1R - 426-218

WORKPLANS

Date: 6-20-13

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

CERTIFIED MAIL
RETURN RECIEPT NO. 7008 1140 0001 3070 5771

June 20th, 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 – BD SWD System
BD Jct. P-30 west (1R426-127): UL/P sec. 30 T21S R37E
BD P-30 EOL (1R426-218): UL/P sec. 30 T21S R37E

Mr. Hansen:

RICE Operating Company (ROC) has retained Rice Environmental Consulting and Safety (RECS) to address potential environmental concerns at the above-referenced sites in the BD Salt Water Disposal (SWD) system. ROC is the service provider (agent) for the BD 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/usage basis.

ROC is requesting that the two sites be incorporated into one site and treated as such throughout the Corrective Action process. The sites are 44 ft apart from each other and are located approximately 2 miles west of Eunice, New Mexico at UL/P sec. 30 T21S R37E as shown on the Site Location Map (Figure 1). NM OSE records indicate that groundwater will likely be encountered at a depth of approximately 97 +/- feet.

Background and Previous Work - <u>BD Jct. P-30 west</u>

In 2006, ROC initiated work on the former BD P-30 west junction box as part of the system pipeline replacement/upgrade program. The site was delineated using a backhoe to form an excavation 30 ft x 30 ft x 12 feet deep and soil samples from the excavation were screened at regular intervals for both hydrocarbons and chlorides. From the excavation, a 4-wall composite, bottom composite and backfill sample were collected for laboratory verification. Laboratory tests of the site showed negligible gasoline range organics (GRO) while diesel range organics (DRO) measured <10.0 mg/kg in the 4-wall composite, 20.9 mg/kg in the bottom composite, and 473.0 mg/kg in the backfill. However, chlorides concentrations from the excavation did not relent with depth or breadth. The chloride concentrations measured 832 mg/kg in the 4-wall

composite, 1,360 mg/kg in the bottom composite, and 592 mg/kg in the backfill. The excavation was backfilled to 6 ft bgs where a 1 ft thick clay barrier was installed. The remaining soil was backfilled into the excavation, and the area was contoured to the surrounding landscape. The site was seeded, and an identification plate was placed on the surface of the site to mark its location for future environmental considerations. NMOCD was notified of potential groundwater impact on November 17th, 2006 and a junction box disclosure report was submitted to NMOCD with all the 2006 junction box closures and disclosures.

Background and Previous Work - <u>BD P-30 EOL</u>

In 2008, ROC initiated work on the former BD P-30 EOL junction box, which was eliminated under the pipeline replacement/upgrade program. The site was delineated using a backhoe to form a 30 ft x 30 ft x 12 ft deep excavation. The soil samples were screened at regular intervals for both hydrocarbons and chlorides. From the excavation, a 4-wall composite, bottom composite and backfill composite sample was collected for laboratory verification. Laboratory tests of the site showed negligible gasoline range organics (GRO) in the bottom composite and backfill and 22 mg/kg in the 4-wall composite. Diesel range organics (DRO) measured 389 mg/kg in the 4-wall composite, 19.2 mg/kg in the bottom composite and 470 mg/kg in the backfill. Chlorides concentrations from the excavation measured 1,390 mg/kg in the 4-wall composite, 2,530 mg/kg in the bottom composite and 960 mg/kg in the backfill. The excavated soil was blended on site and returned to the excavation up to 6 ft below ground surface (bgs). At 6 ft bgs, a shelf was extended 15 ft out from the east wall and a 1 ft thick clay barrier was installed with a compaction test performed on January 31st, 2008. The remaining soil was backfilled over the clay barrier and was contoured to the surrounding landscape. An identification plate was placed on the surface of the site to mark its location for future environmental considerations. NMOCD was notified of potential groundwater impact on September 4th, 2008 and a junction box disclosure report was submitted to NMOCD with all the 2008 junction box closures and disclosures.

ROC proposed additional investigative work at the site to determine if there was a potential for groundwater degradation from residual chlorides at the site.

ICP Investigative Results - <u>BD Jct. P-30 west</u>

As part of the Investigation and Characterization Plan (ICP) submitted to NMOCD on September 20th, 2010 and approved on September 22nd, 2010, five soil bores were advanced through the former junction box site on November 18th, 2010 and November 22nd, 2010 (Figure 2). SB-1 was installed with an air rotary drilling rig and soil bores #2 – 5 were installed with a Geo-probe to avoid the high line electrical wires. Soil bore #2 – 5 could not advance below 25 ft bgs because of a hard stratum below 25 ft bgs. RECS personnel field tested the soil for chlorides and screened in the field with a photo-ionization detector (PID) for hydrocarbons. Representative samples from the bore were taken to a commercial laboratory for confirmation of chloride and hydrocarbon field numbers (Appendix A). Laboratory readings of SB-1 showed chloride readings of 1,700 mg/kg at 10 ft bgs, which decreased to 112 mg/kg at 70 ft bgs. Laboratory readings for GRO and DRO showed non-detect. SB-2 returned laboratory chloride readings of 1,800 mg/kg at 20 ft bgs and 2,480 mg/kg at 25 ft bgs. SB-3 returned laboratory chloride

readings of 2,800 mg/kg at 10 ft bgs and 2,040 mg/kg at 25 ft bgs. SB-4 returned laboratory chloride readings of 1,660 mg/kg at 15 ft bgs and 1,760 mg/kg at 25 ft bgs. SB-5 returned laboratory chloride readings of 1,310 mg/kg at 20 ft bgs, which decreased to 1,040 mg/kg at 25 ft bgs. In all four bores, GRO and DRO readings were non-detect.

ICP Investigative Results - <u>BD P-30 EOL</u>

As part of the Investigation and Characterization Plan submitted to NMOCD on September 10th, 2010 and approved on September 15th, 2010, seven soil bores were advanced through the former junction box site on November 19th, 2010 and November 22nd, 2010. Soil bore #1 - 5 were installed with an air rotary drilling rig and soil bores #6 – 7 were installed with a Geo-probe to avoid the high line electrical wires. Soil bore #6 – 7 could not be advanced below 25 ft bgs because of a hard stratum below 25 ft bgs (Figure 3). RECS personnel field tested the soil for chlorides and screened in the field with a photo-ionization detector (PID) for hydrocarbons. Representative samples from the bores were taken to a commercial laboratory for confirmation of chloride and hydrocarbon field numbers (Appendix B). SB-1 returned laboratory chloride results of 5,040 mg/kg, which decreased to 784 mg/kg at 90 ft bgs. SB-2 returned laboratory chloride results of 3,600 mg/kg at 20 ft bgs, which decreased to 176 mg/kg at 70 ft bgs. SB-3 returned laboratory chloride readings of 3,160 mg/kg at 15 ft bgs, which decreased to 928 mg/kg at 90 ft bgs. SB-4 returned laboratory chloride results of 2,520 mg/kg at 30 ft bgs, which decreased to 752 mg/kg at 90 ft bgs. SB-5 returned laboratory chloride results of 2,720 mg/kg at 30 ft bgs, which decreased to 1,060 mg/kg at 90 ft bgs. SB-6 returned laboratory chloride readings of 6,080 mg/kg at 10 ft bgs, which decreased to 4,160 mg/kg at 25 ft bgs. SB-7 returned laboratory chloride readings of 4,960 mg/kg at 5 ft bgs, which decreased to 1,680 mg/kg at 25 ft bgs. In all bores at all depth, GRO and DRO readings were non-detect.

To further delineate the site, trenches were installed with a backhoe north, west, and south of the combined sites on February 4th and 7th, 2011 (Figure 4). The trenches to the north showed a decrease in chlorides from the 30 ft north trench to the 35 ft north trench. Laboratory confirmation of the 5 ft bgs sample of the 35 ft north trench showed a chloride concentration of 144 mg/kg. The trenches to the west also showed a decrease in chlorides from the 43 ft west trench to the 48 ft west trench. Laboratory confirmation of the 1 ft bgs sample of the 48 ft west trench showed a chloride reading of 64 mg/kg and the 7 ft bgs sample showed a chloride reading of 1,630 mg/kg. The south trench showed a laboratory reading of 848 mg/kg at 5 ft bgs and a chloride reading of 2,840 mg/kg at 10 ft bgs (Appendix C).

On October 11th, 2010, Trident Environmental completed a study of the background chloride concentrations in the region for the NMOCD terminated site BD jct. P-30 (1R0426-124). Given that the BD jct. P-30 west and the P-30 EOL are approximately 230 ft east from the BD jct. P-30 site (Figure 5), the background chloride concentrations determined for the BD jct. P-30 site are valid for the BD jct. P-30 west and the P-30 EOL (Appendix D). Based on the analysis of monitor wells in the area, Trident determined that the upper limit for background chloride concentration is 570 mg/L.

Corrective Action Plan

Groundwater Remedy

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). Data inputs and model outputs are included in Appendix E. With the proposed infiltration barrier measuring 120 ft x 80 ft, the model output concludes that the peak concentration of chlorides in groundwater contributed by the vadose zone soils would be approximately 113.7 mg/L in 80 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.

Vadose Zone Remedy

ROC proposes to excavate the site to the dimensions of 120 ft x 80 ft and properly seat a 20-mil reinforced poly liner at approximately 4-5 ft bgs (Figure 4). The liner will cover the existing clay layers installed at 6.5 ft bgs measuring 30 ft x 30 ft at the BD jct. P-30 west site and 30 ft x 45 ft at the BD P-30 EOL site. 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 soils 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 needed. 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.

Upon completion of the CAP work elements, we anticipate ROC will submit a written report which will include a request for "remediation termination" and the closure of the regulation file.

RECS appreciates the opportunity to work with you on this project. Please call Hack Conder at (575) 393-9174 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 – Soil Bore Installation BD jct. P-30 west

Figure 3 – Soil Bore Installation BD P-30 EOL
Figure 4 – Proposed Liner with Soil Data
Figure 5 – Overview Site Location Map
Appendix A – BD jct. P-30 west Soil Bore Installation Documentation
Appendix B – BD P-30 EOL Soil Bore Installation Documentation
Appendix C – Trenching Laboratory Analyses
Appendix D – Background Characterization Report
Appendix E – Multimed Report

Figures

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

Site Location Map

RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC

RECS

BD jct. P-30 west
BD P-30 EOL

Legals: UL/P sec. 30
T21S R37E

Figure 1

N W E S

0 0.175 0.35 0.7 Miles

Drawing date:5-13-11
Drafted by: L. Weinheimer

Soil Bore Installation

SB-1

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	288	0			
10	1417	0	1700	<10	<10
15	1294	0			
20	1066	0			
25	1224	0			
30	839	0			
35	732	0			
40	694	0			
45	314	0.1			
50	280	0.3			
55	323	0.2			
60	273	0.4			
65	229	0.6			
70	149	0.9	112	<10	<10

SB-2

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	665	1.2			
10	378	0.7			
15	762	0.4			
20	1581	0.6	1800	<10	<10
25	2524	0.3	2480	<10	<10

