1R - 427-13

WORKPLANS

Date:
7-19-12

Rice Environmental Consulting & Safety
P.O. Box 5630 Hobbs, NM 88241
Phone 575.393.4411 Fax 575.393.0293

CERTIFIED MAIL
RETURN RECEIPT NO. 7008 1140 0001 3072 4598

July 19th, 2012

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 – EME SWD System
EME K-11 (1R427-13): UL/K sec. 11 T21S R36E.
Formerly EME N-11

Mr. Hansen:

RICE Operating Company (ROC) has retained Rice Environmental Consulting and Safety (RECS) to address potential environmental concerns at the above-referenced site in the EME Salt Water Disposal (SWD) system. The site was previously referred to as the EME N-11. However, the site name has changed to the EME K-11 to match its geographical location (Figure 1). All correspondence will reference EME K-11. ROC is the service provider (agent) for the EME SWD System and has no ownership of any portion of the pipeline, well, or facility. The system is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis.

Background and Previous Work

The site is located approximately 5.5 miles northwest of Monument, New Mexico at UL/K sec. 11 T21S R36E as shown on the Site Location Map (Figure 1). NM OSE records indicate that groundwater will likely be encountered at a depth of approximately 200 +/- feet.

In 2003, ROC initiated work on the former EME K-11 junction box. The site was delineated using a backhoe to form a 33 ft x 30 ft x 14 ft deep excavation and soil samples were screened at regular intervals for both hydrocarbons and chlorides. Chloride field data numbers showed no vertical or lateral decline. Field hydrocarbons numbers were low throughout. To further investigate the site, a soil bore was advanced on December 31st, 2003, ten feet west of the source. The boring was advanced to 80 ft bgs and samples were taken every five feet. The samples were field tested for chlorides and the 80 ft sample was taken to a commercial laboratory to be analyzed for chlorides. The laboratory chloride reading showed a result of 2,559 mg/kg. The bore was plugged in total with drilling cuttings.

The excavated area was backfilled and contoured to the surrounding landscape 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 January 9th, 2004 and a junction box disclosure report was submitted to NMOCD with all the 2003 junction box closures and disclosures.

Investigation and Characterization Plan (ICP) Report

As part of the Investigation and Characterization Plan submitted to NMOCD on May 22nd, 2012, and approved on May 30th, 2012, RECS personnel were on site on June 14th and 15th, 2012, to conduct soil bore installations (Figure 2). As the six bores (SB-2 through SB-7) were advanced, samples were taken at regular intervals from the bores and field tested for both chlorides and hydrocarbons. Representative samples were taken to a commercial laboratory for field number confirmation. Laboratory chloride readings for SB-2 returned results of 1,380 mg/kg at 70 ft bgs and 256 mg/kg at 130 ft bgs, SB-3 returned results of non-detect at the surface and 256 mg/kg at 10 ft bgs, SB-4 returned results of 528 mg/kg at 5 ft bgs and 336 mg/kg at 15 ft bgs, SB-5 returned results of 464 mg/kg at 5 ft bgs and 240 mg/kg at 15 ft bgs, SB-6 returned results of 1,040 mg/kg at 50 ft bgs and 688 mg/kg at 80 ft bgs and SB-7 returned results of non-detect at the surface and 128 mg/kg at 10 ft bgs. Gasoline Range Organics (GRO) and Diesel Range Organics (DRO) readings in all bores and throughout all depths were non-detect (Appendix A).

To determine what affect the residual chlorides may have on the groundwater beneath the site, ROC personnel ran the U.S. Environmental Protection Agency Exposure Assessment Multimedia Model – Multimed (Version 1.50, 2005). The model predicted that the chlorides in the vadose zone will reach groundwater with a maximum concentration of 114.8 mg/L in 488 years (Appendix B). Therefore, the residual chlorides in the vadose zone will not impact groundwater above WQCC standards.

Corrective Action Plan

Based on the soil bore installation information and the Multimed analysis, it is evident that the residual chlorides in the vadose zone will not contribute to the degradation of groundwater beneath the site. Therefore, RECS recommends that ROC scrape a 4,000 sq ft area that encompasses the site to six inches deep to remove large rocks and debris. Clean, imported soil will be blended with the remaining scraped soil and backfilled over the site. The blended backfill material will have a laboratory chloride reading no greater than 500 mg/kg and a field PID reading below 100 ppm. The area will be contoured to the surrounding location and the site will be seeded with a blend of native vegetation. Vegetation will 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.

Once the CAP activities are completed, ROC will submit a written report detailing the CAP activities and a request for 'remediation termination' status of the regulatory 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

