
9	6613	0
10	17268	0
11	13427	0
12	13372	0

10' N

Depth	Cl-	PID
3	3151	0
4	1547	0
5	4406	0
6	6686	0
7	7460	0
8	9199	0
9	12116	0
10	14109	0
11	13048	0
12	13312	0

10' S

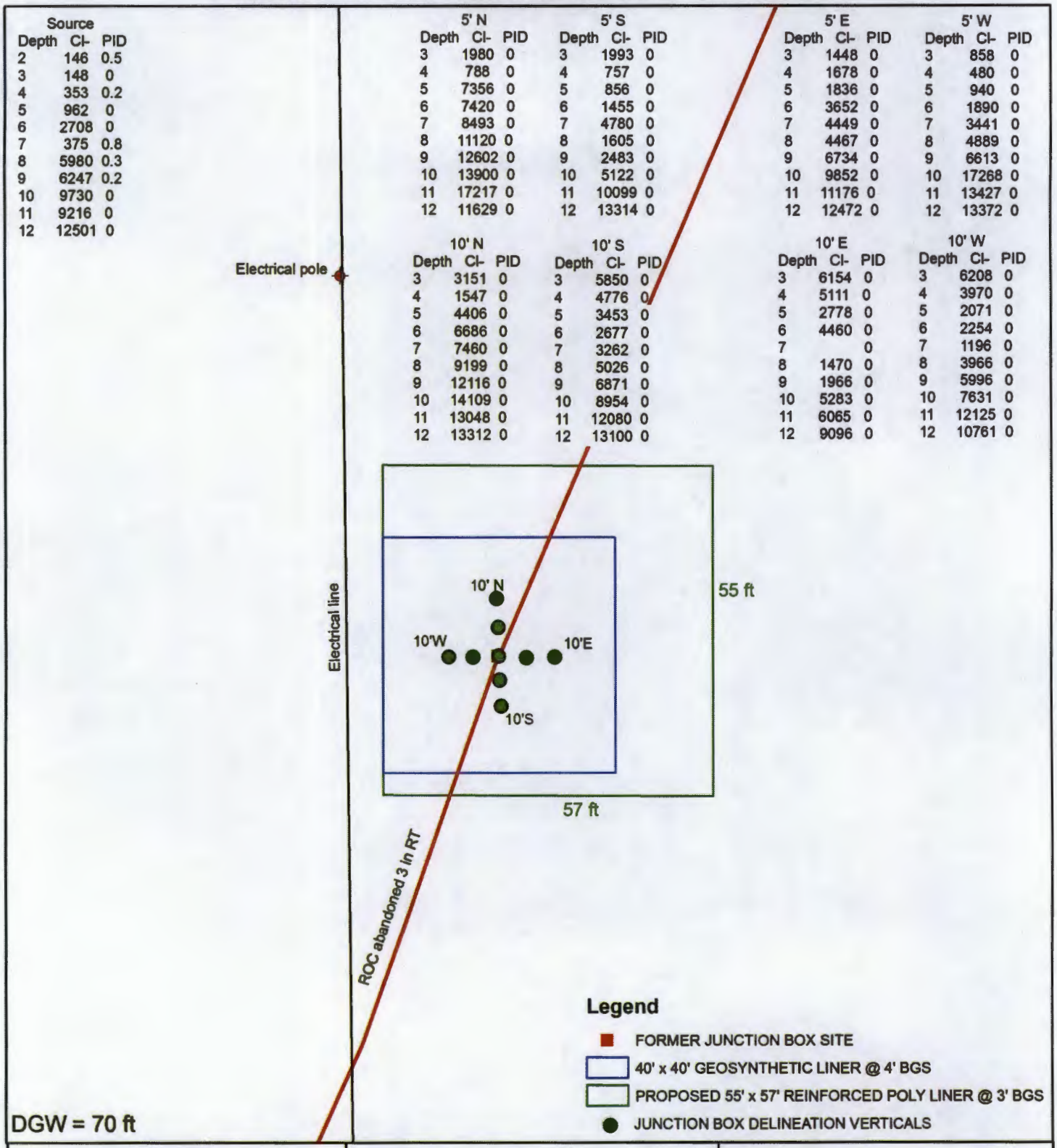
Depth	Cl-	PID
3	5850	0
4	4776	0
5	3453	0
6	2677	0
7	3262	0
8	5026	0
9	6871	0
10	8954	0
11	12080	0
12	13100	0

10' E

Depth	Cl-	PID
3	6154	0
4	5111	0
5	2778	0
6	4460	0
7		0
8	1470	0
9	1966	0
10	5283	0
11	6065	0
12	9096	0

10' W

Depth	Cl-	PID
3	6208	0
4	3970	0
5	2071	0
6	2254	0
7	1196	0
8	3966	0
9	5996	0
10	7631	0
11	12125	0
12	10761	0



DGW = 70 ft

RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC — RECS

Vacuum G-28 vent

Legals: UL/G sec. 28
T17S R35E
LEA COUNTY, NM

NMOCD Case #: 1R425-65

Figure 3

N W E S

0 10 20 40 Feet

Drawing date: 8-16-13
Drafted by: L. Weinheimer

Soil Bore Installation and Proposed Liner

SB-1

Depth	Cl-	PID	LAB Cl-	GRO	DRO
15	736	0.8			
20	829	0.9			
25	3049	1.2	2720	<10	<10
30	1745	1.3			
35	994	1.1			
40	497	1.3			
45	307	1.1			
50	181	1.3	64	<10	<10

SB-2

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	2339	1.0			
10	5396	0.8	5760	<10	<10
15	3014	1.0			
20	837	0.9			
25	282	0.5			
30	180	0.3			
35	173	0.3	96	<10	<10

SB-3

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	3128	0.7			
10	5203	0.3	5840	<10	<10
15	3406	0.3			
20	1466	0.4			
25	4005	0.2			
30	1302	0.3			
35	534	0.2			
40	286	0.1			
45	238	0			
50	166	0	144	<10	<10

15' W Surface Sample

Depth	LAB Cl-	PID
SURFACE	128	55.9

29' N Surface Sample

Depth	LAB Cl-	GRO	DRO
SURFACE	48	<10	<10

SB-4

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	1200	0.1			
10	5158	0	6880	<10	<10
15	3652	0			
20	1852	0			
25	608	0			
30	280	0			
35	150	0.1	64	<10	<10

SB-5

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	572	0.2			
5	1877	1.3	2160	<10	<10
10	276	2.0	224	<10	<10

SB-6

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	7723	1.7			
5	2195	1.9			
10	6772	2.2	7000	<10	<10
15	4076	2.7			
20	2777	1.5			
25	274	1.7	192	<10	<10