SB-3

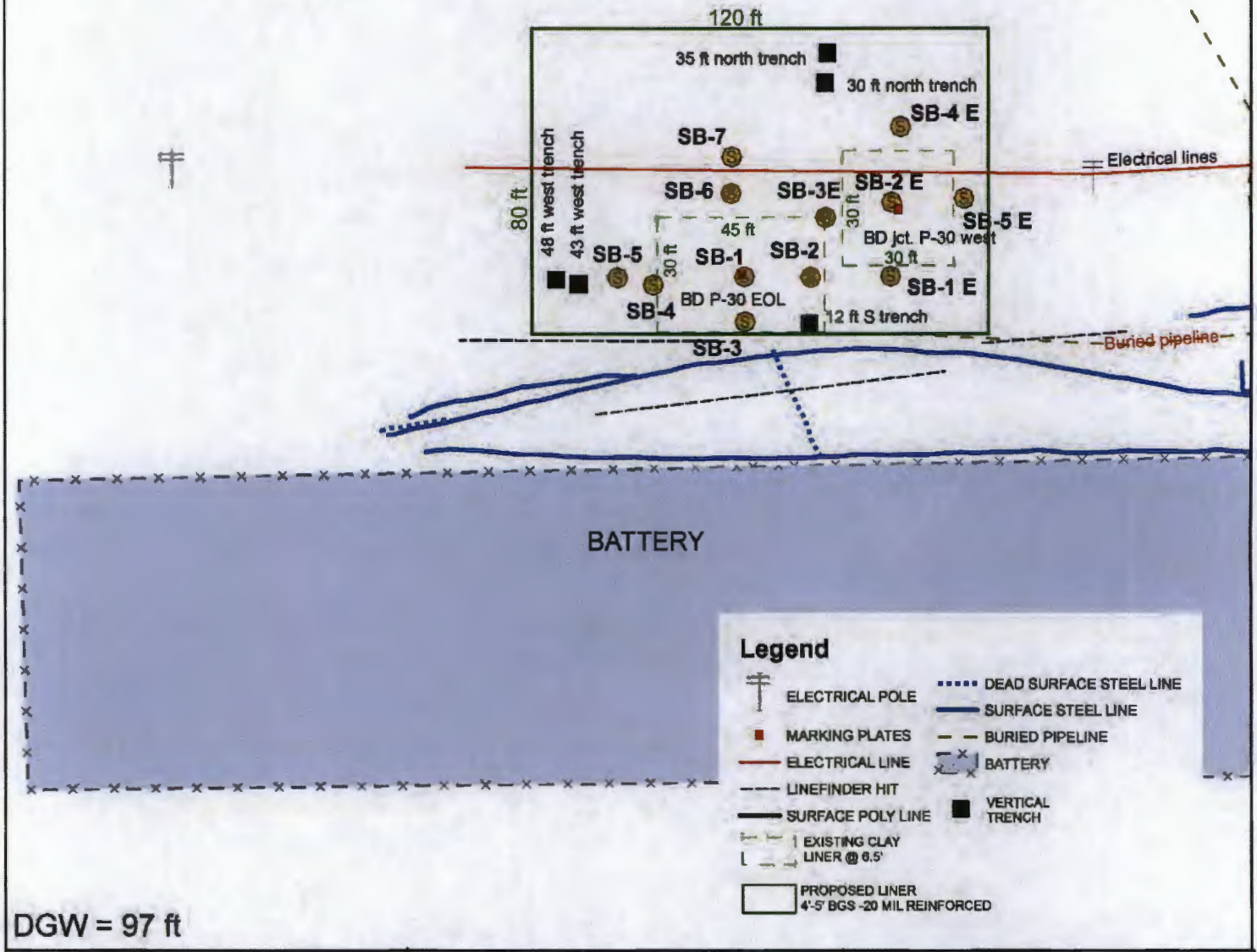
Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	1125	0.8			
10	2317	0.6	2800	<10	<10
15	1823	0.2			
20	1216	0.2			
25	1483	0.3	2040	<10	<10

SB-4

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	272	1			
10	1403	0.6			
15	1570	0.5	1660	<10	<10
20	1500	0.3			
25	1490	0.2	1760	<10	<10

SB-5

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	228	3.4			
10	373	1.4			
15	180	0.7			
20	1513	0.7	1310	<10	<10
25	1000	0.6	1040	<10	<10



DGW = 97 ft

RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC — RECS

BD jct. P-30 west

Legals: UL/P sec. 30 T21S R37E

NMOCD Case#: 1R426-127

Figure 2

N W E S

0 20 40 80 Feet

Drawing date: 6/18/13
Drafted by: L. Weinheimer

Soil Bore Installation

SB-1

Depth	Cl-	PID	LAB Cl-	GRO	DRO
15	3446	0.3	5040	<10	<10
20	2295	0.2			
25	1688	0.1			
30	2089	0.1			
35	2007	0.1			
40	1964	0.1			
45	1614	0.1			
50	1580	0.2			
55	1298	0.1			
60	1565	0.1			
65	1243	0.1			
70	880	0.1			
75	660	0.2			
80	607	0.3			
85	768	0.1			
90	790	0.1	784	<10	<10

SB-2

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	1224	0.7			
10	1208	0.5			
15	3512	0.6			
20	3535	0.5	3600	<10	<10
25	2444	0.2			
30	1258	0.1			
35	418	0.5			
40	334	0.5			
45	283	0.7			
50	258	0.4			
55	227	0.4			
60	195	0.4			
65	197	0.2			
70	174	0.2	176	<10	<10

SB-6

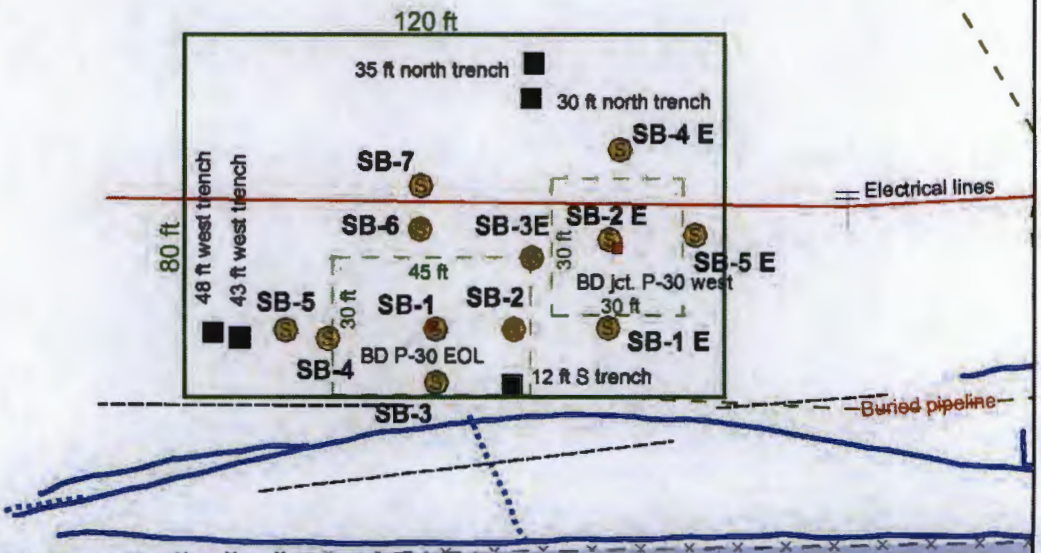
Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	295	0			
10	4955	0	6080	<10	<10
15	4729	0			
20	3689	0			
25	3861	0	4160	<10	<10

SB-7

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	1181	0.9	4960	<10	<10
10	4717	0.3			
15	3010	0.7			
20	3220	0.9			
25	2106	0.9	1680	<10	<10

SB-3

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	1099	0			
10	1191	0			
15	2689	0	3160	<10	<10
20	1752	0			
25	1782	0.1			
30	1484	0.1			
35	940	0.1			
40	348	0.2			
45	326	0			
50	420	0			
55	293	0			
60	321	0			
65	376	0			
70	425	0			
75	602	0			
80	626	0			
85	777	0			
90	840	0.2	928	<10	<10



SB-4

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	572	0.2			
10	608	0.2			
15	947	0.1			
20	1023	0.1			
25	1238	0			
30	1878	0	2520	<10	<10
35	1677	0			
40	1399	0			
45	1295	0			
50	1373	0			
55	1461	0			
60	1291	0.1			
65	1196	0.1			
70	1216	0.1			
75	1100	0.1			
80	801	0.1			
85	606	0.1			
90	710	0.1	752	<10	<10

SB-5

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	1023	0			
10	2034	0			
15	1905	0			
20	1730	0			
25	1829	0			
30	2148	0	2720	<10	<10
35	1413	0			
40	1618	0			
45	1010	0			
50	1554	0			
55	1464	0.1			
60	1728	0.1			
65	1010	0.1			
70	818	0.1			
75	1022	0.5			
80	885	0.7			
85	1013	0.7			
90	915	0.6	1060	<10	<10

BATTERY

Legend

- ELECTRICAL POLE
- MARKING PLATES
- ELECTRICAL LINE
- LINEFINDER HIT
- SURFACE POLY LINE
- EXISTING CLAY LINER @ 6.5'
- PROPOSED LINER 4'-5' BGS -20 MIL REINFORCED
- DEAD SURFACE STEEL LINE
- SURFACE STEEL LINE
- BURIED PIPELINE
- BATTERY
- VERTICAL TRENCH

DGW = 97 ft

RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC — RECS

BD P-30 EOL

Legals: UL/P sec. 30
T21S R37E

NMOCD Case#: 1R426-218

Figure 3

N W E S

0 20 40 80 Feet

Drawing date: 6/18/13
Drafted by: L. Weinheimer

Proposed Liner with Soil Data

48' W trench

Depth	Cl-	PID	LAB Cl-
1	87	1.5	64
2	167	2	
3	477	167.7	
4	501	141.9	
5	686	1802	
6	765	7.1	
7	1102	4.5	1630
8	1001	1.4	

30' N trench

Depth	Cl-	PID
4	527	0
5	518	0
6	960	0
7	782	0
8	1214	0
9	1272	0
10	814	0

35' N trench

Depth	Cl-	PID	LAB Cl-
1	603	0	
2	240	0	
3	365	0	
4	309	0	
5	205	0	144

SB-1 E

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	288	0			
10	1417	0	1700	<10	<10
15	1294	0			
20	1066	0			
25	1224	0			
30	839	0			
35	732	0			
40	694	0			
45	314	0.1			
50	280	0.3			
55	323	0.2			
60	273	0.4			
65	229	0.6			
70	149	0.9	112	<10	<10

SB-2 E

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	665	1.2			
10	378	0.7			
15	762	0.4			
20	1581	0.6	1800	<10	<10
25	2524	0.3	2480	<10	<10

SB-4 E

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	272	1			
10	1403	0.6			
15	1570	0.5	1660	<10	<10
20	1500	0.3			
25	1490	0.2	1760	<10	<10

SB-5 E

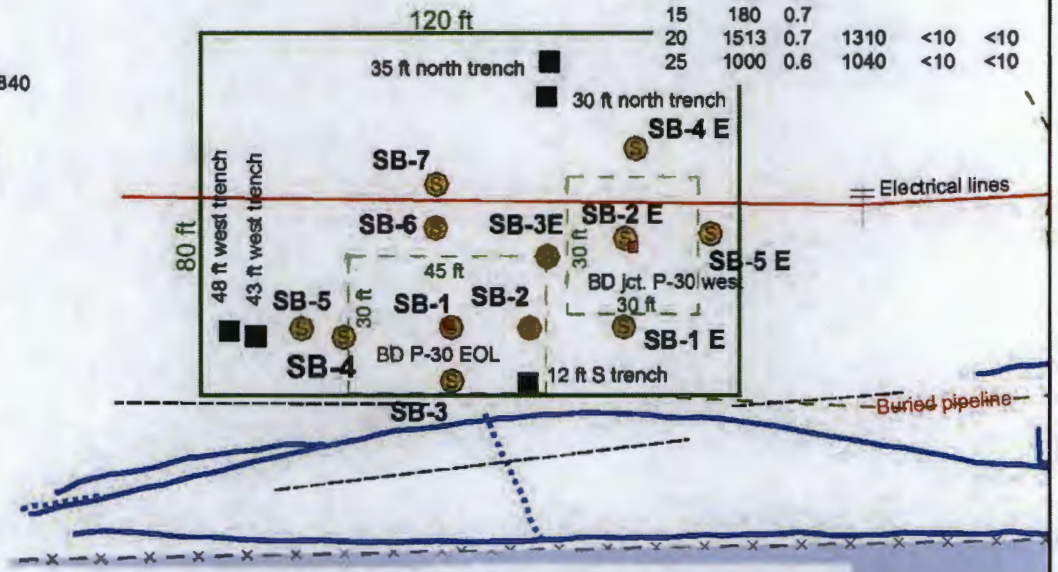
Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	228	3.4			
10	373	1.4			
15	180	0.7			
20	1513	0.7	1310	<10	<10
25	1000	0.6	1040	<10	<10