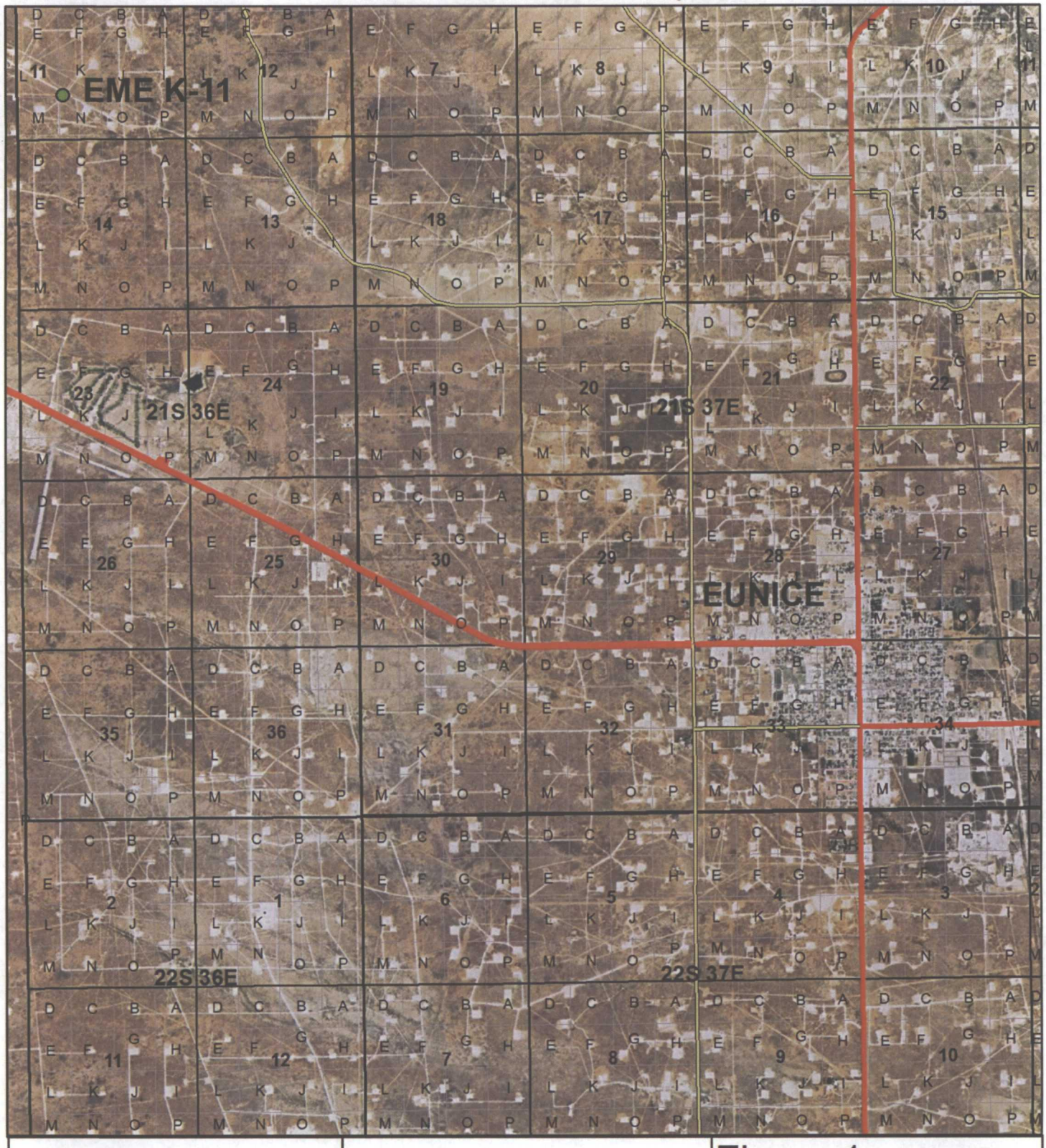
Attachments:

Figure 1 – Site Location Map
Figure 2 – Soil Bore Installation Map
Appendix A – Soil Bore Installation Documentation
Appendix B – Multimed Model