SB-7

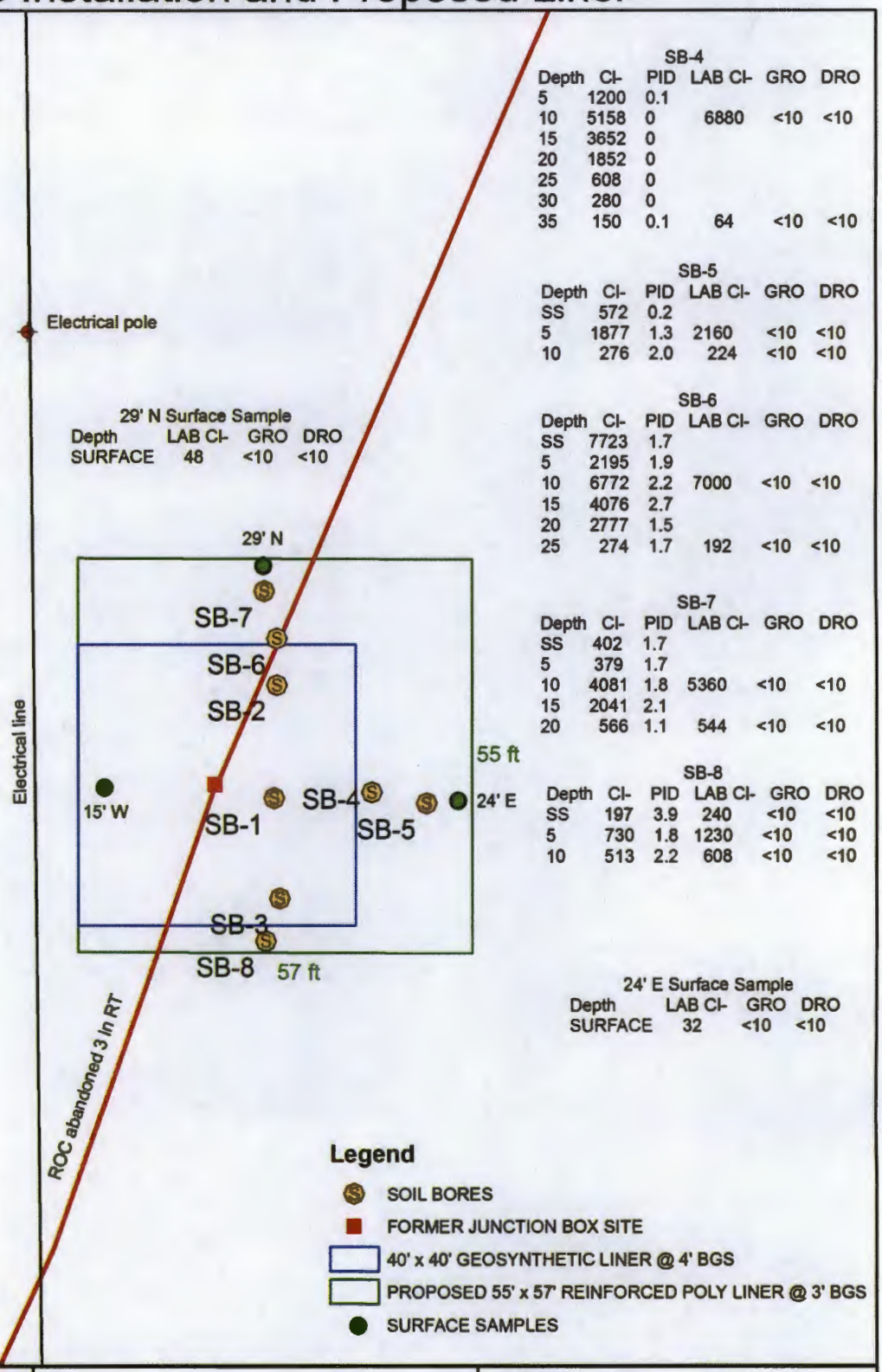
Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	402	1.7			
5	379	1.7			
10	4081	1.8	5360	<10	<10
15	2041	2.1			
20	566	1.1	544	<10	<10

SB-8

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	197	3.9	240	<10	<10
5	730	1.8	1230	<10	<10
10	513	2.2	608	<10	<10

24' E Surface Sample

Depth	LAB Cl-	GRO	DRO
SURFACE	32	<10	<10



DGW = 70 ft

RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC — RECS

Vacuum G-28 vent

Legals: UL/G sec. 28
T17S R35E
LEA COUNTY, NM

NMOCD Case #: 1R425-65

Figure 4

N W E S

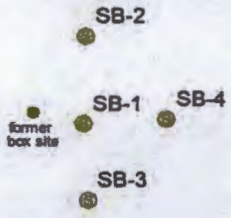
0 10 20 40 Feet

Drawing date: 8-16-13
Drafted by: L. Weinheimer

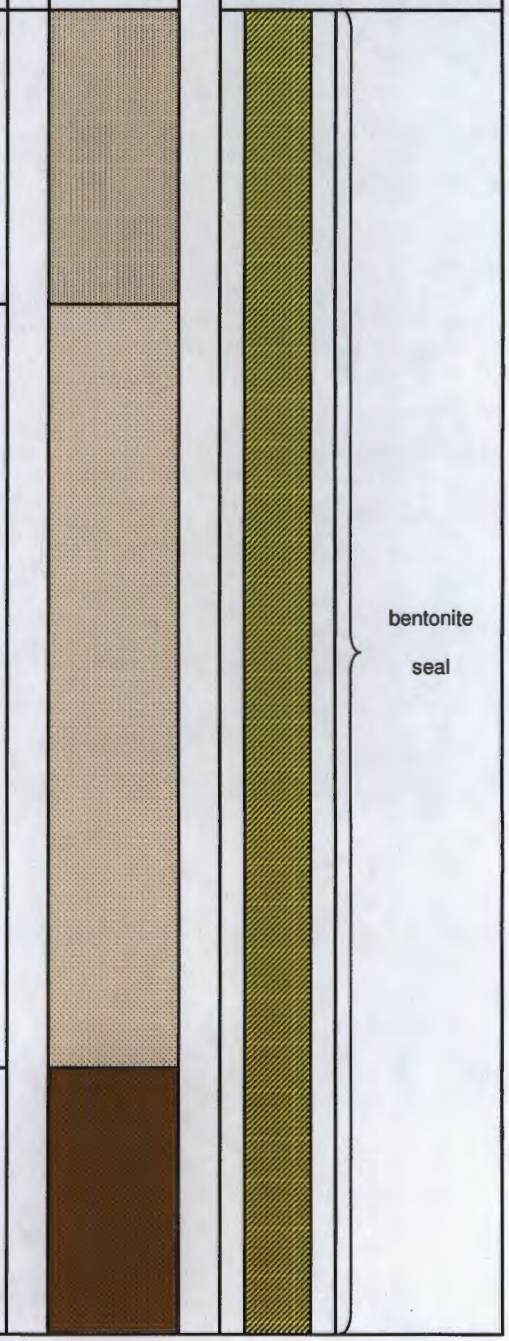
Appendix A

Soil Bore Installation and Surface Sample Documentation

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

Logger:	Jordan Woodfin		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		**Project Name:** Vacuum G-28 vent **Well ID:** SB-1
Start Date:	10/27/2010		**Project Consultant:** RECS
End Date:	10/27/2010		**Location:** UL/G sec. 28 T17S R35E
Comments: Located 8 ft east of the former junction box. All samples were from cuttings. **DRAFTED BY: L. Weinheimer** TD = 50 ft GW = 70 ft			**Lat:** 32°48'29.722"N **Long:** 103°27'34.621"W **County:** LEA **State:** NM

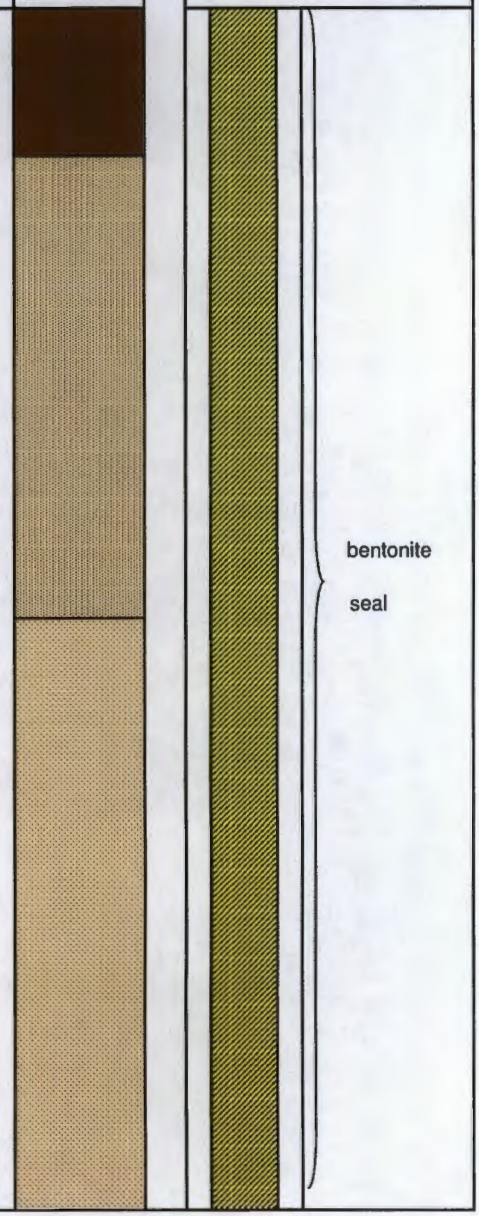
Depth (feet)	chloride field tests	LAB	PID	Description
				Large caliche fragments and tan coarse sand (hard drilling)
15 ft	736		0.8	
20 ft	829		0.9	
				Tan fine sand and caliche (hard drilling)
25 ft	3049	Cl- 2720	1.2	
		GRO <10		
		DRO <10		
30 ft	1745		1.3	
35 ft	994		1.1	
40 ft	497		1.3	
45 ft	307		1.1	
				Light brown very fine sand
50 ft	181	Cl- 64	1.3	
		GRO <10		
		DRO <10		