43' W trench

Depth	Cl-	PID
1	720	0
2	178	0
3	457	0
4	312	0
5	1212	0
6	1214	0
7	1547	0
8	1858	0
9	1823	0
10	2262	0

12' S trench

Depth	Cl-	PID	LAB Cl-
1	129	13.1	
2	256	1558	
3	310	2515	
4	328	5000	
5	924	113.3	848
6	1085	24.9	
7	980	5000	
8	1218	36	
9	1826	2.3	
10	1791	1.2	2840



SB-1

Depth	Cl-	PID	LAB Cl-	GRO	DRO
15	3446	0.3	5040	<10	<10
20	2295	0.2			
25	1688	0.1			
30	2089	0.1			
35	2007	0.1			
40	1964	0.1			
45	1614	0.1			
50	1580	0.2			
55	1298	0.1			
60	1565	0.1			
65	1243	0.1			
70	880	0.1			
75	660	0.2			
80	607	0.3			
85	768	0.1			
90	790	0.1	784	<10	<10

SB-3

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	1099	0			
10	1191	0			
15	2689	0	3160	<10	<10
20	1752	0			
25	1782	0.1			
30	1484	0.1			
35	940	0.1			
40	348	0.2			
45	326	0			
50	420	0			
55	293	0			
60	321	0			
65	376	0			
70	425	0			
75	602	0			
80	626	0			
85	777	0			
90	840	0.2	928	<10	<10

SB-5

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	1023	0			
10	2034	0			
15	1905	0			
20	1730	0			
25	1829	0			
30	2148	0	2720	<10	<10
35	1413	0			
40	1618	0			
45	1010	0			
50	1554	0			
55	1464	0.1			
60	1728	0.1			
65	1010	0.1			
70	818	0.1			
75	1022	0.5			
80	885	0.7			
85	1013	0.7			
90	915	0.6	1060	<10	<10

SB-7

Depth	Cl-	PID	LAB Cl-	GRO	DRO
5	1181	0.9	4960	<10	<10
10	4717	0.3			
15	3010	0.7			
20	3220	0.9			
25	2106	0.9	1680	<10	<10

Legend

- ELECTRICAL POLE
- MARKING PLATES
- ELECTRICAL LINE
- LINEFINDER HIT
- SURFACE POLY LINE
- EXISTING CLAY LINER @ 6.5'
- PROPOSED LINER 4'-5' BGS -20 MIL REINFORCED
- DEAD SURFACE STEEL LINE
- SURFACE STEEL LINE
- BURIED PIPELINE
- BATTERY
- VERTICAL TRENCH

DGW = 97 ft

RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC — RECS

BD jct. P-30 west

NMOCD Case#: 1R426-127

BD P-30 EOL

NMOCD Case#: 1R426-218

Legals: UL/P sec. 30 T21S R37E

Figure 4

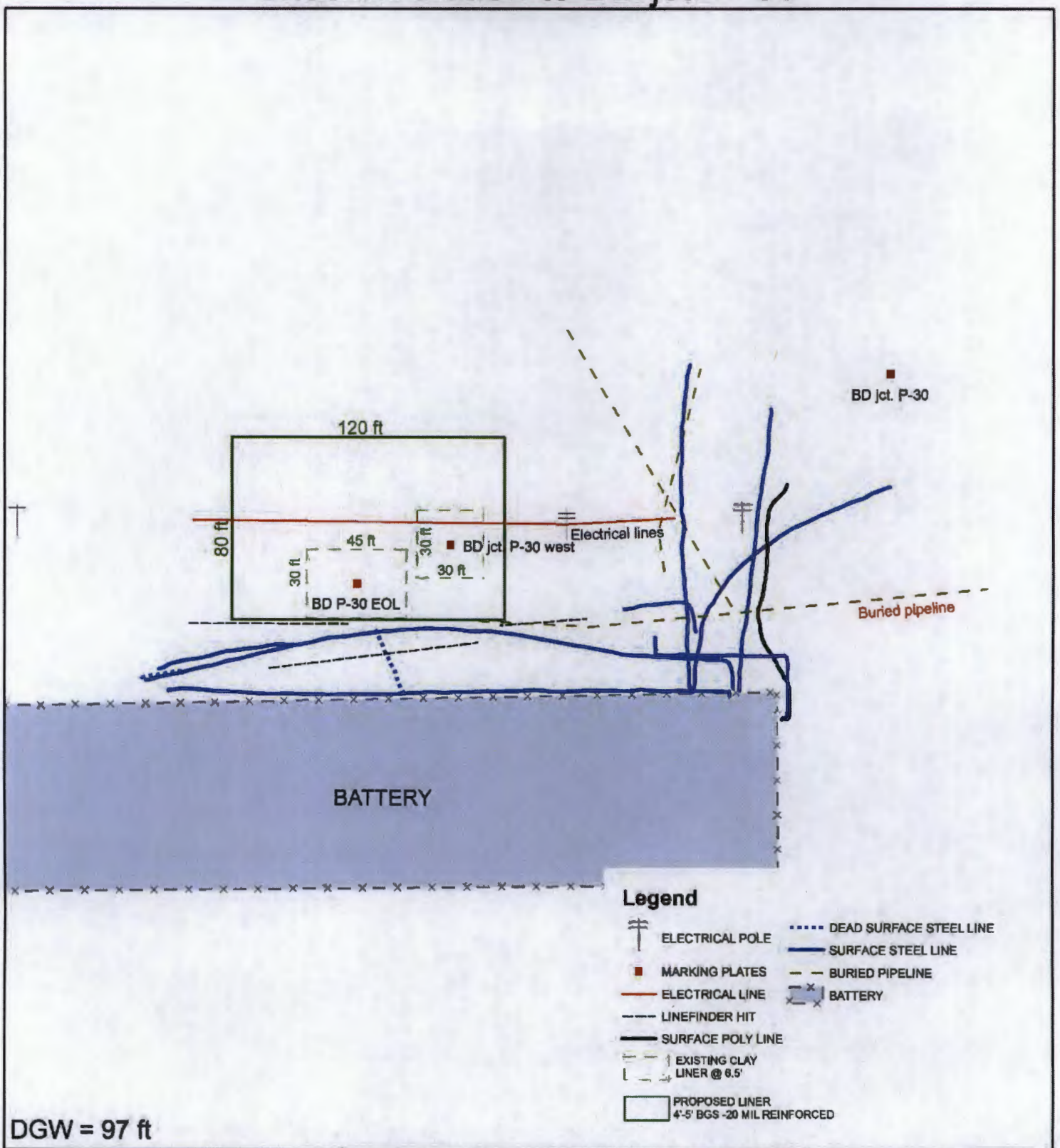
N W E S

0 20 40 80 Feet

Drawing date: 6/18/13

Drafted by: L. Weinheimer

Sites in relation to BD jct. P-30



DGW = 97 ft

RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

BD jct. P-30 west

NMOCD Case #: 1R426-127

BD P-30 EOL

NMOCD Case #: 1R426-218

Legals: UL/P sec. 30 T21S R37E

Figure 5

N W E S

0 25 50 100 Feet

Drawing date: 6/18/13
Drafted by: L. Weinheimer

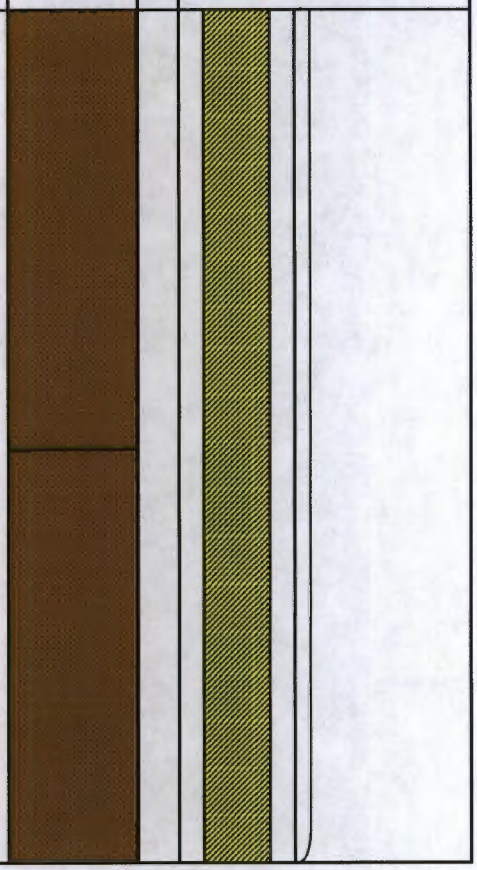
Appendix A

BD jct. P-30 west Soil Bore Installation 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:** BD jct. P-30 west **Well ID:** SB-1
Start Date:	11/18/2010		**Project Consultant:** RECS
End Date:	11/18/2010		**Location:** UL/P sec. 30 T21S R37E
Comments: Located 17 ft south of the former junction box site.			**Lat:** 32°26'42.017"N **County:** LEA
DRAFTED BY: L. Weinheimer			**Long:** 103°11'47.486"W **State:** NM
TD = 70 ft	GW = 97 ft		

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Dark brown to red clay and sand mix		
5 ft	288		0			
10 ft	1417	Cl- 1700	0			
		GRO <10		Brown fine sand with intermitten clay		
		DRO <10				
15 ft	1294		0			
20 ft	1066		0			
				White to tan very fine sandy silt (hard drilling)		
25 ft	1224		0			
				Light brown very fine sand with caliche fragments		
30 ft	839		0			
				Light brown very fine sand		bentonite seal
35 ft	732		0			
40 ft	694		0			
45 ft	314		0.1			

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Light brown very fine sand (slightly moist)		
50 ft	280		0.3			
55 ft	323		0.2			
60 ft	273		0.4			
				Light brown very fine sand		
65 ft	229		0.6			
70 ft	149	Cl- 112	0.9			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin	SB-4	RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.	SB-3 SB-2 SB-5	**Project Name:** BD jct. P-30 west **Well ID:** SB-2
Drilling Method:	Geo-probe		**Project Consultant:** RECS
Start Date:	11/22/2010	SB-1	
End Date:	11/22/2010		

Comments: Located at the source of the former junction box site. Could not penetrate deeper than 25 ft with the Geo-probe.

DRAFTED BY: L. Weinheimer

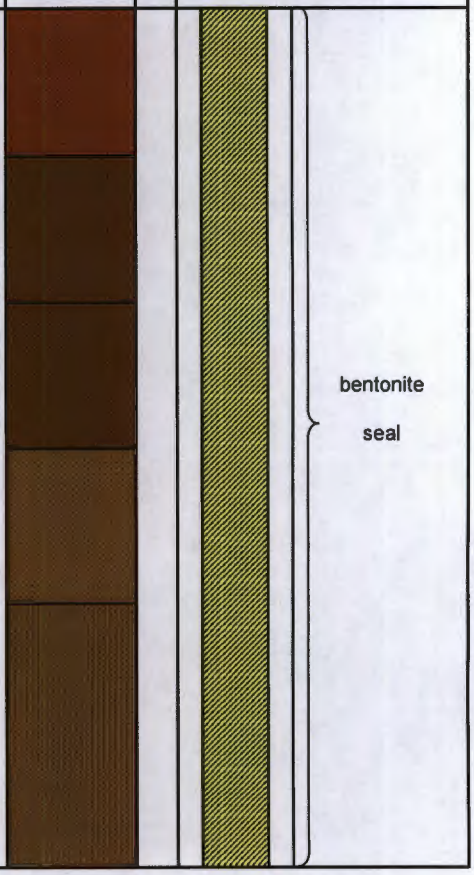
TD = 25 ft GW = 97 ft

Location: UL/P sec. 30 T21S R37E

Lat: 32°26'42.212"N **County**: LEA

Long: 103°11'47.479"W **State**: NM

Depth (feet)	chloride field tests	LAB	PID	Description
				Predominatly brownish red clay with some very fine sand
5 ft	665		1.2	
				Predominatly brown clay with some fine grain sand
10 ft	378		0.7	
				Slightly consolidated brown very fine sand
15 ft	762		0.4	
				Slightly consolidated very fine light brown to tan sand
20 ft	1581	Cl- 1800	0.6	
		GRO <10		Loosely consolidated light brown very fine sand with large caliche fragments (hard drilling)
		DRO <10		
25 ft	2524	Cl- 2480	0.3	
		GRO <10		
		DRO <10		