Figures

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

Site Location Map



RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

EME K-11

Legals: UL/K sec. 11
T-21-S R-36-E
LEA COUNTY, NM

NMOCD CASE #: 1R427-13

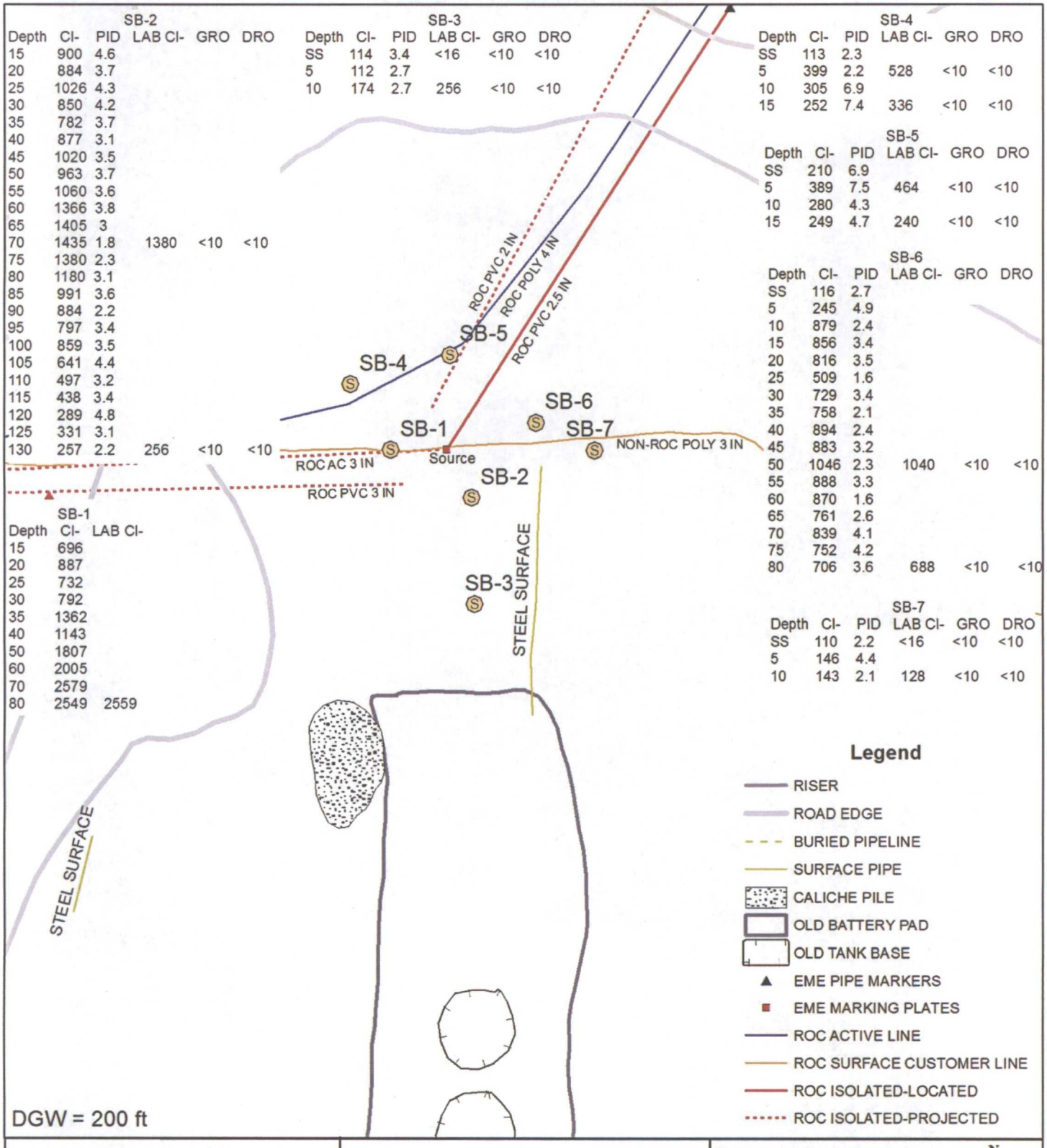
Figure 1

N W E S

0 0.375 0.75 1.5 Miles

Drawing date: 5-7-12
Drafted by: L. Weinheimer

Soil Bore Installation



RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

EME K-11

UL/K SECTION 11
T-21-S R-36-E

NMOCD CASE #: 1R427-13

Figure 2

N W E S

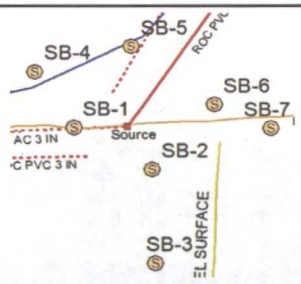
0 20 40 Feet

GPS date: 5/8/12 by TG
Drawing date: 6/21/12
Drafted by: L. Weinheimer

Appendix A

Soil Bore Installation Documentation

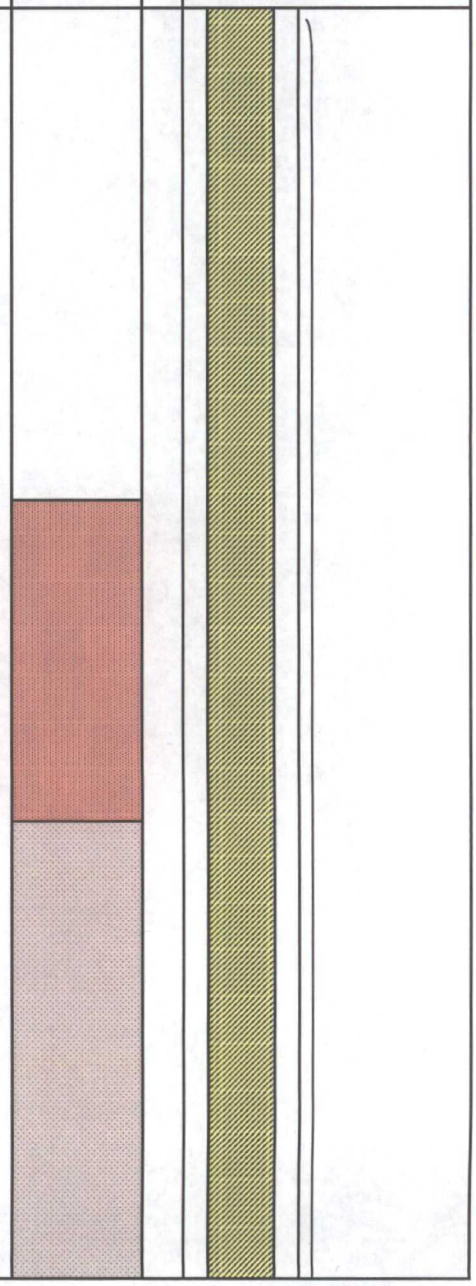
RICE Environmental Consulting and Safety (RECS)
P.O. Box 5630 Hobbs, NM 88241
Phone 575.393.4411 Fax 575.393.0293

Logger:	Kyle Norman		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		**Project Name:** EME K-11 **Well ID:** SB-2
Drilling Method:	Air rotary		**Project Consultant:** RECS
Start Date:	6/14/2012		
End Date:	6/14/2012		

Comments: Located 10 ft southeast of the former junction box site. All samples were from cuttings.
DRAFTED BY: L. Weinheimer
TD = 130 ft GW = 200 ft

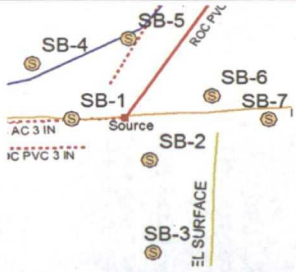
Location: UL/K sec. 11 T-21-S R-36-E
Lat: 32°29'23.711"N **Long:** 103°14'23.96"W
County: Lea **State**: NM

Depth (feet)	Chloride field tests	LAB	PID	Description
				Regolith
SS				
5 ft				
10 ft				
15 ft	900		4.6	Red/Tan Sand With Some Caliche
20 ft	884		3.7	
25 ft	1026		4.3	Tan Sand
30 ft	850		4.2	
35 ft	782		3.7	



Depth (feet)	Chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Tan Sand		bentonite seal
40 ft	877		3.1			
45 ft	1020		3.5			
50 ft	963		3.7			
55 ft	1060		3.6			
60 ft	1366		3.8			
65 ft	1405		3.0			
70 ft	1435	Cl- 1380	1.8			
		GRO <10				
		DRO <10				
75 ft	1380		2.3			
80 ft	1180		3.1			
85 ft	991		3.6			
90 ft	884		2.2			

Depth (feet)	Chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Tan Sand		
95 ft	797		3.4			
100 ft	859		3.5			
105 ft	641		4.4			
110 ft	497		3.2			
115 ft	438		3.4			
120 ft	289		4.8			
125 ft	331		3.1			
130 ft	257	Cl- 256	2.2			
		GRO <10				
		DRO <10				

Logger:	Kyle Norman		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		**Project Name:** EME K-11 **Well ID:** SB-3
Start Date:	6/14/2012		
End Date:	6/14/2012		**Project Consultant:** RECS

Comments: Located 30 ft southeast of the former junction box site. All samples were from cuttings.