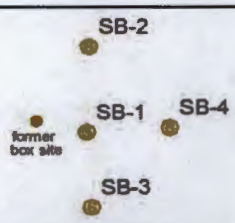


Logger:	Jordan Woodfin		**Project Name:** Vacuum G-28 vent **Well ID:** SB-2
Driller:	Harrison & Cooper, Inc.		**Project Consultant:** RECS
Drilling Method:	Air rotary		**Location:** UL/G sec. 28 T17S R35E
Start Date:	10/27/2010		**Lat:** 32°48'29.879"N **County:** LEA
End Date:	10/27/2010		**Long:** 103°27'34.61"W **State:** NM

Comments: Located 16 ft north east of the former junction box.
All samples were from cuttings.
DRAFTED BY: L. Weinheimer
TD = 35 ft GW = 70 ft

Depth (feet)	chloride field tests	LAB	PID	Description
				Dark brown coarse sand and caliche mix (hard drilling)
5 ft	2339		1.0	
				Tan fine sand and hard caliche mix (hard drilling)
10 ft	5396	Cl- 5760	0.8	
		GRO <10		
		DRO <10		
15 ft	3014		1.0	
20 ft	837		0.9	
				Tan very fine sand and caliche fragments (hard drilling)
25 ft	282		0.5	
30 ft	180		0.3	
35 ft	173	Cl- 96	0.3	
		GRO <10		
		DRO <10		



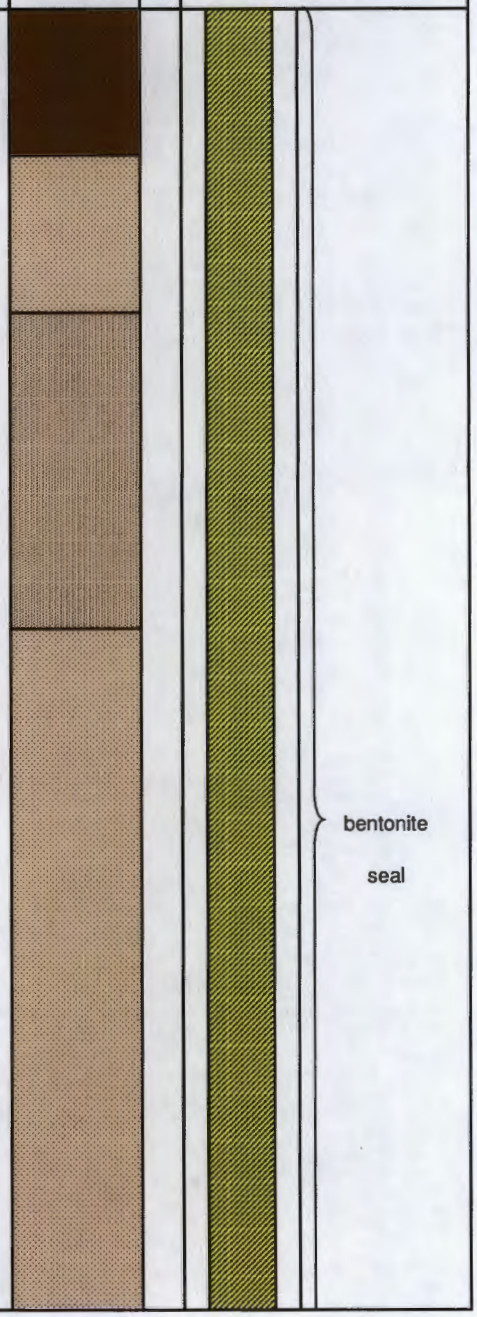
Logger:	Jordan Woodfin		**Project Name:** Vacuum G-28 vent **Well ID:** SB-3
Driller:	Harrison & Cooper, Inc.		**Project Consultant:** RECS
Drilling Method:	Air rotary		**Location:** UL/G sec. 28 T17S R35E
Start Date:	10/27/2010		**Lat:** 32°48'29.581"N **County:** LEA
End Date:	10/27/2010		**Long:** 103°27'34.607"W **State:** NM

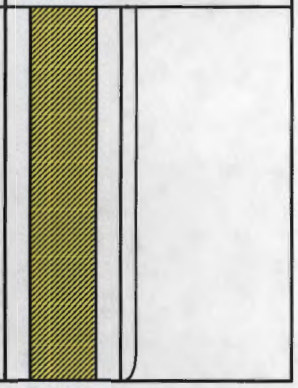
Comments: Located 18 ft south east of the former junction box. All samples were from cuttings.

DRAFTED BY: L. Weinheimer

TD = 50 ft GW = 70 ft

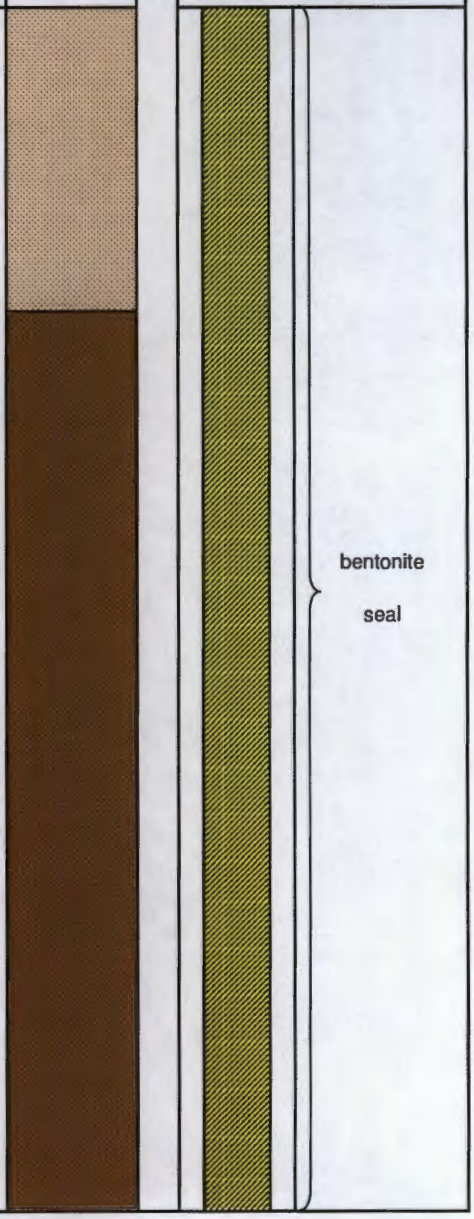
Depth (feet)	chloride field tests	LAB	PID	Description
				Brown coarse sand with hard calcihe (hard drilling)
5 ft	3,128		0.7	
				Tan fine grain sand
10 ft	5,203	CI- 5840	0.3	
		GRO <10		Caliche and sandstone mix (hard drilling)
		DRO <10		
15 ft	3,406		0.3	
20 ft	1,466		0.4	
				Tan very fine sand
25 ft	4,005		0.2	
30 ft	1,302		0.3	
35 ft	534		0.2	
40 ft	286		0.1	



Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
						
45 ft	238		0.0			
50 ft	166	CI-144	0.0			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		**Project Name:** Vacuum G-28 vent **Well ID:** SB-4
Start Date:	10/27/2010		
End Date:	10/27/2010		**Project Consultant:** RECS
Comments: Located 22 ft east of the former junction box. All samples were from cuttings. **DRAFTED BY: L. Weinheimer**			**Location:** UL/G sec. 28 T17S R35E
TD = 35 ft	GW = 70 ft		**Lat:** 32°48'29.728"N **County:** LEA **Long:** 103°27'34.453"W **State:** NM

Depth (feet)	chloride field tests	LAB	PID	Description
				Tan fine sand
5 ft	1200		0.1	
10 ft	5158	Cl- 6880	0.0	
		GRO <10		Light brown fine sand
		<DRO <10		
15 ft	3652		0.0	
20 ft	1852		0.0	
25 ft	608		0.0	
30 ft	280		0.0	
35 ft	150	Cl- 64	0.1	
		GRO <10		
		<DRO <10		



Logger:	Kyle Norman		
Driller:	Harrison & Cooper, Inc.		**Project Name:** Vacuum G-28 vent **Well ID:** SB-5
Drilling Method:	Air rotary		**Project Consultant:** RECS
Start Date:	2/29/2012		
End Date:	2/29/2012		

Comments: Located 31 ft east of the former junction box site. All samples were from cuttings.