Logger:	Jordan Woodfin		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Geo-probe		**Project Name:** BD jct. P-30 west **Well ID:** SB-3
Start Date:	11/22/2010		**Project Consultant:** RECS
End Date:	11/22/2010		

Comments: Located 19 ft west of the former junction box site.
Could not penetrate deeper than 25 ft with the Geo-probe.
DRAFTED BY: L. Weinheimer

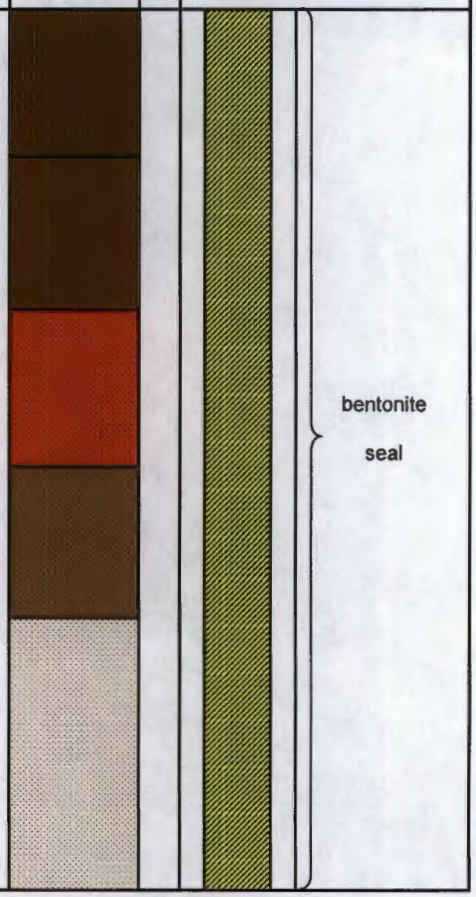
TD = 25 ft GW = 97 ft

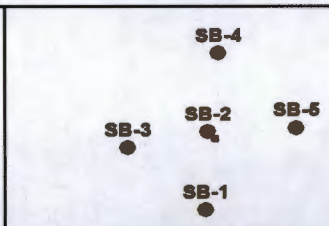
Location: UL/P sec. 30 T21S R37E

Lat: 32°26'42.174"N **County**: LEA

Long: 103°11'47.686"W **State**: NM

Depth (feet)	chloride field tests	LAB	PID	Description
				Brown slightly consolidated moist clay and some fine sand
5 ft	1,125		0.8	
				Slightly consolidated brown fine sand and clay
10 ft	2,317	Cl- 2800	0.6	
		GRO <10		Red slightly consolidated very fine sand
		DRO <10		
15 ft	1,823		0.2	
				Light brown to tan very fine sand. Loosely consolidated
20 ft	1,216		0.2	
				Slightly consolidated tan fine sand with large caliche fragments (hard drilling)
25 ft	1,483	Cl- 2040	0.3	
		GRO <10		
		DRO <10		



Logger:	Jordan Woodfin		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Geo-probe		**Project Name:** BD jct. P-30 west **Well ID:** SB-4
Start Date:	11/22/2010		
End Date:	11/22/2010		**Project Consultant:** RECS
Comments: Located 21 ft north of the former junction box site. Could not penetrate deeper than 25 ft with the Geo-probe. **DRAFTED BY: L. Weinheimer**			**Location:** UL/P sec. 30 T21S R37E
TD = 25 ft	GW = 97 ft		**Lat:** 32°26'42.408"N **County:** LEA **Long:** 103°11'47.449"W **State:** NM

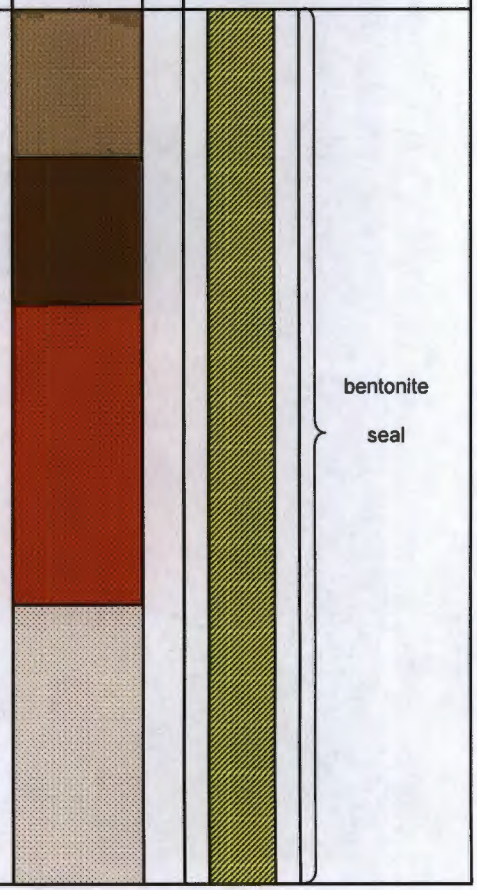
Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Well consolidated clay with fine brown sand		
5 ft	272		1			
				Slightly consolidated tan fine silty sand and mostly small but some large caliche fragments		
10 ft	1403		0.6			
				Tan to red slightly consolidated silt and some very fine sand		
15 ft	1570	Cl- 1660	0.5			bentonite seal
		GRO <10		Light brown slightly consolidated silty sand		
		DRO <10				
20 ft	1500		0.3			
				Light brown loosely consolidated silty sand and small caliche fragments (hard drilling)		
25 ft	1490	Cl- 1760	0.2			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Geo-probe		**Project Name:** BD jct. P-30 west **Well ID:** SB-5
Start Date:	11/22/2010		**Project Consultant:** RECS
End Date:	11/22/2010		

Comments: Located 18 ft east of the former junction box site.
Could not penetrate deeper than 25 ft with the Geo-probe.
DRAFTED BY: L. Weinheimer
TD = 25 ft GW = 97 ft

Location: UL/P sec. 30 T21S R37E
Lat: 32°26'42.219"N **County:** LEA
Long: 103°11'47.252"W **State:** NM

Depth (feet)	chloride field tests	LAB	PID	Description
				Dark brown and purple clay (moist)
5 ft	228		3.4	
				Dark brown fine sand and clay (moist)
10 ft	373		1.4	
				Red slightly consolidated very fine sand
15 ft	180		0.7	
20 ft	1513	Cl- 1310	0.7	
		GRO <10		Tan silty sand non consolidated with caliche fragments (hard drilling)
		DRO <10		
25 ft	1000	Cl- 1040	0.6	
		GRO <10		
		DRO <10		



CARDINAL Laboratories

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

November 21, 2010

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: BD P-30 WEST

Enclosed are the results of analyses for samples received by the laboratory on 11/19/10 8:05.

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:	11/19/2010	Sampling Date:	11/18/2010
Reported:	11/21/2010	Sampling Type:	Soil
Project Name:	BD P-30 WEST	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB #1 @ 10 FT (H021340-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1700**	16.0	11/21/2010	ND	416	104	400	0.00	

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	11/21/2010	ND	194	96.8	200	13.6	
DRO >C10-C28	<10.0	10.0	11/21/2010	ND	225	113	200	17.3	

Surrogate: 1-Chlorooctane	*91.7 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*95.2 %*	*70-130*

Sample ID: SB #1 @ 70 FT (H021340-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**112**	16.0	11/21/2010	ND	416	104	400	0.00	

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	11/21/2010	ND	194	96.8	200	13.6	
DRO >C10-C28	<10.0	10.0	11/21/2010	ND	225	113	200	17.3	

Surrogate: 1-Chlorooctane	*94.4 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*98.1 %*	*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

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene

Celey D. Keene, Lab Director/Quality Manager

CARDINAL LABORATORIES

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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

Company Name:	Rice Operating Company	**BILL TO**	
Project Manager:	Hack Conder	**P.O. #:**	
Address:	122 West Taylor	**Company:**	
City:	Hobbs	**State:** NM **Zip:** 88240	**Attn:**
Phone #:	575-393-9174	**Fax #:** 575-397-1471	**Address:**
Project #:		**Project Owner:**	**City:**
Project Name:	BD P-30 WEST		**State:** **Zip:**
Project Location:	BD P-30 WEST		**Phone #:**
Sampler Name:	Jordan Woodfin		**Fax #:**

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST										
Lab I.D.	**Sample I.D.**	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	**DATE**	**TIME**	Chlorides	TPH 8015 M	BTEX	Texas TPH	Complete Cations/Anions	TPH 8015 M Extended Thru C40						
H21340-1	SB # 1 @ 10FT		1			✓					✓		11/18/10	02:30	✓	✓									
2	SB # 1 @ 70FT		1			✓					✓		11/18/10	03:30	✓	✓									

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 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 services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By: Jordan Woodfin	**Date:** 11/19/10 **Time:** 7:30	**Received By:**	**Phone Result:** ☐ Yes ☑ No **Add'l Phone #:**
Relinquished By:	**Date:** 11/19/10 **Time:** 8:05	**Received By:** Jodi Henson	**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 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

#26

NEED SAMPLES BACK, PLEASE

CARDINAL Laboratories

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

November 30, 2010

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: BD P-30 WEST

Enclosed are the results of analyses for samples received by the laboratory on 11/23/10 9:26.

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:	11/23/2010	Sampling Date:	11/22/2010
Reported:	11/30/2010	Sampling Type:	Soil
Project Name:	BD P-30 WEST	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB #2 @ 20 FT (H021384-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1800**	16.0	11/25/2010	ND	432	108	400	3.77	

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	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*96.7 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*99.9 %*	*70-130*

Sample ID: SB #2 @ 25 FT (H021384-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2480**	16.0	11/25/2010	ND	432	108	400	3.77	

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	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*108 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*109 %*	*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:	11/23/2010	Sampling Date:	11/22/2010
Reported:	11/30/2010	Sampling Type:	Soil
Project Name:	BD P-30 WEST	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB #3 @ 10 FT (H021384-03)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2800**	16.0	11/25/2010	ND	432	108	400	3.77	

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	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*105 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*109 %*	*70-130*

Sample ID: SB #3 @ 25 FT (H021384-04)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2040**	16.0	11/25/2010	ND	432	108	400	3.77	

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	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*89.8 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*92.6 %*	*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:	11/23/2010	Sampling Date:	11/22/2010
Reported:	11/30/2010	Sampling Type:	Soil
Project Name:	BD P-30 WEST	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB #4 @ 15 FT (H021384-05)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1660**	16.0	11/25/2010	ND	432	108	400	3.77	

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	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*98.2 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*102 %*	*70-130*

Sample ID: SB #4 @ 25 FT (H021384-06)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1760**	16.0	11/25/2010	ND	432	108	400	3.77	

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	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*91.9 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*94.5 %*	*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:	11/23/2010	Sampling Date:	11/22/2010
Reported:	11/30/2010	Sampling Type:	Soil
Project Name:	BD P-30 WEST	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB #5 @ 20 FT (H021384-07)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1310**	16.0	11/25/2010	ND	432	108	400	3.77	

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	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*89.4 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*94.2 %*	*70-130*

Sample ID: SB #5 @ 25 FT (H021384-08)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1040**	16.0	11/25/2010	ND	448	112	400	0.00	

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	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*90.8 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*95.5 %*	*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:	BD P-30 West	**State:** **Zip:**	
Project Location:	BD P-30 West	**Phone #:**	
Sampler Name:	Jordan Woodfin	**Fax #:**	