DRAFTED BY: A. Ruth

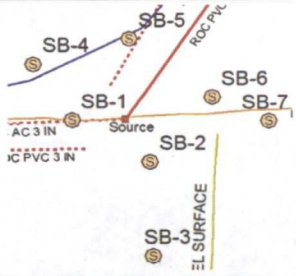
TD = 10 ft GW = 200 ft

Location: UL/K sec. 11 T-21-S R-36-E

Lat: 32°29'23.708"N **County**: Lea

Long: 103°14'23.955"W **State**: NM

Depth (feet)	Chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Brown Sand		
SS	114	Cl- <16	3.4			
		GRO <10		Tan Sand		bentonite seal
		DRO <10				
5 ft	112		2.7			
10 ft	174	Cl- 256	2.7			
		GRO <10				
		DRO <10				

Logger:	Kyle Norman		**Project Name:** EME K-11 **Well ID:** SB-4
Driller:	Harrison & Cooper, Inc.		**Project Consultant:** RECS
Drilling Method:	Air rotary		
Start Date:	6/15/2012		
End Date:	6/15/2012		

Comments: Located 20 ft northwest of the former junction box site. All samples were from cuttings.

DRAFTED BY: A. Ruth

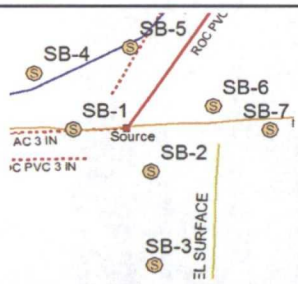
TD = 15 ft GW = 200 ft

Location: UL/K sec. 11 T-21-S R-36-E

Lat: 32°29'23.914"N **County**: Lea

Long: 103°14'24.219"W **State**: NM

Depth (feet)	Chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Tan Sand		bentonite seal
SS	113		2.3			
5 ft	399	Cl- 528	2.2			
		GRO <10				
		DRO <10				
10 ft	305		6.9			
15 ft	252	Cl- 336	7.4			
		GRO <10				
		DRO <10				

Logger:	Kyle Norman		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		**Project Name:** EME K-11 **Well ID:** SB-5
Start Date:	6/15/2012		
End Date:	6/15/2012		**Project Consultant:** RECS

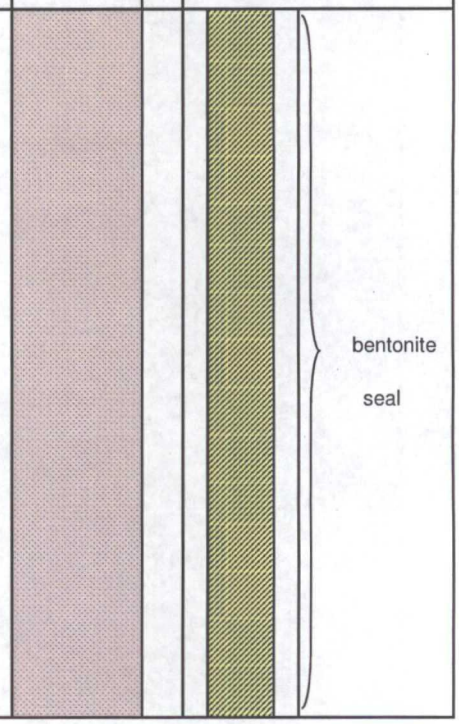
Comments: Located 17 ft north of the former junction box site.
All samples were from cuttings.
DRAFTED BY: A. Ruth

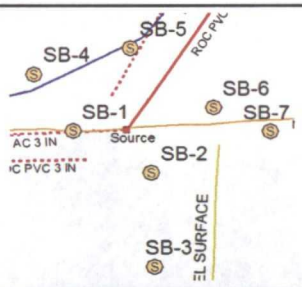
TD = 15 ft GW = 200 ft

Location: UL/K sec. 11 T-21-S R-36-E

Lat: 32°29'23.965"N **County**: Lea
Long: 103°14'24.003"W **State**: NM

Depth (feet)	Chloride field tests	LAB	PID	Description
				Tan Sand
SS	210		6.9	
5 ft	389	Cl- 464	7.5	
		GRO <10		
		DRO <10		
10 ft	280		4.3	
15 ft	249	Cl- 240	4.7	
		GRO <10		
		DRO <10		



Logger:	Kyle Norman		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		**Project Name:** EME K-11 **Well ID:** SB-6
Start Date:	6/15/2012		
End Date:	6/15/2012		**Project Consultant:** RECS

Comments: Located 17 ft northeast of the former junction box site. All samples were from cuttings.

DRAFTED BY: A. Ruth

TD = 80 ft GW = 200 ft

Location: UL/K sec. 11 T-21-S R-36-E

Lat: 32°29'23.843"N **Long:** 103°14'23.82"W

County: Lea **State**: NM

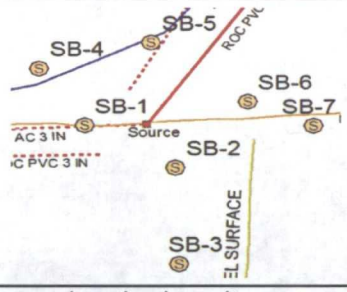
Depth (feet)	Chloride field tests	LAB	PID	Description
				Brown Sand
SS	116		2.7	
				Brown Sand with some Caliche
5 ft	245		4.9	
				Tan Sand with some Caliche
10 ft	879		2.4	
15 ft	856		3.4	
20 ft	816		3.5	
				Tan Sand
25 ft	509		1.6	
30 ft	729		3.4	

Lithology

Well Construction

35 ft	758		2.1	Tan Sand	bentonite seal
40 ft	894		2.4		
45 ft	883		3.2		
50 ft	1046	Cl- 1040	2.3		
		GRO <10			
		DRO <10			
55 ft	888		3.3		
60 ft	870		1.6		
65 ft	761		2.6		
70 ft	839		4.1		
75 ft	752		4.2		
80 ft	706	Cl- 688	3.6		
		GRO <10			
		DRO <10			

Logger:	Kyle Norman
Driller:	Harrison & Cooper, Inc.
Drilling Method:	Air rotary
Start Date:	6/15/2012
End Date:	6/15/2012