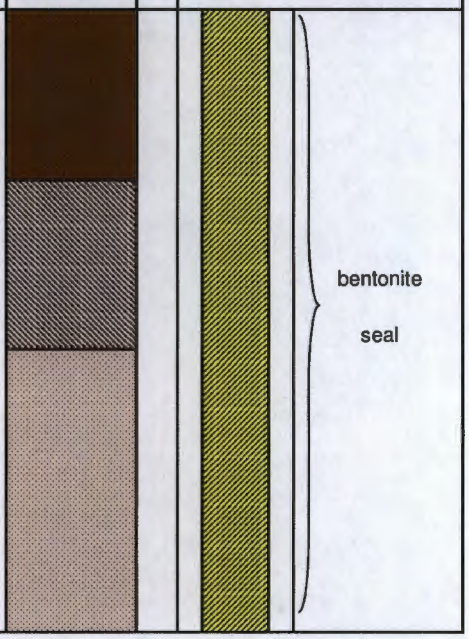
DRAFTED BY: L. Weinheimer

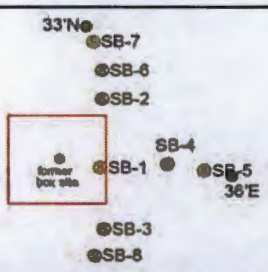
TD = 10 ft GW = 70 ft

Location: UL/G sec. 28 T17S R35E

Lat: 32°48'29.709"N **Long:** 103°27'34.36"W **County:** Lea **State:** NM

Depth (feet)	Chloride field tests	LAB	PID	Description
				Brown Sand
SS	572		0.2	
				Tan Sand With Some Sandstone
5 ft	1877	Cl- 2160	1.3	
		GRO <10		Tan Sand
		DRO <10		
10 ft	276	Cl- 224	2.0	
		GRO <10		
		DRO <10		



Logger:	Kyle Norman		**Project Name:** Vacuum G-28 vent **Well ID:** SB-6
Driller:	Harrison & Cooper, Inc.		**Project Consultant:** RECS
Drilling Method:	Air rotary		
Start Date:	2/29/2012		
End Date:	2/29/2012		

Comments: Located 23 ft north of the former junction box site. All samples were from cuttings.

DRAFTED BY: L. Weinheimer

TD = 25 ft GW = 70 ft

Location: UL/G sec. 28 T17S R35E

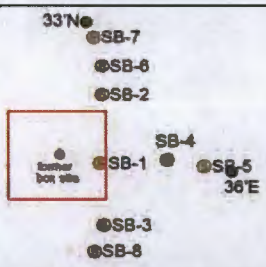
Lat: 32°48'29.943"N **County:** Lea

Long: 103°27'34.608"W **State:** NM

Depth (feet)	Chloride field tests	LAB	PID	Description
				Brown Sand
SS	7723		1.7	
				Tan Sand
5 ft	2195		1.9	
				Tan Sand With Some Sandstone
10 ft	6772	Cl- 7000	2.2	
		GRO <10		
		DRO <10		
15 ft	4076		2.7	
20 ft	2777		1.5	
				Red/Tan Sand
25 ft	274	Cl- 192	1.7	
		GRO <10		
		DRO <10		

Lithology

Well Construction: bentonite seal

Logger:	Kyle Norman		**Project Name:** Vacuum G-28 vent **Well ID:** SB-7
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		**Project Consultant:** RECS
Start Date:	2/29/2012		
End Date:	2/29/2012		

Comments: Located 28 ft north of the former junction box site. All samples were from cuttings.

DRAFTED BY: L. Weinheimer

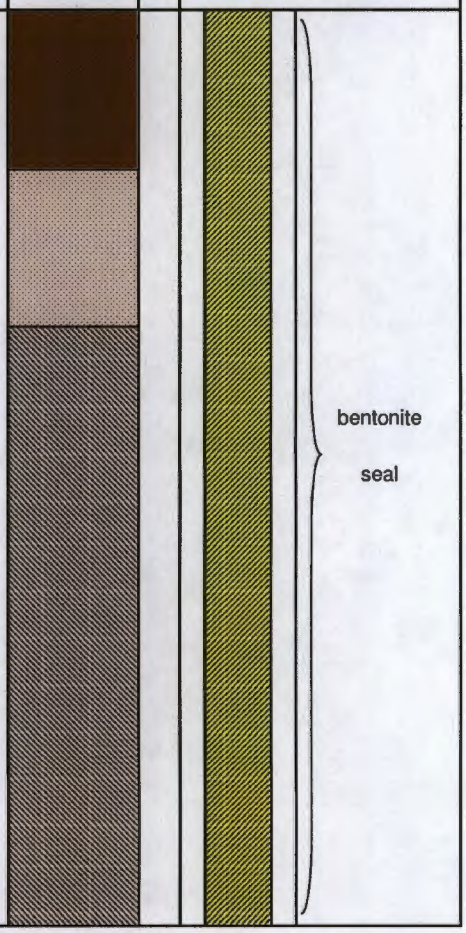
TD = 20 ft GW = 70 ft

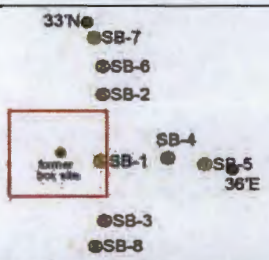
Location: UL/G sec. 28 T17S R35E

Lat: 32°48'30.008"N **County:** Lea

Long: 103°27'34.629"W **State:** NM

Depth (feet)	Chloride field tests	LAB	PID	Description
				Brown Sand
SS	402		1.7	
				Tan Sand
5 ft	379		1.7	
				Tan Sand With Some Sandstone
10 ft	4081	Cl- 5360	1.8	
		GRO <10		
		DRO <10		
15 ft	2041		2.1	
20 ft	566	Cl- 544	1.1	
		GRO <10		
		DRO <10		



Logger:	Kyle Norman		**Project Name:** Vacuum G-28 vent **Well ID:** SB-8
Driller:	Harrison & Cooper, Inc.		**Project Consultant:** RECS
Drilling Method:	Air rotary		
Start Date:	3/1/2012		
End Date:	3/1/2012		
Comments: Located 23 ft south of the former junction box site. All samples were from cuttings. **DRAFTED BY: L. Weinheimer** TD = 10 ft GW = 70 ft			**Location:** UL/G sec. 28 T17S R35E **Lat:** 32°48'29.518"N **Long:** 103°27'34.634"W **County:** Lea **State:** NM

Depth (feet)	Chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Brown Sand		
SS	197	Cl- 240	3.9			
		GRO <10		Tan Sand With Some Sandstone		bentonite seal
		DRO <10				
5 ft	730	Cl- 1230	1.8			
		GRO <10				
		DRO <10				
10 ft	513	Cl- 608	2.2			
		GRO <10				
		DRO <10				

CARDINAL Laboratories

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

November 02, 2010

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: VACUUM G-28 VENT

Enclosed are the results of analyses for samples received by the laboratory on 10/28/10 8:25.

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:	10/28/2010	Sampling Date:	10/27/2010
Reported:	11/02/2010	Sampling Type:	Soil
Project Name:	VACUUM G-28 VENT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	VACUUM G-28 VENT		

Sample ID: SB #1 @ 25 FT (H021164-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2720**	16.0	10/29/2010	ND	448	112	400	3.64	

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	179	89.3	200	16.0	
DRO >C10-C28	<10.0	10.0	10/30/2010	ND	168	84.2	200	24.1	

Surrogate: 1-Chlorooctane	*100 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*101 %*	*70-130*

Sample ID: SB #1 @ 50 FT (H021164-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**64.0**	16.0	10/29/2010	ND	448	112	400	3.64	

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	179	89.3	200	16.0	
DRO >C10-C28	<10.0	10.0	10/30/2010	ND	168	84.2	200	24.1	

Surrogate: 1-Chlorooctane	*95.5 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*96.2 %*	*70-130*

Cardinal Laboratories *=Accredited Analyte

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:	10/28/2010	Sampling Date:	10/27/2010
Reported:	11/02/2010	Sampling Type:	Soil
Project Name:	VACUUM G-28 VENT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	VACUUM G-28 VENT		

Sample ID: SB #2 @ 10 FT (H021164-03)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**5760**	16.0	10/29/2010	ND	448	112	400	3.64	

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	179	89.3	200	16.0	
DRO >C10-C28	<10.0	10.0	10/30/2010	ND	168	84.2	200	24.1	

Surrogate: 1-Chlorooctane	*97.1 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*98.1 %*	*70-130*

Sample ID: SB #2 @ 35 FT (H021164-04)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**96.0**	16.0	10/29/2010	ND	448	112	400	3.64	

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	179	89.3	200	16.0	
DRO >C10-C28	<10.0	10.0	10/30/2010	ND	168	84.2	200	24.1	

Surrogate: 1-Chlorooctane	*90.3 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*89.6 %*	*70-130*