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST										
Lab I.D.	**Sample I.D.**	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	**DATE**	**TIME**	Chlorides	TPH 8015 M	BTEX	Texas TPH	Complete Cations/Anions	TPH 8015 M Extended Thru C40						
H21384-1	SB # 2 @ 20ft	G	1			✓					✓			09:00	✓	✓									
2	SB # 2 @ 25ft	G	1			✓					✓			09:30	✓	✓									
3	SB # 3 @ 10ft	G	1			✓					✓			10:00	✓	✓									
4	SB # 3 @ 25ft	G	1			✓					✓			10:30	✓	✓									
5	SB # 4 @ 15ft	G	1			✓					✓			01:00	✓	✓									
6	SB # 4 @ 25ft	G	1			✓					✓			01:30	✓	✓									
7	SB # 5 @ 20ft	G	1			✓					✓			02:00	✓	✓									
8	SB # 5 @ 25ft	G	1			✓					✓			02:30	✓	✓									

Relinquished By: Jordan Woodfin	**Date:** 11/23/10 **Time:** 4:26	**Received By:** Jodi Henson	
Relinquished By:	**Date:** **Time:**	**Received By:**	
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

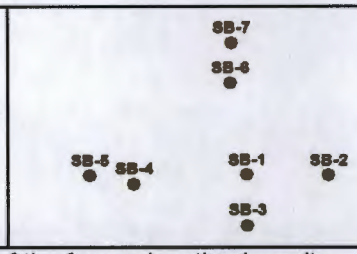
#26

NEED SAMPLES BACK, PLEASE

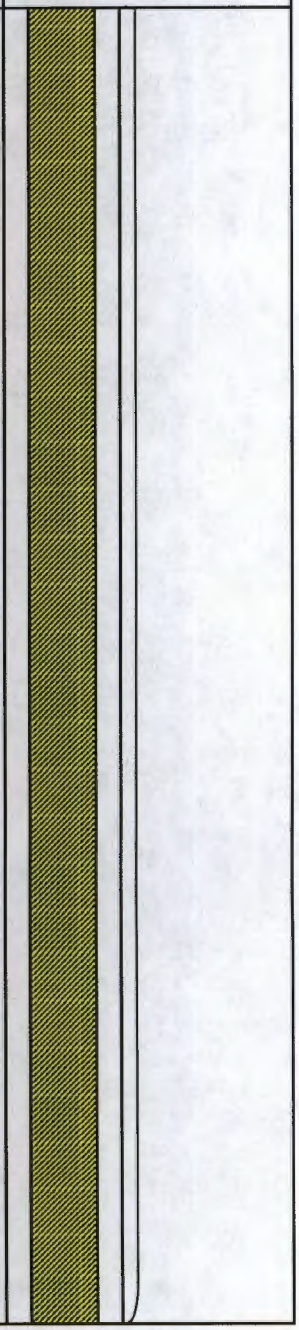
Appendix B

BD P-30 EOL Soil Bore Installation Documentation

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

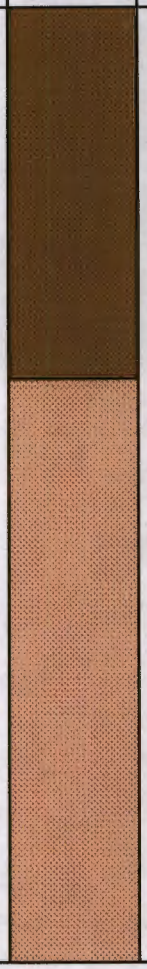
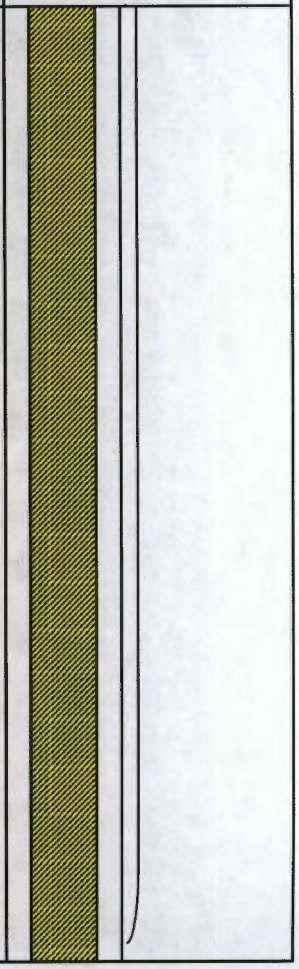
Logger:	Jordan Woodfin		RECS — Rice Environmental Consulting & Safety, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		**Project Name:** BD P-30 EOL **Well ID:** SB-1
Start Date:	11/19/2010		
End Date:	11/19/2010		**Project Consultant:** RECS
Comments: Located at the source of the former junction box site.			**Location:** UL/P sec. 30 T21S 37E
DRAFTED BY: L. Weinheimer			**Lat:** 32°26'42.018"N **County**: LEA
TD = 90 ft	GW = 97		**Long:** 103°11'47.94"W **State**: NM

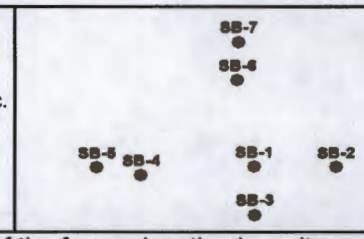
Depth (feet)	chloride field tests	LAB	PID	Description
				Red to light brown fine sand with caliche fragments
15 ft	3446	Cl- 5040	0.3	
		GRO <10		Light brown fine and caliche fragments
		DRO <10		
20 ft	2295		0.2	
				Tan fine silty sand with caliche fragments (hard drilling)
25 ft	1688		0.1	
30 ft	2089		0.1	
				Tan very fine sand
35 ft	2007		0.1	
40 ft	1964		0.1	
45 ft	1614		0.1	
50 ft	1580		0.2	

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Light brown very fine sand		
55 ft	1298		0.1			
60 ft	1565		0.1			
65 ft	1243		0.1			
70 ft	880		0.1			
75 ft	660		0.2			
80 ft	607		0.3			
85 ft	768		0.1			
90 ft	790	Cl- 784	0.1			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		**Project Name:** BD P-30 EOL **Well ID:** SB-2
Start Date:	11/19/2010		
End Date:	11/19/2010		**Project Consultant:** RECS
Comments: Located 17 ft east of the former junction box site.			**Location:** UL/P sec. 30 T21S 37E
DRAFTED BY: L. Weinheimer			**Lat:** 32°26'42.016"N **County**: LEA
TD = 70 ft	GW = 97		**Long:** 103°11'47.733"W **State**: NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Reddish brown sand and clay		
5 ft	1224		0.7			
10 ft	1208		0.5			
				Light brown very fine sand		
15 ft	3512		0.6			
20 ft	3535	Cl- 3600	0.5			
		GRO <10		Very fine tan silty sand (hard drilling)		
		DRO <10				
25 ft	2444		0.2			
30 ft	1258		0.1			
				Light brown very fine sand		bentonite seal
35 ft	418		0.5			
40 ft	334		0.5			

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
45 ft	283		0.7			
50 ft	258		0.4			
55 ft	227		0.4			
60 ft	195		0.4			
				Light brown to red very fine sand		
65 ft	197		0.2			
70 ft	174	Cl- 176	0.2			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		**Project Name:** BD P-30 EOL **Well ID:** SB-3
Driller:	Harrison & Cooper, Inc.		**Project Consultant:** RECS
Drilling Method:	Air rotary		**Location:** UL/P sec. 30 T21S 37E
Start Date:	11/19/2010		**Lat:** 32°26'41.906"N **County**: LEA
End Date:	11/19/2010		**Long:** 103°11'47.939"W **State**: NM

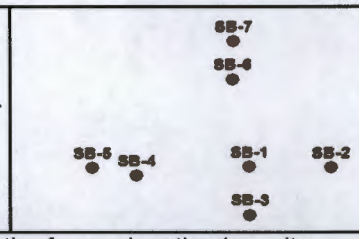
Comments: Located 12 ft south of the former junction box site.

DRAFTED BY: L. Weinheimer

TD = 90 ft GW = 97

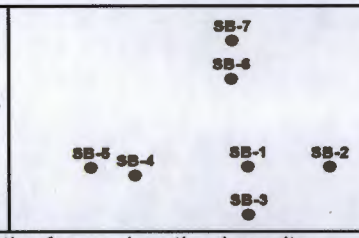
Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Brown silty clay		
5 ft	1,099		0			
10 ft	1,191		0			
				Light brown fine sand with caliche fragments		
15 ft	2,689	Cl- 3160	0			
		GRO <10				
		DRO <10				
20 ft	1,752		0			
				Tan very fine silty sand (hard drilling)		
25 ft	1,782		0.1			
30 ft	1,484		0.1			
35 ft	940		0.1			
40 ft	348		0.2			

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Light brown very fine sand		bentonite seal
45 ft	326		0			
50 ft	420		0			
55 ft	293		0			
60 ft	321		0			
65 ft	376		0			
70 ft	425		0			
75 ft	602		0			
80 ft	626		0			
85 ft	777		0			
90 ft	840	Cl-928	0.2			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		**Project Name:** BD P-30 EOL **Well ID:** SB-4
Driller:	Harrison & Cooper, Inc.		**Project Consultant:** RECS
Drilling Method:	Air rotary		
Start Date:	11/19/2010		
End Date:	11/19/2010		
Comments: Located 24 ft west of the former junction box site. **DRAFTED BY: L. Weinheimer** TD = 90 ft GW = 97			**Location:** UL/P sec. 30 T21S 37E **Lat:** 32°26'42.003"N **Long:** 103°11'48.224"W **County**: LEA **State**: NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Brownish red sand clay		
5 ft	572		0.2			
10 ft	608		0.2			
				Red fine sand with caliche fragments		
15 ft	947		0.1			
				Tan fine sand with caliche fragments (hard drilling)		
20 ft	1023		0.1			
25 ft	1238		0			
30 ft	1878	Cl- 2520	0			
		GRO <10		Light brown very fine sand		
		DRO <10				
35 ft	1677		0			
40 ft	1399		0			

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
45 ft	1295		0			bentonite seal
50 ft	1373		0			
55 ft	1461		0			
60 ft	1291		0.1			
65 ft	1196		0.1			
				Light red very fine sand		
70 ft	1216		0.1			
75 ft	1100		0.1			
80 ft	801		0.1			
85 ft	606		0.1			
90 ft	710	Cl-752	0.1			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		**Project Name:** BD P-30 EOL **Well ID:** SB-5
Driller:	Harrison & Cooper, Inc.		**Project Consultant:** RECS
Drilling Method:	Air rotary		**Location:** UL/P sec. 30 T21S 37E
Start Date:	11/19/2010		**Lat:** 32°26'42.021"N **County:** LEA
End Date:	11/19/2010		**Long:** 103°11'48.332"W **State:** NM

Comments: Located 33 ft west of the former junction box site.