Project Name: EME K-11 **Well ID:** SB-7

Project Consultant: RECS

Comments: Located 27 ft east of the former junction box site.
All samples were from cuttings.
DRAFTED BY: A. Ruth

TD = 10 ft GW = 200 ft

Location: UL/K sec. 11 T-21-S R-36-E

Lat: 32°29'23.792"N **County**: Lea

Long: 103°14'23.694"W **State**: NM

Depth (feet)	Chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Tan Sand		bentonite seal
SS	110	Cl- <16	2.2			
		GRO <10				
		DRO <10				
5 ft	146		4.4			
10 ft	143	Cl- 128	2.1			
		GRO <10				
		DRO <10				

CARDINAL Laboratories

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

June 20, 2012

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: EME K-11 21S/36E

Enclosed are the results of analyses for samples received by the laboratory on 06/14/12 16:30.

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

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

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

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

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

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

Analytical Results For:

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

Received:	06/14/2012	Sampling Date:	06/14/2012
Reported:	06/20/2012	Sampling Type:	Soil
Project Name:	EME K-11 21S/36E	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB 2 @ 70' (H201360-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1380**	16.0	06/19/2012	ND	416	104	400	0.00	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/18/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/18/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*93.4 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*108 %*	*63.6-154*

Sample ID: SB 2 @ 130' (H201360-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**256**	16.0	06/19/2012	ND	400	100	400	3.92	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/18/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/18/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*93.1 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*105 %*	*63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

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

Analytical Results For:

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

Received:	06/14/2012	Sampling Date:	06/14/2012
Reported:	06/20/2012	Sampling Type:	Soil
Project Name:	EME K-11 21S/36E	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB 3 @ SURFACE (H201360-03)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	<16.0	16.0	06/19/2012	ND	400	100	400	3.92	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/18/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/18/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*93.0 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*108 %*	*63.6-154*

Sample ID: SB 3 @ 10' (H201360-04)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**256**	16.0	06/19/2012	ND	400	100	400	3.92	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/18/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/18/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*93.4 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*109 %*	*63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

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

Notes and Definitions

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

Celey D. Keene, Lab Director/Quality Manager

CARDINAL LABORATORIES

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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

Company Name: Rice		**BILL TO**	
Project Manager: Hack Conder		P.O. #:	
Address:		Company:	
City: Hobbs	State: NM Zip: 88240	Attn:	
Phone #:	Fax #:	Address:	
Project #:	Project Owner:	City:	
Project Name:		State: Zip:	
Project Location: EME K-11		Phone #:	
Sampler Name: Kyle Norman		Fax #:	

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST										
Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME	Chlorides	TPH 8015 M	BTEX	Texas TPH	Complete Cations/Anions	TDS					
H201360																									
1	SB2 @ 70'	G	1			✓					✓		6/9/12	11:30	✓	✓									
2	SB2 @ 130'	G	1			✓					✓		"	2:45	✓	✓									
3	SB 3 @ Surface	G	1			✓					✓		"	3:45	✓	✓									
4	SB 3 @ 10'	G	1			✓					✓		6/9/12	4:00	✓	✓									

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:	Date: 6-10-12	Received By:	Phone Result: ☐ Yes ☑ No Add'l Phone #:
	Time: 4:30		Fax Result: ☐ Yes ☑ No Add'l Fax #:
Relinquished By:	Date:	Received By:	REMARKS:
	Time:		email results: zconder@rice-ecs.com Knorman@rice-ecs.com; lpena@riceswd.com Kjones@riceswd.com; Bbaker@rice-ecs.com; hconder@rice-ecs.com; Lweinheimer@rice-ecs.com

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

Sample Condition: Cool ☐ Yes ☐ No Intact ☐ Yes ☐ No

CHECKED BY: (Initials)

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

#26

CARDINAL Laboratories

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

June 20, 2012

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: EME K-11 21S/36E

Enclosed are the results of analyses for samples received by the laboratory on 06/15/12 12:55.

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

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

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

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

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

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

Analytical Results For:

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

Received:	06/15/2012	Sampling Date:	06/15/2012
Reported:	06/20/2012	Sampling Type:	Soil
Project Name:	EME K-11 21S/36E	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB 4 @ 5' (H201365-01)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**528**	16.0	06/19/2012	ND	400	100	400	3.92	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/19/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/19/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*94.6 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*112 %*	*63.6-154*

Sample ID: SB 4 @ 15' (H201365-02)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**336**	16.0	06/19/2012	ND	400	100	400	3.92	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/19/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/19/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*95.4 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*112 %*	*63.6-154*

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:	06/15/2012	Sampling Date:	06/15/2012
Reported:	06/20/2012	Sampling Type:	Soil
Project Name:	EME K-11 21S/36E	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB 5 @ 5' (H201365-03)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**464**	16.0	06/19/2012	ND	400	100	400	3.92	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/19/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/19/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*91.8 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*108 %*	*63.6-154*

Sample ID: SB 5 @ 15' (H201365-04)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**240**	16.0	06/19/2012	ND	432	108	400	3.77	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/19/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/19/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*98.2 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*115 %*	*63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

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

Analytical Results For:

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

Received:	06/15/2012	Sampling Date:	06/15/2012
Reported:	06/20/2012	Sampling Type:	Soil
Project Name:	EME K-11 21S/36E	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB 6 @ 50' (H201365-05)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1040**	16.0	06/19/2012	ND	432	108	400	3.77	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/19/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/19/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*98.0 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*113 %*	*63.6-154*

Sample ID: SB 6 @ 80' (H201365-06)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**688**	16.0	06/19/2012	ND	432	108	400	3.77	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/19/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/19/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*94.5 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*111 %*	*63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

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

Analytical Results For:

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

Received:	06/15/2012	Sampling Date:	06/15/2012
Reported:	06/20/2012	Sampling Type:	Soil
Project Name:	EME K-11 21S/36E	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB 7 @ SURFACE (H201365-07)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	<16.0	16.0	06/19/2012	ND	432	108	400	3.77	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/19/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/19/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*84.3 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*94.9 %*	*63.6-154*