Cardinal Laboratories

*=Accredited Analyte

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:	10/28/2010	Sampling Date:	10/27/2010
Reported:	11/02/2010	Sampling Type:	Soil
Project Name:	VACUUM G-28 VENT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	VACUUM G-28 VENT		

Sample ID: SB #3 @ 10 FT (H021164-05)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**5840**	16.0	10/29/2010	ND	448	112	400	3.64	

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	179	89.3	200	16.0	
DRO >C10-C28	<10.0	10.0	10/30/2010	ND	168	84.2	200	24.1	

Surrogate: 1-Chlorooctane	*89.4 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*92.4 %*	*70-130*

Sample ID: SB #3 @ 50 FT (H021164-06)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**144**	16.0	10/29/2010	ND	448	112	400	3.64	

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	179	89.3	200	16.0	
DRO >C10-C28	<10.0	10.0	10/30/2010	ND	168	84.2	200	24.1	

Surrogate: 1-Chlorooctane	*90.9 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*92.7 %*	*70-130*

Cardinal Laboratories

*=Accredited Analyte

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:	10/28/2010	Sampling Date:	10/27/2010
Reported:	11/02/2010	Sampling Type:	Soil
Project Name:	VACUUM G-28 VENT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	VACUUM G-28 VENT		

Sample ID: SB #4 @ 10 FT (H021164-07)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**6880**	16.0	10/29/2010	ND	448	112	400	3.64	

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	179	89.3	200	16.0	
DRO >C10-C28	<10.0	10.0	10/30/2010	ND	168	84.2	200	24.1	

Surrogate: 1-Chlorooctane	*97.3 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*99.4 %*	*70-130*

Sample ID: SB #4 @ 35 FT (H021164-08)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**64.0**	16.0	10/29/2010	ND	448	112	400	3.64	

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	179	89.3	200	16.0	
DRO >C10-C28	<10.0	10.0	10/30/2010	ND	168	84.2	200	24.1	

Surrogate: 1-Chlorooctane	*97.0 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*97.3 %*	*70-130*

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene

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

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: Vacuum G-28 Vent	**State:** **Zip:**
Project Location: Vacuum G-28 Vent	**Phone #:**
Sampler Name: Jordan Woodfin	**Fax #:**

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	PRESERV.: ACID/BASE:	ICE / COOL	OTHER :	SAMPLING: DATE	TIME	Chlorides	TPH 8015 M	BTEX	Texas TPH	Complete Cations/Anions
H21164-1	SB # 1 @ 25FT		1			✓					✓		10/27/10	10:30	✓	✓			
2	SB # 1 @ 50FT		1			✓					✓		10/27/10	11:15	✓	✓			
3	SB # 2 @ 10FT		1			✓					✓		10/27/10	01:00	✓	✓			
4	SB # 2 @ 35FT		1			✓					✓		10/27/10	01:30	✓	✓			
5	SB # 3 @ 10FT		1			✓					✓		10/27/10	02:15	✓	✓			
6	SB # 3 @ 50FT		1			✓					✓		10/27/10	02:45	✓	✓			
7	SB # 4 @ 10FT		1			✓					✓		10/27/10	03:00	✓	✓			
8	SB # 4 @ 35FT		1			✓					✓		10/27/10	03:30	✓	✓			

Relinquished By: Jordan Woodfin	**Date:** 10/28/10 **Time:** 7:30	**Received By:**	
Relinquished By:	**Date:** 10/28/10 **Time:** 8:25	**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@riceswd.com;
Lweinheimer@riceswd.com kjones@riceswd.com

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

NEED SAMPLES BACK, PLEASE

#26

CARDINAL Laboratories

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

March 05, 2012

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: VACUUM G-28 VENT

Enclosed are the results of analyses for samples received by the laboratory on 02/29/12 16:55.

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.

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 (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

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:	02/29/2012	Sampling Date:	02/29/2012
Reported:	03/05/2012	Sampling Type:	Soil
Project Name:	VACUUM G-28 VENT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	VACUUM G-28 VENT		

Sample ID: SB 5 @ 5' (H200541-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2160**	16.0	03/02/2012	ND	416	104	400	0.00	

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	03/03/2012	ND	192	96.2	200	3.12	
DRO >C10-C28	<10.0	10.0	03/03/2012	ND	157	78.5	200	2.75	

Surrogate: 1-Chlorooctane	*90.6 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*97.6 %*	*57.6-158*

Sample ID: SB 5 @ 10' (H200541-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**224**	16.0	03/02/2012	ND	416	104	400	0.00	

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	03/03/2012	ND	192	96.2	200	3.12	
DRO >C10-C28	<10.0	10.0	03/03/2012	ND	157	78.5	200	2.75	

Surrogate: 1-Chlorooctane	*94.0 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*103 %*	*57.6-158*

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:	02/29/2012	Sampling Date:	02/29/2012
Reported:	03/05/2012	Sampling Type:	Soil
Project Name:	VACUUM G-28 VENT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	VACUUM G-28 VENT		

Sample ID: SB 6 @ 10' (H200541-03)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**7000**	16.0	03/02/2012	ND	416	104	400	0.00	

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	03/03/2012	ND	192	96.2	200	3.12	
DRO >C10-C28	<10.0	10.0	03/03/2012	ND	157	78.5	200	2.75	

Surrogate: 1-Chlorooctane	*92.6 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*99.0 %*	*57.6-158*

Sample ID: SB 6 @ 25' (H200541-04)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**192**	16.0	03/02/2012	ND	416	104	400	0.00	

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	03/03/2012	ND	192	96.2	200	3.12	
DRO >C10-C28	<10.0	10.0	03/03/2012	ND	157	78.5	200	2.75	

Surrogate: 1-Chlorooctane	*92.5 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*97.3 %*	*57.6-158*

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:	02/29/2012	Sampling Date:	02/29/2012
Reported:	03/05/2012	Sampling Type:	Soil
Project Name:	VACUUM G-28 VENT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	VACUUM G-28 VENT		

Sample ID: SB 7 @ 10' (H200541-05)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**5360**	16.0	03/02/2012	ND	416	104	400	0.00	

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	03/03/2012	ND	192	96.2	200	3.12	
DRO >C10-C28	<10.0	10.0	03/03/2012	ND	157	78.5	200	2.75	

Surrogate: 1-Chlorooctane	*86.2 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*90.6 %*	*57.6-158*

Sample ID: SB 7 @ 20' (H200541-06)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**544**	16.0	03/02/2012	ND	416	104	400	0.00	

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	03/03/2012	ND	192	96.2	200	3.12	
DRO >C10-C28	<10.0	10.0	03/03/2012	ND	157	78.5	200	2.75	

Surrogate: 1-Chlorooctane	*93.6 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*98.5 %*	*57.6-158*

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

S-HI	High surrogate recovery was confirmed as a matrix effect by a second analysis.
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

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	BILL TO
Project Manager: Hack Conder	P.O. #:
Address:	Company:
City: State: NM Zip:	Attn:
Phone #: Fax #:	Address:
Project #: Project Owner:	City:
Project Name:	State: Zip:
Project Location: Vacuum Gas Plant 175-35E	Phone #:
Sampler Name: Kyle Norman	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	TDS					
H200541																									
1	SB5 @ 5'	G	1			✓					✓		2-20-12	1:45	✓	✓									
2	SB5 @ 10'	G	1			✓					✓		2-20-12	2:00	✓	✓									
3	SB6 @ 10'	G	1			✓					✓			3:00	✓	✓									
4	SB6 @ 25'	G	1			✓					✓			3:45	✓	✓									
5	SB7 @ 15'	G	1			✓					✓			4:00	✓	✓									
6	SB7 @ 20'	G	1			✓					✓			4:20	✓	✓									

Relinquished By:	Date: 2-21-12	Received By:	Phone Result: ☐ Yes ☑ No Add'l Phone #:
	Time: 4:55	Jodi Henson	Fax Result: ☐ Yes ☑ No Add'l Fax #:
Relinquished By:	Date:	Received By:	REMARKS: email results kjones@riceswd.com; knorman@rice-ecs.com; Zconder@rice-ecs.com; Bbaker@rice-ecs.com; hconder@rice-ecs.com; Lweinheimer@rice-ecs.com
	Time:		
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Sample Condition Cool ☑ Yes ☐ No Intact ☑ Yes ☐ No	CHECKED BY: (Initials)	

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

#26

CARDINAL Laboratories

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

March 06, 2012

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: VACUUM G-28 VENT

Enclosed are the results of analyses for samples received by the laboratory on 03/01/12 13:20.