DRAFTED BY: L. Weinheimer

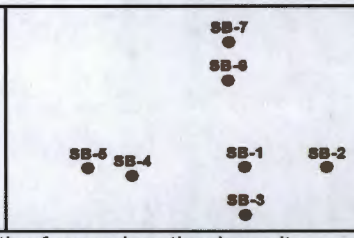
TD = 90 ft GW = 97

Depth (feet)	chloride field tests	LAB	PID	Description
				Brown silty clay
5 ft	1023		0	
				Light brown fine sand and caliche fragments
10 ft	2034		0	
15 ft	1905		0	
				Tan fine sandy silt with caliche fragments (hard drilling)
20 ft	1730		0	
25 ft	1829		0	
30 ft	2148	Cl- 2720	0	
		GRO <10		Light red very fine sand
		DRO <10		
35 ft	1413		0	
				Tan very fine sand
40 ft	1618		0	

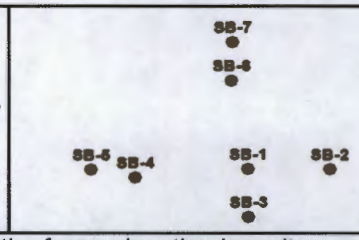
Lithology

Well Construction

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
45 ft	1010		0	Light red very fine sand		bentonite seal
50 ft	1554		0			
55 ft	1464		0.1			
60 ft	1728		0.1			
65 ft	1010		0.1			
70 ft	818		0.1			
75 ft	1022		0.5			
80 ft	885		0.7			
85 ft	1013		0.7			
90 ft	915	Cl- 1060	0.6			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Geo-probe		**Project Name:** BD P-30 EOL **Well ID:** SB-6
Start Date:	11/22/2010		
End Date:	11/22/2010		**Project Consultant:** RECS
Comments: Located 22 ft north of the former junction box site. 25 feet is all that could be penetrated with the Geo-probe. **DRAFTED BY: L. Weinheimer** TD = 25 ft GW = 97			**Location:** UL/P sec. 30 T21S 37E **Lat:** 32°26'42.24"N **Long:** 103°11'47.98"W **County:** LEA **State:** NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Brownish red fine sand and clay (moist)		
5 ft	295		0			
				Brown fine sand and clay		
10 ft	4955	Cl- 6080	0			
		GRO <10		Light brown fine sand and caliche		bentontie
		DRO <10				
15 ft	4729		0			seal
20 ft	3689		0			
				Tan caliche with some fine sand (hard drilling)		
25 ft	3861	Cl- 4160	0			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Geo-probe		**Project Name:** BD P-30 EOL **Well ID:** SB-7
Start Date:	11/22/2010		**Project Consultant:** RECS
End Date:	11/22/2010		
Comments: Located 31 ft north of the former junction box site. 25 feet is all that could be penetrated with the Geo-probe. **DRAFTED BY: L. Weinheimer** TD = 25 ft GW = 97			**Location:** UL/P sec. 30 T21S 37E **Lat:** 32°26'42.335"N **Long:** 103°11'47.977"W **County**: LEA **State**: NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Well consolidated red clay and fine sand		
5 ft	1181	Cl- 4960	0.9			
		GRO <10		Light brown to tan fine sand with caliche, slightly consolidated		
		DRO <10				
10 ft	4717		0.3			
				Tan very fine sand with caliche moderatly consolidated		bentonite seal
15 ft	3010		0.7			
20 ft	3220		0.9			
				Tan very fine sand with caliche moderatly consolidated (hard drilling)		
25 ft	2106	Cl- 1680	0.9			
		GRO <10				
		DRO <10				

CARDINAL Laboratories

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

November 30, 2010

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: BD P-30 EOL

Enclosed are the results of analyses for samples received by the laboratory on 11/22/10 13:30.

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:	11/22/2010	Sampling Date:	11/19/2010
Reported:	11/30/2010	Sampling Type:	Soil
Project Name:	BD P-30 EOL	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	BD P-30 EOL		

Sample ID: SB #1 @ 15 FT. (H021370-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**5040**	16.0	11/30/2010	ND	432	108	400	3.77	

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	11/28/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane	*105 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*112 %*	*70-130*

Sample ID: SB #1 @ 90 FT. (H021370-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**784**	16.0	11/30/2010	ND	432	108	400	3.77	

TPH 8015M mg/kg **Analyzed By: AB** **S-04**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/28/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane	*134 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*144 %*	*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:	11/22/2010	Sampling Date:	11/19/2010
Reported:	11/30/2010	Sampling Type:	Soil
Project Name:	BD P-30 EOL	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	BD P-30 EOL		

Sample ID: SB #2 @ 20 FT. (H021370-03)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**3600**	16.0	11/30/2010	ND	432	108	400	3.77	

TPH 8015M mg/kg **Analyzed By: AB** **S-04**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/28/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane	*124 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*131 %*	*70-130*

Sample ID: SB #2 @ 70 FT. (H021370-04)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**176**	16.0	11/30/2010	ND	432	108	400	3.77	

TPH 8015M mg/kg **Analyzed By: AB** **S-04**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/28/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane	*138 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*145 %*	*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:	11/22/2010	Sampling Date:	11/19/2010
Reported:	11/30/2010	Sampling Type:	Soil
Project Name:	BD P-30 EOL	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	BD P-30 EOL		

Sample ID: SB #3 @ 15 FT. (H021370-05)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**3160**	16.0	11/30/2010	ND	448	112	400	11.3	

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	11/28/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane	*111 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*119 %*	*70-130*

Sample ID: SB #3 @ 90 FT. (H021370-06)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**928**	16.0	11/30/2010	ND	448	112	400	11.3	

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	11/29/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/29/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane	*114 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*118 %*	*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:	11/22/2010	Sampling Date:	11/19/2010
Reported:	11/30/2010	Sampling Type:	Soil
Project Name:	BD P-30 EOL	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	BD P-30 EOL		

Sample ID: SB #4 @ 30 FT. (H021370-07)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2520**	16.0	11/30/2010	ND	448	112	400	11.3	

TPH 8015M mg/kg **Analyzed By: AB** **S-04**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/29/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/29/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane	*138 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*140 %*	*70-130*

Sample ID: SB #4 @ 90 FT. (H021370-08)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**752**	16.0	11/30/2010	ND	448	112	400	11.3	

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	11/29/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/29/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane	*114 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*122 %*	*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:	11/22/2010	Sampling Date:	11/19/2010
Reported:	11/30/2010	Sampling Type:	Soil
Project Name:	BD P-30 EOL	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	BD P-30 EOL		

Sample ID: SB #5 @ 30 FT. (H021370-09)

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	11/30/2010	ND	448	112	400	11.3	

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	11/29/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/29/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane	*92.8 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*97.0 %*	*70-130*

Sample ID: SB #5 @ 90 FT. (H021370-10)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1060**	16.0	11/30/2010	ND	448	112	400	11.3	

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	11/29/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/29/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane	*109 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*116 %*	*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

S-04	The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.
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

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 Operating Company	**BILL TO**	
Project Manager:	Hack Conder	**P.O. #:**	
Address:	122 West Taylor	**Company:**	
City:	Hobbs	**State:** NM **Zip:** 88240	**Attn:**
Phone #:	575-393-9174	**Fax #:** 575-397-1471	**Address:**
Project #:		**Project Owner:**	**City:**
Project Name:	BD P-30 EOL		**State:** **Zip:**
Project Location:	BD P-30 EOL		**Phone #:**
Sampler Name:	Jordan Woodfin		**Fax #:**

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST										
Lab I.D.	**Sample I.D.**	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	**DATE**	**TIME**	Chlorides	TPH 8015 M	BTEX	Texas TPH	Complete Cations/Anions	TPH 8015 M Extended Thru C40						
H21370-1	SB # 1 @ 15ft	G	1			✓					✓		11/19/10	08:30	✓	✓									
2	SB # 1 @ 90 FT	G	1			✓					✓		"	09:00	✓	✓									
3	SB # 2 @ 20FT	G	1			✓					✓		"	09:15	✓	✓									
4	SB # 2 @ 70FT	G	1			✓					✓		"	09:45	✓	✓									
5	SB # 3 @ 15FT	G	1			✓					✓		"	10:15	✓	✓									
6	SB # 3 @ 90FT	G	1			✓					✓		"	11:30	✓	✓									
7	SB # 4 @ 30FT	G	1			✓					✓		"	01:15	✓	✓									
8	SB # 4 @ 90FT	G	1			✓					✓		"	02:00	✓	✓									
9	SB # 5 @ 30FT	G	1			✓					✓		"	02:30	✓	✓									
10	SB # 5 @ 90FT	G	1			✓					✓		"	03:30	✓	✓									

Relinquished By: Jordan Woodfin	**Date:** 11/22/10 **Time:** 7:31	**Received By:**	**Phone Result:** ☐ Yes ☑ No	**Add'l Phone #:**	
Relinquished By:	**Date:** **Time:** 13:30	**Received By:** Jodi Henson	**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		
~14.5°C			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

#26

NEED SAMPLES BACK, PLEASE

CARDINAL Laboratories

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

November 30, 2010

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: BD P-30 EOL

Enclosed are the results of analyses for samples received by the laboratory on 11/23/10 9:26.

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:	11/23/2010	Sampling Date:	11/22/2010
Reported:	11/30/2010	Sampling Type:	Soil
Project Name:	BD P-30 EOL	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	BD P-30 EOL		

Sample ID: SB #6 @ 10 FT (H021385-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**6080**	16.0	11/29/2010	ND	448	112	400	0.00	

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	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*109 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*115 %*	*70-130*

Sample ID: SB #6 @ 25 FT (H021385-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**4160**	16.0	11/29/2010	ND	448	112	400	0.00	

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	11/28/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*84.2 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*86.3 %*	*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

Analytical Results For:

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

Received:	11/23/2010	Sampling Date:	11/22/2010
Reported:	11/30/2010	Sampling Type:	Soil
Project Name:	BD P-30 EOL	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	BD P-30 EOL		

Sample ID: SB #7 @ 10 FT (H021385-03)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**4960**	16.0	11/29/2010	ND	448	112	400	0.00	

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	11/28/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*85.2 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*85.9 %*	*70-130*

Sample ID: SB #7 @ 25 FT (H021385-04)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1680**	16.0	11/29/2010	ND	448	112	400	0.00	

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	11/28/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane	*89.6 %*	*70-130*
Surrogate: 1-Chlorooctadecane	*95.4 %*	*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

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 Operating Company	**BILL TO**	
Project Manager:	Hack Conder	**P.O. #:**	
Address:	122 West Taylor	**Company:**	
City:	Hobbs	**State:** NM **Zip:** 88240	**Attn:**
Phone #:	575-393-9174	**Fax #:** 575-397-1471	**Address:**
Project #:		**Project Owner:**	**City:**
Project Name:	BD P-30 EOL		**State:** **Zip:**
Project Location:	BD P-30 EOL		**Phone #:**
Sampler Name:	Jordan Woodfin		**Fax #:**

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST										
Lab I.D.	**Sample I.D.**	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME	Chlorides	TPH 8015 M	BTEX	Texas TPH	Complete Cations/Anions	TPH 8015 M Extended Thru C40						
H21385-1	SB # 6 @ 10ft	G	1			✓					✓			08:00	✓	✓									
2	SB # 6 @ 25ft	G	1			✓					✓			08:30	✓	✓									
3	SB # 7 @ 10ft	G	1			✓					✓			03:00	✓	✓									
4	SB # 7 @ 25ft	G	1			✓					✓			03:30	✓	✓									

Relinquished By: Jordan Woodfin	**Date:** 11/23/10 **Time:** 4:26	**Received By:** Jodi Henson	**Phone Result:** ☐ Yes ☑ No **Add'l Phone #:**
			Fax Result: ☐ Yes ☑ No **Add'l Fax #:**
Relinquished By:	**Date:** **Time:**	**Received By:**	**REMARKS:** email results
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	**Sample Condition** Cool: ☐ Yes ☐ No Intact: ☑ Yes ☐ No	**CHECKED BY: (Initials)** JH	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

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Appendix C

Trenching Laboratory Analyses

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

CARDINAL Laboratories

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

February 08, 2011

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: BD P-30 WEST

Enclosed are the results of analyses for samples received by the laboratory on 02/07/11 8:14.

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:	02/07/2011	Sampling Date:	02/04/2011
Reported:	02/08/2011	Sampling Type:	Soil
Project Name:	BD P-30 WEST	Sampling Condition:	Cool & Intact
Project Number:	BD P-30 WEST & EOL	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: 35' NORTH TRENCH @ 5' (H100233-01)

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	02/07/2011	ND	448	112	400	3.64	

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
Project Manager:	Hack Conder
Address:	122 West Taylor
City:	Hobbs **State:** NM **Zip:** 88240
Phone #:	575-393-9174 **Fax #:** 575-397-1471
Project #:	**Project Owner:**
Project Name:	BD P-30 West & EOL
Project Location:	BD P-30 West & EOL
Sampler Name:	Jordan Woodfin

BILL TO

P.O. #:	
Company:	
Attn:	
Address:	
City:	
State:	**Zip:**
Phone #:	
Fax #:	

ANALYSIS REQUEST

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	TPH 8015 M Extended Thru C40
H1002331	35' North Trench @ 5'		1			✓					✓		2/4/11	02:45	✓	✓				

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 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 services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By: Jordan Woodfin	**Date:** 2/7/11 **Time:** 8:00	**Received By:**	
Relinquished By:	**Date:** 2/7/11 **Time:** 8:14	**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

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CARDINAL Laboratories

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

February 09, 2011

KATY JONES

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: BD P-30 21.37

Enclosed are the results of analyses for samples received by the laboratory on 02/07/11 17:00.