Sample ID: SB 7 @ 10' (H201365-08)

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**128**	16.0	06/19/2012	ND	432	108	400	3.77	

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

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	06/19/2012	ND	182	91.2	200	5.14	
DRO >C10-C28	<10.0	10.0	06/19/2012	ND	189	94.5	200	1.59	

Surrogate: 1-Chlorooctane	*94.8 %*	*65.2-140*
Surrogate: 1-Chlorooctadecane	*110 %*	*63.6-154*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

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

Notes and Definitions

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

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL LABORATORIES

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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

Company Name: Rice		**BILL TO**	
Project Manager: Hack Conder		P.O. #:	
Address:		Company:	
City: Hobbs	State: NM Zip: 88240	Attn:	
Phone #:	Fax #:	Address:	
Project #:	Project Owner:	City:	
Project Name:		State: Zip:	
Project Location: EME K-11 21S-36E		Phone #:	
Sampler Name: Kyle Norman		Fax #:	

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST									
Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME	Chlorides	TPH 8015 M	BTEX	Texas TPH	Complete Cations/Anions	TDS				
H201365																								
1	SB4 @ 5'	G	1			✓					✓		6-6-17	8:30	✓	✓								
2	SB4 @ 15'	G	1			✓					✓			8:45	✓	✓								
3	SB5 @ 5'	G	1			✓					✓			9:15	✓	✓								
4	SB5 @ 15'	G	1			✓					✓			9:45	✓	✓								
5	SB6 @ 20'	G	1			✓					✓			10:00	✓	✓								
6	SB6 @ 30'	G	1			✓					✓			10:15	✓	✓								
7	SB7 @ Surface	G	1			✓					✓			11:30	✓	✓								
8	SB7 @ 10'	G	1			✓					✓		6-15-17	11:45	✓	✓								

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: Kyle Norman	Date: 6-15-17 Time: 12:55	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: zconder@rice-ecs.com Knorman@rice-ecs.com; lpena@riceswd.com Kjones@riceswd.com; Bbaker@rice-ecs.com; hconder@rice-ecs.com; Lweinheimer@rice-ecs.com

Delivered By: (Circle One)	Sample Condition	CHECKED BY:
Sampler - UPS - Bus - Other:	Cool: ☑ Yes ☐ No Intact: ☑ Yes ☐ No	(Initials)

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

#26

Appendix B
Multimed Model

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

MULTIMED V1.01 DATE OF CALCULATIONS: 13-JUL-2012 TIME: 14: 7:57

U. S. ENVIRONMENTAL PROTECTION AGENCY

EXPOSURE ASSESSMENT

MULTIMEDIA MODEL

MULTIMED (Version 1.50, 2005)

1

Run options

EME K-11

Chemical simulated is Chloride

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration Specified By User: 3.048E-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	61.00	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	61.0	0.000	0.000	0.000

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

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

1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

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

OPTIONS CHOSEN

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

1

DATA FOR LAYER 1

VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Thickness of layer	m	CONSTANT	61.0	-999.	-999.	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	-999.	-999.
Percent organic matter	--	CONSTANT	0.000	-999.	-999.	-999.
Bulk density of soil for layer	g/cc	CONSTANT	1.99	-999.	-999.	-999.
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	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		LIMITS	
			MEAN	STD DEV	MIN	MAX
Infiltration rate	m/yr	CONSTANT	0.305E-01	-999.	-999.	-999.
Area of waste disposal unit	m^2	CONSTANT	197.	-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	0.146E+04	-999.	-999.	-999.
Length scale of facility	m	DERIVED	14.0	-999.	-999.	-999.
Width scale of facility	m	DERIVED	14.0	-999.	-999.	-999.
Near field dilution		DERIVED	1.00	0.000	0.000	1.00