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.

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 (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

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:	03/01/2012	Sampling Date:	03/01/2012
Reported:	03/06/2012	Sampling Type:	Soil
Project Name:	VACUUM G-28 VENT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	VACUUM G-28 VENT		

Sample ID: SB 8 @ 5' (H200550-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1230**	16.0	03/02/2012	ND	432	108	400	0.00	

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	03/05/2012	ND	206	103	200	15.5	
DRO >C10-C28	<10.0	10.0	03/05/2012	ND	195	97.3	200	8.29	

Surrogate: 1-Chlorooctane	*104 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*103 %*	*57.6-158*

Sample ID: SB 8 @ 10' (H200550-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**608**	16.0	03/02/2012	ND	432	108	400	0.00	

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	03/05/2012	ND	206	103	200	15.5	
DRO >C10-C28	<10.0	10.0	03/05/2012	ND	195	97.3	200	8.29	

Surrogate: 1-Chlorooctane	*98.2 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*97.6 %*	*57.6-158*

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, 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	**BILL TO** P.O. #:
Project Manager: Zach Conder	Company:
Address:	Attn:
City: State: NM Zip:	Address:
Phone #: Fax #:	City:
Project #: Project Owner:	State: Zip:
Project Name:	Phone #:
Project Location: Vacuum J-28 Unit I, Sec 28	Fax #:
Sampler Name: Kyle Norman	

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	TDS					
H200550																								
1	SB 8 @ 5'	G	1			✓					✓		3-1-12	9:45	✓	✓									
2	SB 8 @ 10'	G	1			✓					✓		3-1-12	10:00	✓	✓									

Relinquished By:	Date: 3-1-12	Received By:	Phone Result: ☐ Yes ☑ No	Add'l Phone #:
	Time: 1:20	Jodi Henson	Fax Result: ☐ Yes ☐ No	Add'l Fax #:
Relinquished By:	Date:	Received By:	REMARKS:	
	Time:		email results	
Delivered By: (Circle One)	Sample Condition: Cool ✓ Yes ☐ No; Intact ☐ Yes ☐ No	CHECKED BY: (Initials)	kjones@riceswd.com; knorman@rice-ecs.com;	
Sampler - UPS - Bus - Other:			Zconder@rice-ecs.com; Bbaker@rice-ecs.com;	
			hconder@rice-ecs.com; Lweinheimer@rice-ecs.com	

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

#26

CARDINAL Laboratories

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

March 06, 2012

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: VACUUM G-28 VENT

Enclosed are the results of analyses for samples received by the laboratory on 03/01/12 13:20.

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.

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 (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

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:	03/01/2012	Sampling Date:	03/01/2012
Reported:	03/06/2012	Sampling Type:	Soil
Project Name:	VACUUM G-28 VENT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	VACUUM G-28 VENT		

Sample ID: SB 8 @ SURFACE (H200549-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**240**	16.0	03/02/2012	ND	432	108	400	0.00	

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	03/05/2012	ND	206	103	200	15.5	
DRO >C10-C28	<10.0	10.0	03/05/2012	ND	195	97.3	200	8.29	

Surrogate: 1-Chlorooctane	*102 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*106 %*	*57.6-158*

Sample ID: SURFACE @ 24' EAST (H200549-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**32.0**	16.0	03/02/2012	ND	432	108	400	0.00	

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	03/05/2012	ND	206	103	200	15.5	
DRO >C10-C28	<10.0	10.0	03/05/2012	ND	195	97.3	200	8.29	

Surrogate: 1-Chlorooctane	*89.4 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*96.3 %*	*57.6-158*

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:	03/01/2012	Sampling Date:	03/01/2012
Reported:	03/06/2012	Sampling Type:	Soil
Project Name:	VACUUM G-28 VENT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	VACUUM G-28 VENT		

Sample ID: SURFACE @ 29' NORTH (H200549-03)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**48.0**	16.0	03/02/2012	ND	432	108	400	0.00	

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	03/05/2012	ND	206	103	200	15.5	
DRO >C10-C28	<10.0	10.0	03/05/2012	ND	195	97.3	200	8.29	

Surrogate: 1-Chlorooctane	*95.3 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*99.1 %*	*57.6-158*

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, Lab Director/Quality Manager

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

CARDINAL LABORATORIES

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	BILL TO
Project Manager: Hark Conder	P.O. #:
Address:	Company:
City: State: NM Zip:	Attn:
Phone #: Fax #:	Address:
Project #: Project Owner:	City:
Project Name:	State: Zip:
Project Location: Vacuum G-28 Unit 17 S 35E	Phone #:
Sampler Name: Kyle Norman	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	TDS					
H200549																									
1	SB 5' Surface	G	1			✓					✓		3-1-12	8:45	✓	✓									
2	Surface @ 24' E	G	1			✓					✓		3-1-12	9:00	✓	✓									
3	Surface @ 29' N	G	1			✓					✓		3-1-12	9:30	✓	✓									

Relinquished By: Kyle N	Date: 3-1-12	Received By: Jodi Henson	Phone Result: ☐ Yes ☑ No Add'l Phone #:
	Time: 1:20		Fax Result: ☐ Yes ☑ No Add'l Fax #:
Relinquished By:	Date:	Received By:	REMARKS: email results kjones@riceswd.com; knorman@rice-ecs.com; Zconder@rice-ecs.com; Bbaker@rice-ecs.com; hconder@rice-ecs.com; Lweinheimer@rice-ecs.com
	Time:		
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Sample Condition Cool ☐ Yes ☐ No Intact ☐ Yes ☐ No	CHECKED BY: (Initials)	

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

#26

CARDINAL Laboratories

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

July 29, 2013

KATIE JONES

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: VACUUM G-28 VENT

Enclosed are the results of analyses for samples received by the laboratory on 07/26/13 9:11.

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.

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 (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

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
KATIE JONES
112 W. Taylor
Hobbs NM, 88240
Fax To: (575) 397-1471

Received:	07/26/2013	Sampling Date:	07/25/2013
Reported:	07/29/2013	Sampling Type:	Soil
Project Name:	VACUUM G-28 VENT	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Celey D. Keene
Project Location:	VACUUM G-28 VENT		

Sample ID: 15' W OF SOURCE SURFACE (H301762-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**128**	16.0	07/29/2013	ND	400	100	400	3.92	

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

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	**BILL TO**	
Project Manager:	Katie Jones	**P.O. #:**	
Address:	112 W. Taylor	**Company:**	
City:	Hobbs **State:** NM **Zip:** 88240	**Attn:**	
Phone #:	**Fax #:**	**Address:**	
Project #:	**Project Owner:**	**City:**	
Project Name:		**State:** **Zip:**	
Project Location:	Vacuum G-28 Vent	**Phone #:**	
Sampler Name:	KARANTA LEWIS	**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	TDS				
H301762																								
1	15' west of source Surface	G	1			✓					✓		7/25/13	9:47	✓									

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 the client for the 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 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequental 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 services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By: KARANTA LEWIS	**Date:** 7-26-13 **Time:** 9:11	**Received By:**	**Phone Result:** ☐ Yes ☑ No **Add'l Phone #:**
Relinquished By:	**Date:** **Time:**	**Received By:**	**Fax Result:** ☐ Yes ☑ No **Add'l Fax #:**
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	**Sample Condition** Cool: ☑ Yes ☐ No Intact: ☑ Yes ☐ No	**CHECKED BY: (Initials)**	**REMARKS:** email results knorman@rice-ecs.com hconder@rice-ecs.com; Lweinheimer@rice-ecs.com; kjones@riceswd.com; Lpena@riceswd.com klewis@rice-ecs.com
	-0.2°C	ch	

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

H84

RICE ENVIRONMENTAL CONSULTING & SAFETY

122 West Taylor Hobbs, NM 88240
PHONE: (505) 393-9174 FAX: (505) 397-1471
PID METER CALIBRATION & FIELD REPORT FORM

CK. MODEL NO.			
	X	MODEL: PGM 7300	SERIAL NO: 590-000508
		MODEL: PGM 7300	SERIAL NO: 590-000504
		MODEL: PGM 7320	SERIAL NO: 592-903318
		MODEL: PGM 7300	SERIAL NO: ___ 590-902690

GAS COMPOSITION: ISOBUTYLENE 100PPM / AIR: BALANCE

LOT# IAM 248-100-6	EXP: 7/1/2015
METER READING:100 PPM	

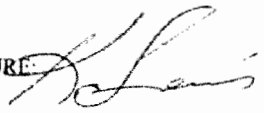
ACCURACY : +/- 2%

COMPANY
RICE

SITE	UNIT	SECTION	TOWN SHIP	RANGE
Vacuum G-28 vent	G	28	17S	35E

SAMPLE ID	PID	SAMPLE ID	PID
15' West of Source	55.9		

I verify that I have calibrated the above instrument in accordance to the manufacture operation manual.