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

Received:	02/07/2011	Sampling Date:	02/07/2011
Reported:	02/09/2011	Sampling Type:	Soil
Project Name:	BD P-30 21.37	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: W DELINEATION TRENCH @1' (H100240-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**64.0**	16.0	02/08/2011	ND	416	104	400	3.77	

Sample ID: W DELINEATION TRENCH @8' (H100240-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1630**	16.0	02/08/2011	ND	416	104	400	3.77	

Sample ID: S DELINEATION TRENCH @5' (H100240-03)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**848**	16.0	02/08/2011	ND	416	104	400	3.77	

Sample ID: S DELINEATION TRENCH @10' (H100240-04)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**2840**	16.0	02/08/2011	ND	416	104	400	3.77	

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
(575) 393-2326 FAX (575) 393-2476

Company Name:	KEC
Project Manager:	KATIE JONES
Address:	
City:	State: Zip:
Phone #:	Fax #:
Project #:	Project Owner:
Project Name:	BD R30 21.37
Project Location:	
Sampler Name:	

BILL TO

P.O. #:	
Company:	
Attn:	
Address:	
City:	
State:	Zip:
Phone #:	
Fax #:	

ANALYSIS REQUEST

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	CHLORIDE
H1DD240-1	W. DELINEATION TRENCH @ 1'	G				✓					✓		2.7.11	10:00	✓
2	W. DELINEATION TRENCH @ 8'	G				✓					✓		2.7.11	11:25	✓
3	S. DELINEATION TRENCH @ 5'	G				✓					✓		2.7.11	3:00	✓
4	S. DELINEATION TRENCH @ 10'	G				✓					✓		2.7.11	3:45	✓

Relinquished By:	Date: 2.7.11	Received By: Jodi Henson	Phone Result: ☐ Yes ☐ No Add'l Phone #:
	Time: 5:00		Fax Result: ☐ Yes ☐ No Add'l Fax #:
Relinquished By:	Date:	Received By:	REMARKS: EMAIL
	Time:		

Delivered By: (Circle One)
Sampler - UPS - Bus - Other:

Sample Condition		CHECKED BY: (Initials)
Cool: ☐ Yes ☐ No	Intact: ☐ Yes ☐ No	

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

#26

Appendix D

Background Characterization Report

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

CERTIFIED MAIL
RETURN RECEIPT NO. 7010 0290 0003 1264 9000

October 11, 2010

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: **Background Characterization Report**
BD Jct. P-30 (1R0426-124)
T21S-R37E-Section 30, Unit Letter P, Lea County, New Mexico

Mr. Hansen:

As agent for Rice Operating Company (ROC), and in response to your email request on August 18, 2010, Trident Environmental is submitting this *Background Characterization Report* for the above-referenced site. Based on the characterization of background concentrations for chlorides and total dissolved solids (TDS), as described in more detail below, we have determined that groundwater at the site is representative of background conditions and therefore has not been impacted by the former junction box. However, ROC will develop a *Corrective Action Plan* to address the vadose zone and mitigate the potential for migration of chlorides and TDS from the vadose zone to groundwater. The CAP will include plans to excavate the affected area, install a liner, and re-establish vegetation.

Chloride and TDS Background Characterization

The most recent data (1990 – 1995) from the New Mexico Water and Infrastructure Data System (NMWAIDS) were used to determine the range of chloride concentrations within an approximate 5 mile radius of the site. Only chloride data is available; therefore, TDS concentrations were directly correlated to chloride levels using a conservative factor of 3. This data set resulted in 29 wells within all of T21S-R36E, T21S-R37E, T22S-R36E, and T22S-R37E. The mean (μ) and standard deviation (σ) were calculated from the data set from which an upper limit for background chloride concentration was conservatively estimated by adding two standard deviations to the mean ($\mu + 2\,\sigma$). Table 1 below summarizes the available data set and calculation results.

Table 1
Summary of Background Chloride Concentrations

Data obtained from NMWAIDS (Years: 1990-1995; Chlorides: 0 mg/L – 1,000 mg/L)

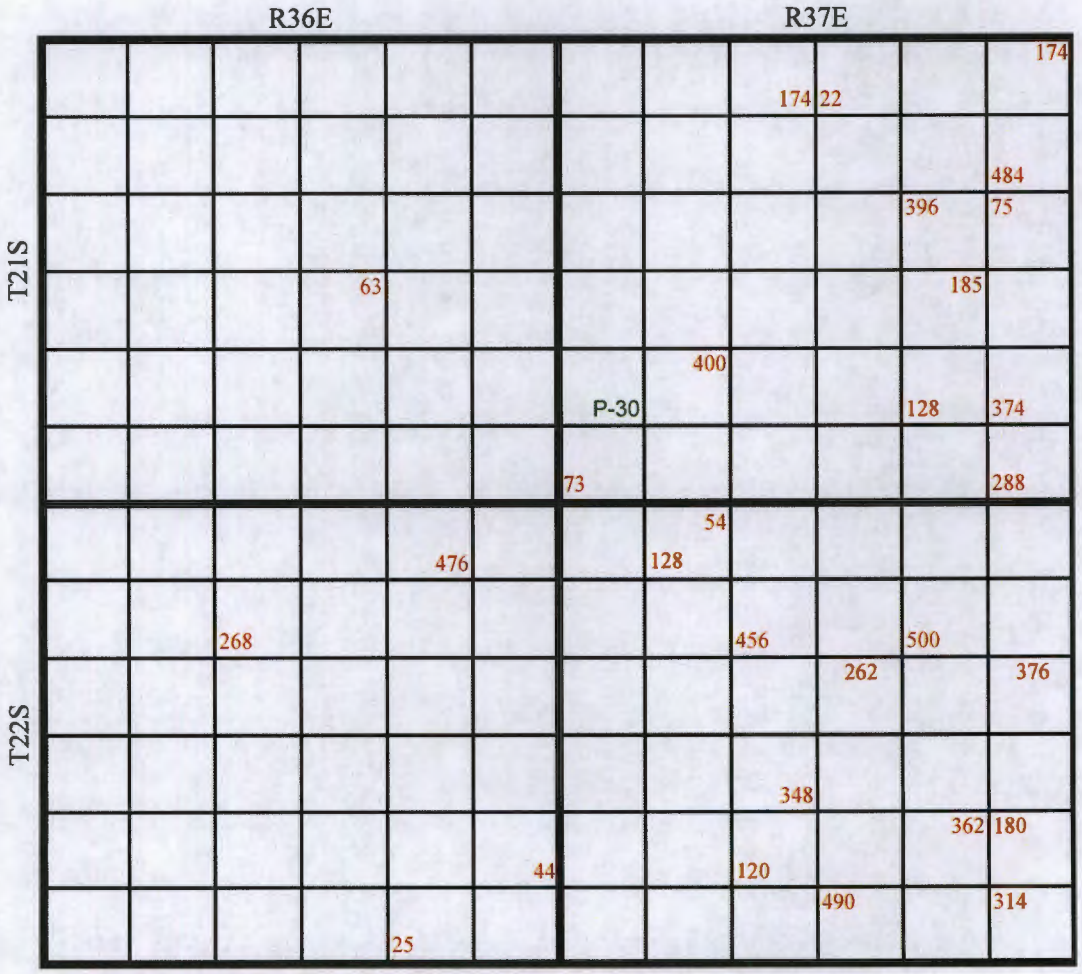
S	T	R	Formation	Date	Chlorides (mg/L)	Location (qtr/qtr)
23	21S	36E	OGALLALA	10/05/95	63	21S.36E.23.232311
1	21S	37E	OAL	10/04/95	174	21S.37E.01.242422
3	21S	37E	OAL	11/15/95	22	21S.37E.03.31221
4	21S	37E	OAL	10/03/95	174	21S.37E.04.412442
12	21S	37E	OAL	10/04/95	484	21S.37E.12.34341
13	21S	37E	OAL	06/21/90	75	21S.37E.13.13434
14	21S	37E	OAL	10/04/95	396	21S.37E.14.12410
26	21S	37E	OAL	11/15/95	128	21S.37E.26.32322
31	21S	37E	OAL	10/05/95	73	21S.37E.31.13311
36	21S	37E	OAL	10/04/95	288	21S.37E.36.34432
2	22S	36E	OGALLALA	10/06/95	476	22S.36E.02.442441
9	22S	36E	OGALLALA	10/17/95	268	22S.36E.09.341221
25	22S	36E	OGALLALA	10/11/95	44	22S.36E.25.43433A
35	22S	36E	OGALLALA	10/06/95	25	22S.36E.35.313224
5	22S	37E	OAL	10/05/95	54	22S.37E.05.21213
5	22S	37E	OGALLALA	10/04/95	128	22S.37E.05.341434
9	22S	37E	OGALLALA	10/05/95	456	22S.37E.09.313331
11	22S	37E	OAL	10/03/95	500	22S.37E.11.322414
13	22S	37E	null	10/03/95	376	22S.37E.13.22111
15	22S	37E	OGALLALA	10/05/95	262	22S.37E.15.333343
21	22S	37E	OAL	10/11/95	348	22S.37E.21.44223
25	22S	37E	OAL	10/04/95	180	22S.37E.25.123332
26	22S	37E	OAL	10/03/95	362	22S.37E.26.21231
28	22S	37E	OAL	10/04/95	120	22S.37E.28.31243
34	22S	37E	OAL	10/04/95	490	22S.37E.34.121344
36	22S	37E	null	10/04/95	314	22S.37E.36.14311
				Mean (μ) =	249.6 mg/L	
				Standard Deviation (σ) =	160.3 mg/L	
				Mean + 2 SD = $\mu + 2\sigma$ =	570.2 mg/L	

The chloride concentrations in Table 1 are also depicted in Figure 2. Based on the regional chloride concentration data in Table 1 above, a conservative upper limit for background chloride concentration is 570 mg/L. Since TDS data is not available an upper limit for background TDS was conservatively estimated at three times the chloride level (3 x 570.2 = 1,711 mg/L).

Figure 2

Regional Distribution of Chloride Concentrations

Data obtained from NMWAIDS (Years: 1990-1995; Chlorides: 0 mg/L – 1,000 mg/L)



Values in red type indicate chloride concentrations in (mg/L)

As shown in Table 2 below, five quarters of groundwater data at the site monitoring well (MW-1) indicate chloride and TDS levels well below the upper limit of background concentrations for the regional area. In addition, the average chloride and TDS concentrations in MW-1 are only marginally above the WQCC standard of 250 mg/L and 1,000 mg/L, respectively. Therefore, it has been concluded that chloride and TDS concentrations at the site are representative of background conditions, and the site has not been impacted by the former junction box.

Table 2
Summary of Site Chloride and TDS Concentrations

Monitoring Well	Sample Date	Depth to Groundwater (feet BTOC)	Chloride (mg/L)	TDS (mg/L)
MW-1	07/27/09	97.89	392	1,180
	10/16/09	97.86	364	1,130
	01/25/10	97.82	324	957
	04/22/10	97.77	280	811
	07/22/10	97.76	370	1,030
		Mean (μ) =	346	1,022

Chloride and TDS Background Characterization

The United States Geological Survey National Water Information System (USGS NWIS), New Mexico Water Rights Reporting System (NM WRRS) , and NM WAIDS, databases were reviewed to identify water wells within a mile of the site with historical chloride concentration data as summarized in Table 3 below. A site location map with these wells identified is shown in Figure 1.