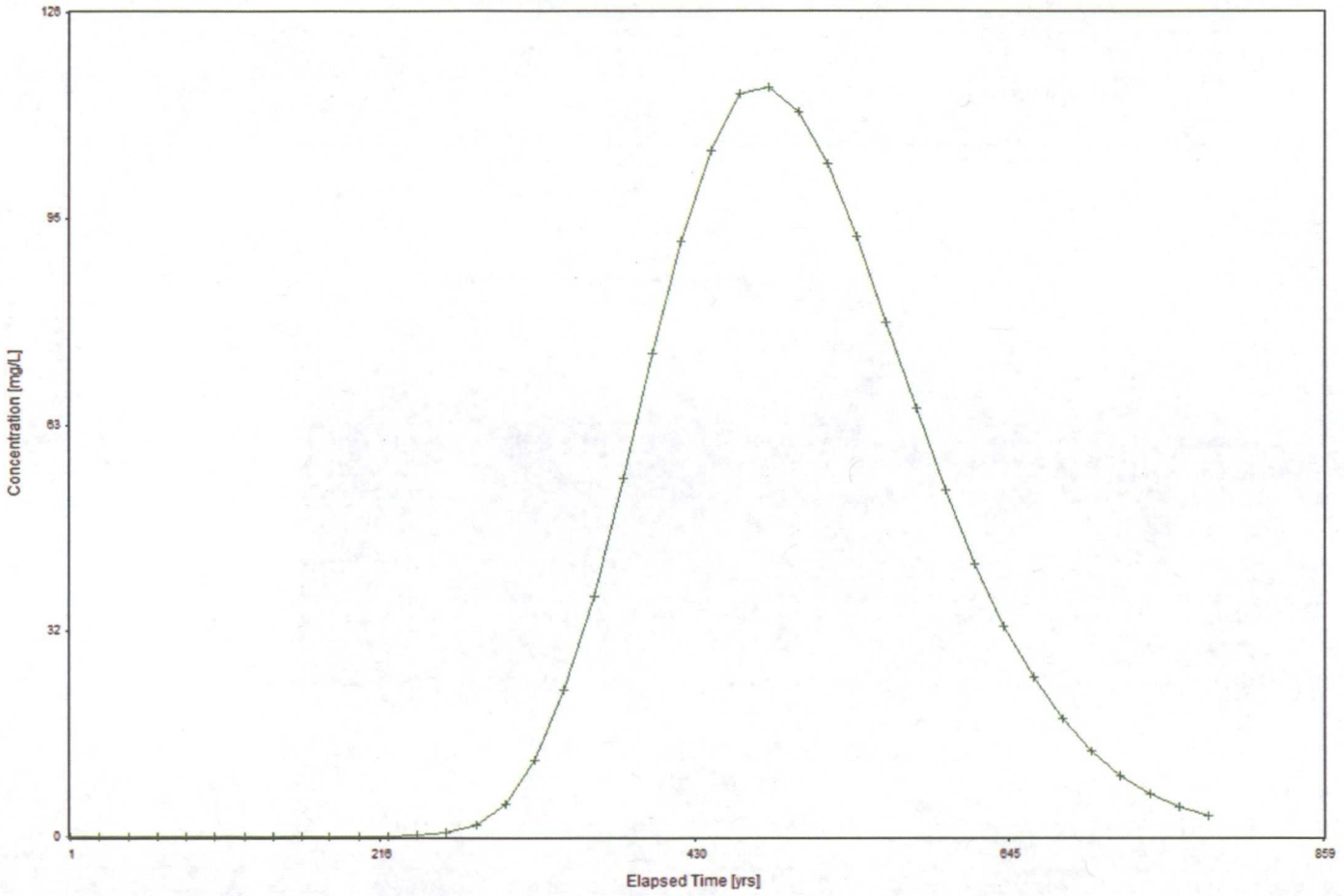
AQUIFER SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Particle diameter	cm	CONSTANT	-999.	-999.	-999.	-999.
Aquifer porosity	--	CONSTANT	0.300	-999.	-999.	-999.
Bulk density	g/cc	CONSTANT	1.86	-999.	-999.	-999.
Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
Source thickness (mixing zone depth)	m	DERIVED	-999.	-999.	-999.	-999.
Conductivity (hydraulic)	m/yr	CONSTANT	315.	-999.	-999.	-999.
Gradient (hydraulic)		CONSTANT	0.400E-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 114.8 AT 0.488E+03 YEARS

Chloride Concentration At The Receptor Well

EME K-11



EME K-11 (1R427-13)
UL K, Section 11, T21S, R36E

Facing West 6/28/2012

Facing North 6/28/2012

Hansen, Edward J., EMNRD

From: Laura Pena <lpena@riceswd.com>
Sent: Friday, August 24, 2012 7:18 AM
To: Hansen, Edward J., EMNRD
Cc: Hack Conder; Katie Jones
Subject: ROC - EME K-11 (1R427-13) ICP Report and CAP Addendum
Attachments: EME K-11 (1R427-13) Multimed.inp; EME K-11 (1R427-13) Multimed.pdf; EME K-11 (1R427-13) Chloride Graph.pdf; EME K-11 (1R427-13) SB Info.xlsx; EME K-11 (1R427-13) Depth to Groundwater Report.pdf

Mr. Hansen,

The following is an Addendum to the EME K-11 (1R427-13) ICP Report and CAP submitted to the NMOCD on July 19, 2012. The attached multimed file, as requested, will replace Appendix B.

This file uses the parameters submitted to NMOCD in the Multimed Study report. Site specific parameters are as follows:

- Initial Concentration: an average of SB-1 (which yielded the highest average soil bore chloride concentration) of 1,460 mg/L.
- Layer Thickness: an average of all soil bore depths subtracted from the depth to groundwater (197 ft – 80 ft) to yield 117 ft or 36 meters.
- An estimated area of 33 ft x 32 ft (1,056 ft^2 or 98.11 m^2).
- An aquifer thickness of 20 ft (6.10 meters).

The result of this model indicates that the maximum chloride concentration is 152.1 mg/L at 301 years, falling below the WQCC standard of 250 mg/L. A graph depicting chloride concentration over time is attached.

Also, please find attached the EME K-11 Groundwater Study justifying depth to groundwater in the area being approximately 197 ft below ground surface (bgs).

Let Hack Conder, Katie Jones or me know if you have any questions or require any additional information.

Thank you,

Laura Peña
Environmental Project Scientist
RICE Operating Company

MULTIMED V1.01 DATE OF CALCULATIONS: 23-AUG-2012 TIME: 15:59:31

U. S. ENVIRONMENTAL PROTECTION AGENCY

EXPOSURE ASSESSMENT

MULTIMEDIA MODEL

MULTIMED (Version 1.50, 2005)

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

EME K-11

Chemical simulated is Chloride

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration Specified By User: 3.048E-02 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	36.00	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	36.0	0.000	0.000	0.000

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

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

1

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

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

OPTIONS CHOSEN

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

1

DATA FOR LAYER 1

VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Thickness of layer	m	CONSTANT	36.0	-999.	-999.	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	-999.	-999.
Percent organic matter	--	CONSTANT	0.000	-999.	-999.	-999.
Bulk density of soil for layer	g/cc	CONSTANT	1.99	-999.	-999.	-999.

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	0.305E-01	-999.	-999.	-999.
Area of waste disposal unit	m^2	CONSTANT	98.1	-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	0.146E+04	-999.	-999.	-999.
Length scale of facility	m	DERIVED	-999.	-999.	-999.	-999.
Width scale of facility	m	DERIVED	-999.	-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	0.400E-02	-999.	-999.	-999.