SIGNATURE: 

DATE: 7-25-13

Appendix B

Multimed Documentation

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

MULTIMED V1.01 DATE OF CALCULATIONS: 18-OCT-2013 TIME: 11:28:38

U. S. E N V I R O N M E N T A L P R O T E C T I O N A G E N C Y

E X P O S U R E A S S E S S M E N T

M U L T I M E D I A M O D E L

MULTIMED (Version 1.50, 2005)

1
Run options
--- -------

Vacuum G-28 vent

(1R427-65)
Chemical simulated is Chloride

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration Specified By User: 7.620E-03 m/yr
Run was transient
Well Times: Entered Explicitly
Reject runs if Y coordinate outside plume
Reject runs if Z coordinate outside plume
Gaussian source used in saturated zone model
1
1
UNSATURATED ZONE FLOW MODEL PARAMETERS
(input parameter description and value)

NP	- Total number of nodal points	240
NMAT	- Number of different porous materials	1
KPROP	- Van Genuchten or Brooks and Corey	1
IMSHGN	- Spatial discretization option	1
NVFLAYR	- Number of layers in flow model	1

OPTIONS CHOSEN
------- ------
Van Genuchten functional coefficients
User defined coordinate system
1

Layer information

LAYER NO.	LAYER THICKNESS	MATERIAL PROPERTY
1	12.00	1

DATA FOR MATERIAL 1
---- --- --------
VADOSE ZONE MATERIAL VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS 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	12.0	0.000	0.000	0.000

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS 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.

1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY	- Number of different layers used		1
NTSTPS	- Number of time values concentration calc		40
DUMMY	- Not presently used		1
ISOL	- Type of scheme used in unsaturated zone		2
N	- Stehfest terms or number of increments		18
NTEL	- Points in Lagrangian interpolation		3
NGPTS	- Number of Gauss points		104
NIT	- Convolution integral segments		2
IBOUND	- Type of boundary condition		3
ITSGEN	- Time values generated or input		1
TMAX	- Max simulation time	--	0.0
WTFUN	- Weighting factor	--	1.2

OPTIONS CHOSEN

Convolution integral approach
Exponentially decaying continuous source
Computer generated times for computing concentrations

1

DATA FOR LAYER 1

VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Thickness of layer	m	CONSTANT	12.0	-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.

Vacuum G-28 vent (1R425-65) Multimed

Biological decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.

1

CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS 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	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Neutral hydrolysis rate constant	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Base catalyzed hydrolysis rate	l/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	cm2/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^3/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

1

SOURCE SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Infiltration rate	m/yr	CONSTANT	0.762E-02	-999.	-999.	-999.
Area of waste disposal unit	m^2	DERIVED	291.	-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	0.453E+04	-999.	-999.	-999.
Length scale of facility	m	CONSTANT	16.8	-999.	-999.	-999.
Width scale of facility	m	CONSTANT	17.4	-999.	-999.	-999.
Near field dilution		DERIVED	1.00	0.000	0.000	1.00

1

AQUIFER SPECIFIC VARIABLES

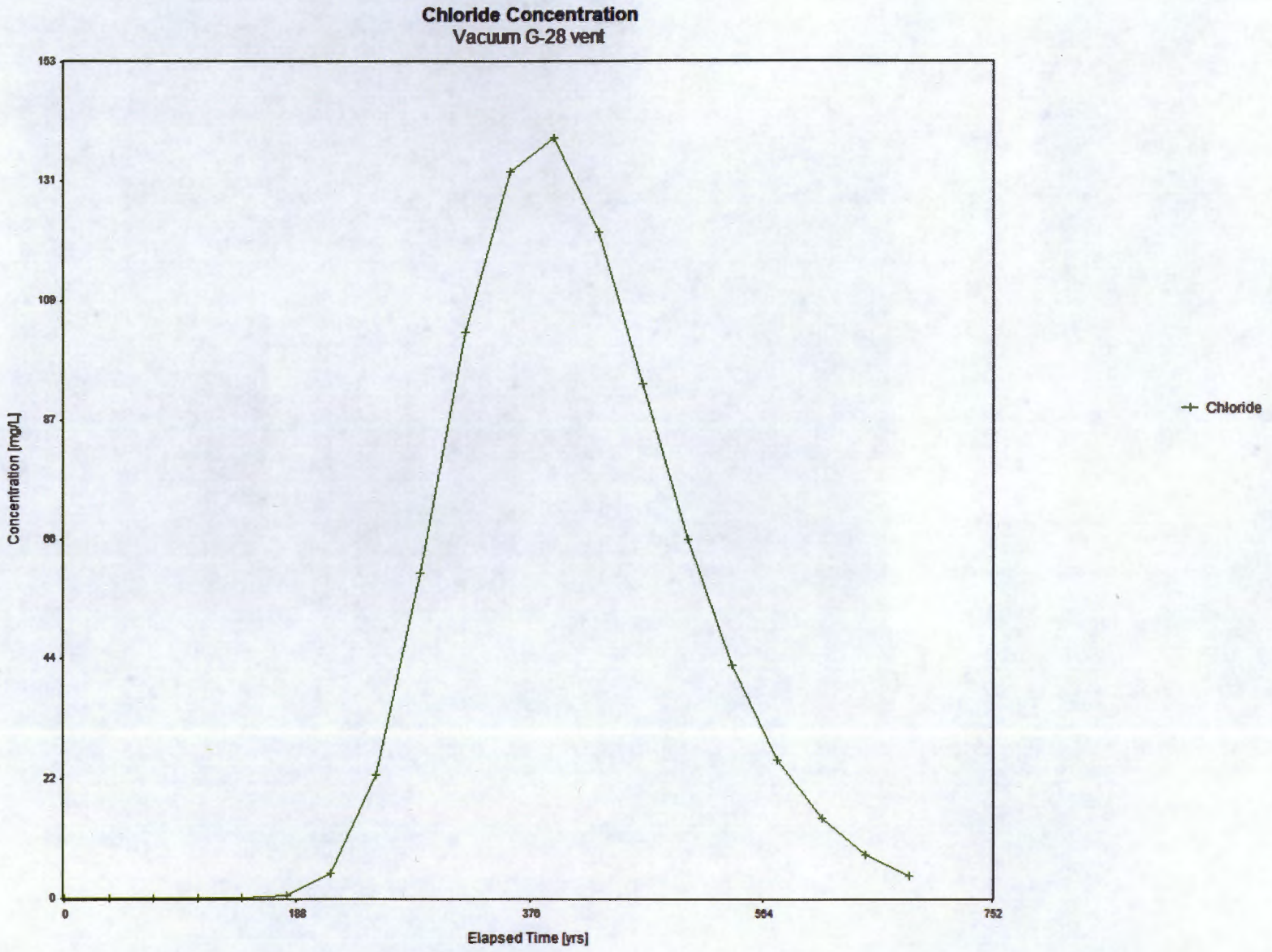
VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Particle diameter	cm	CONSTANT	-999.	-999.	-999.	-999.
Aquifer porosity	--	CONSTANT	0.300	-999.	-999.	-999.
Bulk density	g/cc	CONSTANT	1.86	-999.	-999.	-999.
Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
Source 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.

Vacuum G-28 vent (1R425-65) Multimed

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.