Table 3
Summary of Chloride Concentrations within One-Mile Radius

Water Well or Sample ID	Distance from BD Jct P-30	S	T	R	Sample Date	TD (ft bgs)	Chloride (mg/L)
MW-1	0 ft	30	21S	37E	07/22/10	113	370
10155	2,500 ft NW	30	21S	37E	10/18/84	125	106
8849	3,800 ft SSW	31	21S	37E	07/09/90	115	95
9387	4,200 ft NE	29	21S	37E	07/09/90	130	400
12349	5,000 ft SE	32	21S	37E	10/26/65	115	140

Chloride concentrations in each well identified in Table 3 above and in Figure 1 are representative of background conditions. The nearest water well is located approximately 2,500 ft northwest of the site and is not a concern due to its upgradient location. The closest downgradient well from the site is located almost a mile (5,000 ft) southeast and is not a concern due to its long distance from the site. The remaining wells can not be affected by any activity at the site due to their distant cross-gradient locations and the prevailing southeast trending groundwater gradient direction.

TRIDENT ENVIRONMENTAL

0 1000 2000
Approximate Scale (Feet)

BD Jct. P-30 Site
T21S - R37E - Section 30, Unit P
RICE *Operating Company*

FIGURE 1

SITE LOCATION MAP

Conclusions and Recommendations

Based on the regional characterization of background concentrations for chlorides and TDS, we have determined that groundwater at the site is representative of background conditions and therefore has not been impacted by the former junction box. However, ROC will develop a *Corrective Action Plan* to address the vadose zone and mitigate the potential for migration of chlorides from the vadose zone to groundwater. The CAP will include plans to excavate the affected area, install a liner, and re-establish vegetation.

ROC is the service provider (agent) for the Blinebry Drinkard (BD) Salt Water Disposal System and has no ownership of any portion of the pipelines, wells, or facilities. The BD System is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis. Environmental remediation projects of this magnitude require System Parties AFE approval and work begins as funds are received.

If you have any questions please call Hack Conder at 575-393-9174.

Sincerely,

Gilbert J. Van Deventer, REM, PG
Trident Environmental - Project Manager

cc: Hack Conder (Rice Operating Co., Hobbs NM)

Appendix E

Multimed Report

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

MULTIMED V1.01 DATE OF CALCULATIONS: 19-JUN-2013 TIME: 12:25:24

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
--- -------

BD Jct. P-30 west and BD P-30 EOL

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	2.00	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	2.00	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	2.00	-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.

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	892.	-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	0.118E+04	-999.	-999.	-999.
Length scale of facility	m	CONSTANT	36.6	-999.	-999.	-999.
Width scale of facility	m	CONSTANT	24.4	-999.	-999.	-999.
Near field dilution		DERIVED	1.00	0.000	0.000	1.00

1

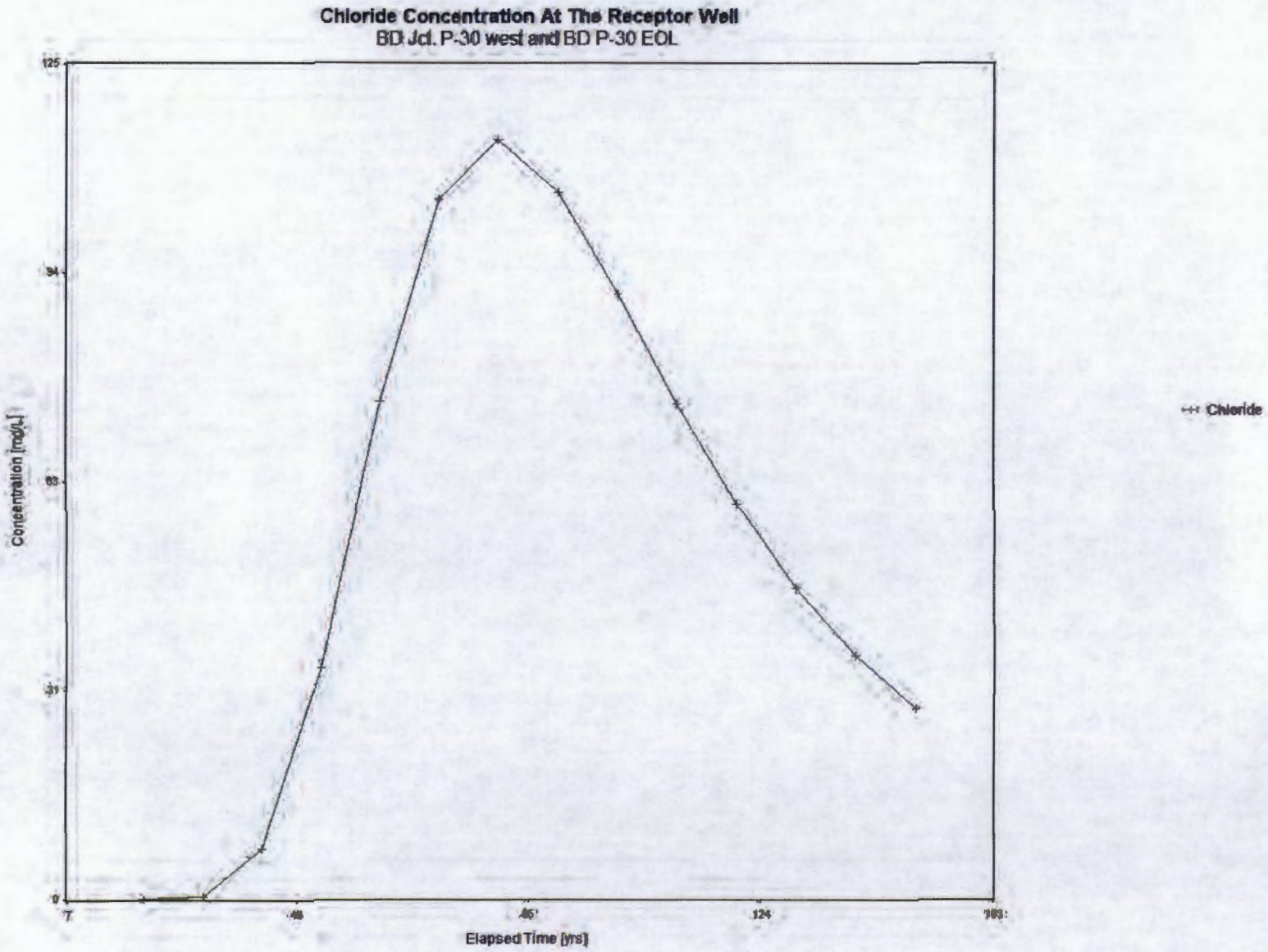
AQUIFER SPECIFIC VARIABLES

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.

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
0.200E+02	0.15357E-02
0.300E+02	0.43476E+00
0.400E+02	0.75995E+01
0.500E+02	0.34663E+02
0.600E+02	0.74681E+02
0.700E+02	0.10491E+03
0.800E+02	0.11372E+03
0.900E+02	0.10590E+03
0.100E+03	0.90746E+02
0.110E+03	0.74248E+02
0.120E+03	0.59212E+02
0.130E+03	0.46703E+02
0.140E+03	0.36542E+02
0.150E+03	0.28665E+02


Chloride Concentration At The Receptor Well
BD Jct. P-30 west and BD P-30 EOL
125
94
63
31
0
Concentration [mg/L]
7
46
85
124
163
Elapsed Time [yrs]
Chloride

BD Jct. P-30 west and BD P-30 EOL
Unit P, Section 30, T20S, R37E
Depth to GW: 97 ft
Proposed Liner Dimension: 120x80-ft

BD Jct. P-30 West

	SB1 20' S		SB2 Source		SB3 20' W		SB4 20' N		SB5 20' E	
	Cl-	PID	Cl-	PID	Cl-	PID	Cl-	PID	Cl-	PID
1										
5	288	0	665	1.2	1125	0.8	272	1	228	3.4
10	1417	0	378	0.7	2317	0.6	1403	0.6	373	1.4
15	1294	0	762	0.4	1823	0.2	1570	0.5	180	0.7
20	1066	0	1581	0.6	1216	0.2	1500	0.3	1513	0.7
25	1224	0	2524	0.3	1483	0.3	1490	0.2	1000	0.6
30	839	0								
35	732	0								
40	694	0								
45	314	0.1								
50	280	0.3								
55	323	0.2								
60	273	0.4								
65	229	0.6								
70	149	0.9								

12 ft South Trench

	Cl-	PID
1'	129	13.1
2'	256	1558
3'	310	2515
4'	328	5000
5'	924	113.3
6'	1085	24.9
7'	980	5000
8'	1218	36
9'	1826	2.3
10'	1791	1.2

30' North trench

	Cl-	PID
4'	527	0
5'	518	0
6'	960	0
7'	782	0
8'	1214	0
9'	1272	0
10'	814	0

35' North Trench

	Cl-	PID
1'	603	0
2'	240	0
3'	365	0
4'	309	0
5'	205	0

	Cl-	PID	Cl-	PID	Cl-	PID	Cl-	PID	Cl-	PID
10			1224	0.7	1099	0	572	0.2	1023	0
15	3446	0.3	1208	0.5	1191	0	608	0.2	2034	0
20	2295	0.2	3512	0.6	2689	0	947	0.1	1905	0
25	1688	0.1	3535	0.5	1752	0	1023	0.1	1730	0
30	2089	0.1	2444	0.2	1782	0.1	1238	0	1829	0
35	2007	0.1	1258	0.1	1484	0.1	1878	0	2148	0
40	1964	0.1	418	0.5	940	0.1	1677	0	1413	0
45	1614	0.1	334	0.5	348	0.2	1399	0	1618	0
50	1580	0.2	283	0.7	326	0	1295	0	1010	0
55	1298	0.1	258	0.4	420	0	1373	0	1554	0
60	1565	0.1	227	0.4	293	0	1461	0	1464	0.1
65	1243	0.1	195	0.4	321	0	1291	0.1	1728	0.1
70	880	0.1	197	0.2	376	0	1196	0.1	1010	0.1
75	660	0.2	174	0.2	425	0	1216	0.1	818	0.1
80	607	0.3			602	0	1100	0.1	1022	0.5
85	768	0.1			626	0	801	0.1	885	0.7
90	790	0.1			777	0	606	0.1	1013	0.7
					840	0.2	710	0.1	915	0.6

30' W

20' N

	Cl-	PID
	295	0
	4955	0
	4729	0
	3689	0
	3861	0

	Cl-	PID
	1181	0.9
	4717	0.3
	3010	0.7
	3220	0.9
	2106	0.9

	Cl-	PID
1'	720	0
2'	178	0
3'	457	0
4'	312	0
5'	1212	0
6'	1214	0
7'	1547	0
8'	1858	0
9'	1823	0
10'	2262	0

	Cl-	PID
1'	87	1.5
2'	167	2
3'	477	167.7
4'	501	141.9
5'	686	1802
6'	765	7.1
7'	1102	4.5
8'	1001	1.4

Average Chloride concentration	1,184	mg/kg
Deepest sample collected (90 ft) subtracted from depth to GW (97 ft)	7	ft

MULTIMED V1.01 DATE OF CALCULATIONS: 1-JUL-2013 TIME: 16: 7:22

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
--- -------

BD Jct. P-30 west and BD P-30 EOL

Chemical simulated is Chloride

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration Specified By User: 1.524E-02 m/yr
Run was transient
Well Times: Find Maximium Concentration
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	3.00	1

DATA FOR MATERIAL 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	3.00	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		LIMITS	
			MEAN	STD DEV	MIN	MAX
Thickness of layer	m	CONSTANT	3.00	-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.

1

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	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		LIMITS	
			MEAN	STD DEV	MIN	MAX
Infiltration rate	m/yr	CONSTANT	0.152E-01	-999.	-999.	-999.
Area of waste disposal unit	m^2	DERIVED	892.	-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	806.	-999.	-999.	-999.
Length scale of facility	m	CONSTANT	36.6	-999.	-999.	-999.
Width scale of facility	m	CONSTANT	24.4	-999.	-999.	-999.

	Near field dilution		DERIVED	1.00	0.000	
0.000	1.00					

1

AQUIFER SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		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	CONSTANT	3.18	-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.				

MAXIMUM WELL CONCENTRATION IS 211.4 AT 0.628E+02 YEARS