1

TIME	CONCENTRATION
0.000E+00	0.00000E+00
0.360E+02	0.00000E+00
0.720E+02	0.00000E+00
0.108E+03	0.00000E+00
0.144E+03	0.13538E-02
0.180E+03	0.44862E+00
0.216E+03	0.44013E+01
0.252E+03	0.22458E+02
0.288E+03	0.59298E+02
0.324E+03	0.10331E+03
0.360E+03	0.13282E+03
0.396E+03	0.13899E+03
0.432E+03	0.12165E+03
0.468E+03	0.94019E+02
0.504E+03	0.65633E+02
0.540E+03	0.42394E+02
0.576E+03	0.25236E+02
0.612E+03	0.14598E+02
0.648E+03	0.78325E+01
0.684E+03	0.41025E+01


Chloride Concentration
Vacuum G-28 vent
153
131
109
87
66
44
22
0
Concentration [mg/L]
0
188
376
564
752
Elapsed Time [yrs]
Chloride

Vacuum G-28 vent
Unit G, Section 28, T17S, R35E
Depth to GW: 70 ft
Liner Dimensions: 55x57 ft

	SB1				
	Cl-	PID	Lab Cl-	GRO	DRO
15	736	0.8			
20	829	0.9			
25	3,049	1.2	2,720	<10	<10
30	1,745	1.3			
35	994	1.1			
40	497	1.3			
45	307	1.1			
50	181	1.3	64	<10	<10

	SB2				
	Cl-	PID	Lab Cl-	GRO	DRO
5	2,339	1			
10	5,396	0.8	5,760	<10	<10
15	3,014	1			
20	837	0.9			
25	282	0.5			
30	180	0.3			
35	173	0.3	96	<10	<10

	SB3				
	Cl-	PID	Lab Cl-	GRO	DRO
5	3,128	0.7			
10	5,203	0.3	5,840	<10	<10
15	3,406	0.3			
20	1,466	0.4			
25	4,005	0.2			
30	1,302	0.3			
35	534	0.2			
40	286	0.1			
45	238	0			
50	166	0	144	<10	<10

	SB5				
	Cl-	PID	Lab Cl-	GRO	DRO
0	572	0.2			
5	1,877	1.3	2,160	<10	<10
10	276	2	224	<10	<10

	SB6				
	Cl-	PID	Lab Cl-	GRO	DRO
0	7,723	1.7			
5	2,195	1.9			
10	6,772	2.2	7,000	<10	<10
15	4,076	2.7			
20	2,777	1.5			
25	274	1.7	192	<10	<10

	SB7				
	Cl-	PID	Lab Cl-	GRO	DRO
0	402	1.7			
5	379	1.7			
10	4,081	1.8	5,360	<10	<10
15	2,041	2.1			
20	566	1.1	544	<10	<10

	15' West				
	Cl-	PID	Lab Cl-	GRO	DRO
0	n/a	55.9	128	n/a	n/a

	29' North				
	Cl-	PID	Lab Cl-	GRO	DRO
0	n/a	n/a	48	<10	<10

	24' East				
	Cl-	PID	Lab Cl-	GRO	DRO
0	n/a	n/a	56	<10	<10

Vacuum G-28 vent
Unit G, Section 28, T17S, R35E
Depth to GW: 70 ft
Liner Dimensions: 55x57 ft

	SB4					Source vertical		5' North		5' South		
	Cl-	PID	Lab Cl-	GRO	DRO	Cl-	PID	Cl-	PID	Cl-	PID	
						2 146	0.5					
5	1,200	0.1				3 148	0	3 1,980	0	3 1,993	0	3
10	5,158	0	6,880	<10	<10	4 353	0.2	4 788	0	4 757	0	4
15	3,652	0				5 962	0	5 7,356	0	5 856	0	5
20	1,852	0				6 2,706	0	6 7,420	0	6 1,455	0	6
25	608	0				7 375	0.8	7 8,493	0	7 4,780	0	7
30	280	0				8 5,980	0.3	8 11,120	0	8 1,605	0	8
35	150	0.1	64	<10	<10	9 6,247	0.2	9 12,602	0	9 2,483	0	9
						10 9,730	0	10 13,900	0	10 5,122	0	10
						11 9,216	0	11 17,217	0	11 10,099	0	11
						12 12,501	0	12 11,629	0	12 13,314	0	12

	SB8					10' North		10' South		
	Cl-	PID	Lab Cl-	GRO	DRO	Cl-	PID	Cl-	PID	
0	197	3.9	240	<10	<10					
5	730	1.8	1,230	<10	<10	3 3,151	0	3 5,850	0	3
10	513	2.2	608	<10	<10	4 1,547	0	4 4,776	0	4
						5 4,406	0	5 3,453	0	5
						6 6,686	0	6 2,677	0	6
						7 7,460	0	7 3,262	0	7
						8 9,199	0	8 5,026	0	8
						9 12,116	0	9 6,871	0	9
						10 14,109	0	10 8,954	0	10
						11 13,048	0	11 12,080	0	11
						12 13,312	0	12 13,100	0	12

Average Chloride concentration	4,527	mg/kg
Average Depth	28	ft
Depth to Groundwater - Average Depth	42	ft

Vacuum G-28 vent
Unit G, Section 28, T17S, R35E
Depth to GW: 70 ft
Liner Dimensions: 55x57-ft

5' East			5' West	
Cl-	**PID**		**Cl-**	**PID**
1,448	0	**3**	858	0
1,678	0	**4**	480	0
1,836	0	**5**	940	0
3,652	0	**6**	1,890	0
4,449	0	**7**	3,441	0
4,467	0	**8**	4,889	0
6,734	0	**9**	6,613	0
9,852	0	**10**	17,268	0
11,176	0	**11**	13,427	0
12,472	0	**12**	13,372	0

10' East			10' West	
Cl-	**PID**		**Cl-**	**PID**
6,154	0	**3**	6,208	0
5,111	0	**4**	3,970	0
2,778	0	**5**	2,071	0
4,460	0	**6**	2,254	0
		7	1,196	0
1,470	0	**8**	3,966	0
1,966	0	**9**	5,996	0
5,283	0	**10**	7,631	0
6,065	0	**11**	12,125	0
9,096	0	**12**	10,761	0

General						
1	Title					Vacuum G-28 vent
2	Application Type					Generic
3	Run Type					Deterministic
4	Source Type					Transient
5	Aquifer Source Patch					Gaussian
6	Active Modules					Unsaturated Zone
						Saturated Zone
Source						
7	Source Area			291.25	m^2	Area
8	Source Length	55	ft	16.76	m	Length
9	Source Width	57	ft	17.37	m	Width
10	Source Infiltration Rate	0.3	in	0.00762		Good liner
11	Outside Recharge Rate				m/yr	0
12	Initial Leachate Concentration			4,527	mg/L	Average all bores
13	Source Duration				yrs	Derive
14	Source Decay Coefficient				1/yr	2.5%
15	Initial Spread of Source				m	Derive
Chemical						
16	Chemical Name					Chloride
17	Dissolved Decay Coefficients				1/yr	Derive
18	Sorbed Phase Decay Coef.				1/yr	Derive
19	Overall Aquifer Decay Coef.				1/yr	Derive
20	Acid Catalyzed Rate				l/mole-yr	0
21	Neutral Rate				1/yr	0
22	Base Catalyzed Rate				l/mole-yr	0
23	Reference Temperature				deg C	25
24	Normalized Distribution Coef.				ml/g	0
25	Aquifer Distribution Coef.				ml/g	Derive
Unsaturated Zone Flow						
26	Layer Thickness and Material Number	42	ft	12.80	m	Difference average depth and depth to GW
27	Saturated Hydraulic Conductivity				cm/hr	3.6
28	Effective Porosity				fraction	0.25
29	Air Entry Pressure Head				m	0.7
30	Residual Water Content				fraction	0.116
31	van Genuchten Alpha				1/cm	0.005
32	van Genuchten Beta				fraction	1.09
33	Brooks and Corey Exponent				fraction	-------
Unsaturated Zone Transport						
34	Transport Layer Thickness	42	ft	12.80	m	Difference average depth and depth to GW
35	Longitudinal Dispersivity				m	Derive
36	Percent Organic Matter				%	0
37	Bulk Density				g/cm^3	1.99

38	Biological Decay Coefficient				1/yr	0
	Saturated Zone Flow					
39	Aquifer Thickness	20	ft	6.10	m	Aquifer Thickness
40	Mixing Zone Thickness				m	Derive
41	Effective Porosity				fraction	0.3
42	Bulk Density				g/cm^3	1.855
43	Saturated Hydraulic Conductivity				m/yr	315
44	Hydraulic Gradient				fraction	0.003
45	Seepage Velocity				m/yr	Derive
46	Longitudinal Dispersivity				m	Derive
47	Transverse Dispersivity				m	Derive
48	Vertical Dispersivity				m	Derive
49	Aquifer Temperature				deg C	20
50	Aquifer pH					7
51	Fraction Organic Carbon				fraction	0
52	Retardation Factor				fraction	Derive
53	Biological Decay Coefficient				1/yr	0
	Well Location and Time					
54	Radial Distance to Well				m	1
55	Angle Off Plume Axis				degree	0
56	Well Screen Depth Fraction				fraction	0
57	Time Step Option					Max Concentration
						Time Intervals
	Run Project					
						138.99 mg/L in 396 years