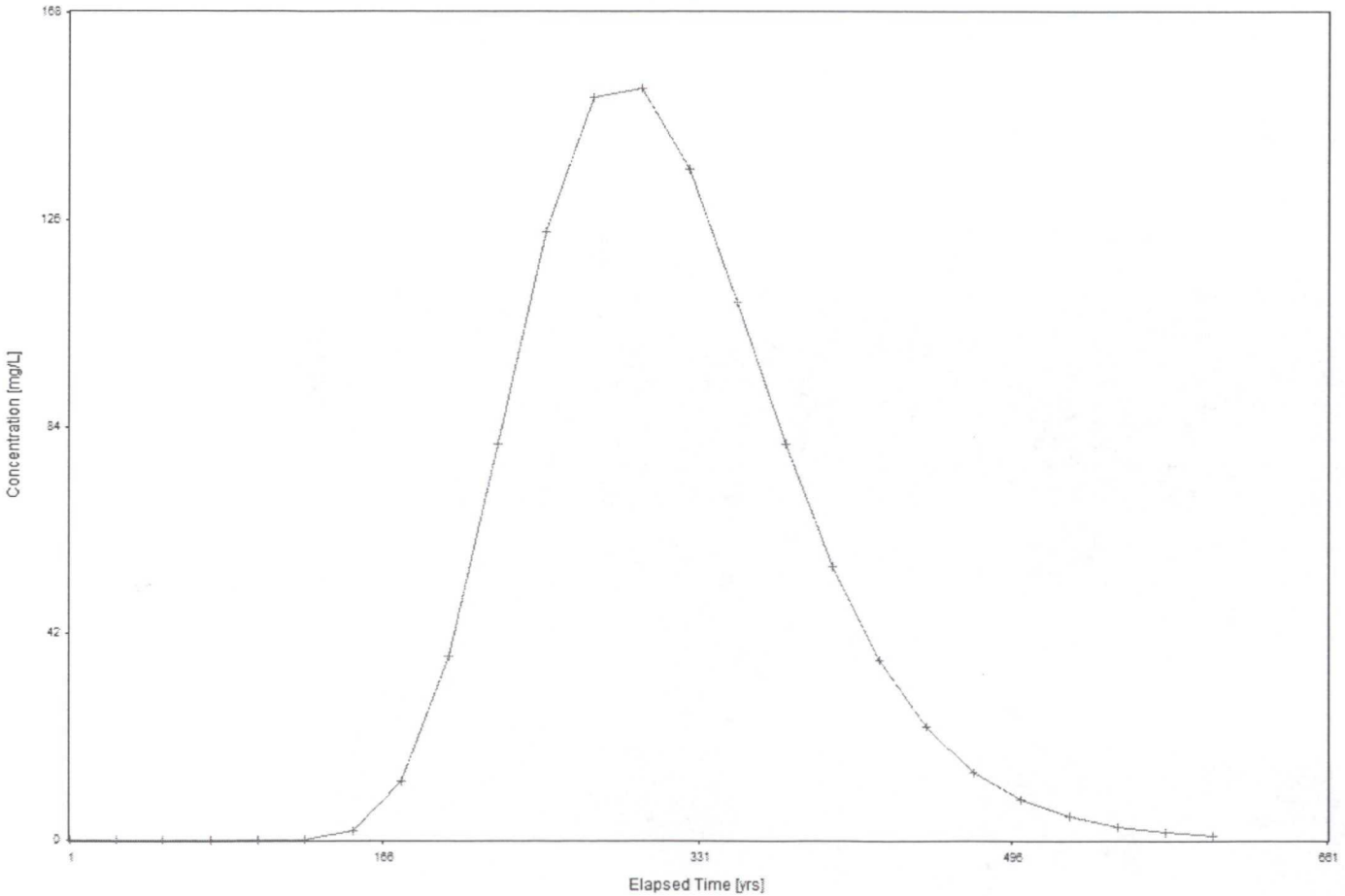
Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.	-999.	-999.
Retardation coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Longitudinal dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Transverse dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Vertical dispersivity	m	FUNCTION OF X	-999.	-999.	-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
0.100E+01	0.00000E+00
0.260E+02	0.00000E+00
0.510E+02	0.00000E+00
0.760E+02	0.00000E+00
0.101E+03	0.00000E+00
0.126E+03	0.77581E-01
0.151E+03	0.19477E+01
0.176E+03	0.11794E+02
0.201E+03	0.37209E+02
0.226E+03	0.80229E+02
0.251E+03	0.12331E+03
0.276E+03	0.15048E+03
0.301E+03	0.15224E+03
0.326E+03	0.13581E+03
0.351E+03	0.10884E+03
0.376E+03	0.80315E+02
0.401E+03	0.55271E+02
0.426E+03	0.36379E+02
0.451E+03	0.22919E+02
0.476E+03	0.13765E+02
0.501E+03	0.81552E+01
0.526E+03	0.46991E+01
0.551E+03	0.26823E+01
0.576E+03	0.14944E+01
0.601E+03	0.83307E+00

Chloride Concentration At The Receptor Well

EME K-11



EME K-11 (1R427-13)

Unit K, Section 11, T21S, R36E

Depth to GW: 197 ft

SB-1		SB-2		SB-3		SB-4		SB-5		SB-6		SB-7	
				SS	114	SS	113	SS	210	SS	116	SS	110
				5	112	5	399	5	389	5	245	5	146
				10	174	10	305	10	280	10	879	10	143
15	696	15	900			15	252	15	249	15	856		
20	887	20	884							20	816		
25	732	25	1026							25	509		
30	792	30	850							30	729		
35	1362	35	782							35	758		
40	1143	40	877							40	894		
50	1807	45	1020							45	883		
60	2005	50	963							50	1046		
70	2579	55	1060							55	888		
80	2549	60	1366							60	870		
130		65	1405							65	761		
		70	1435							70	839		
		75	1380							75	752		
		80	1180							80	706		
		85	991							110			
		90	884										
		95	797										
		100	859										
		105	641										
		110	497										
		115	438										
		120	289										
		125	331										
		130	257										
Average	1.46E+03		8.80E+02		1.33E+02		2.67E+02		2.82E+02		7.38E+02		1.33E+02

Average Chloride Concentration	8.E+02
Average SB Depth	80
Average SB Depth minus Depth to GW	117

EME
SWD System

K-11
site name

K	11	T21S	R36E
Unit Letter	Section	Township	Range

Groundwater Depth: 197 ft

Compiled by: Lara Weinheimer Date: 5/8/2012

Comments:

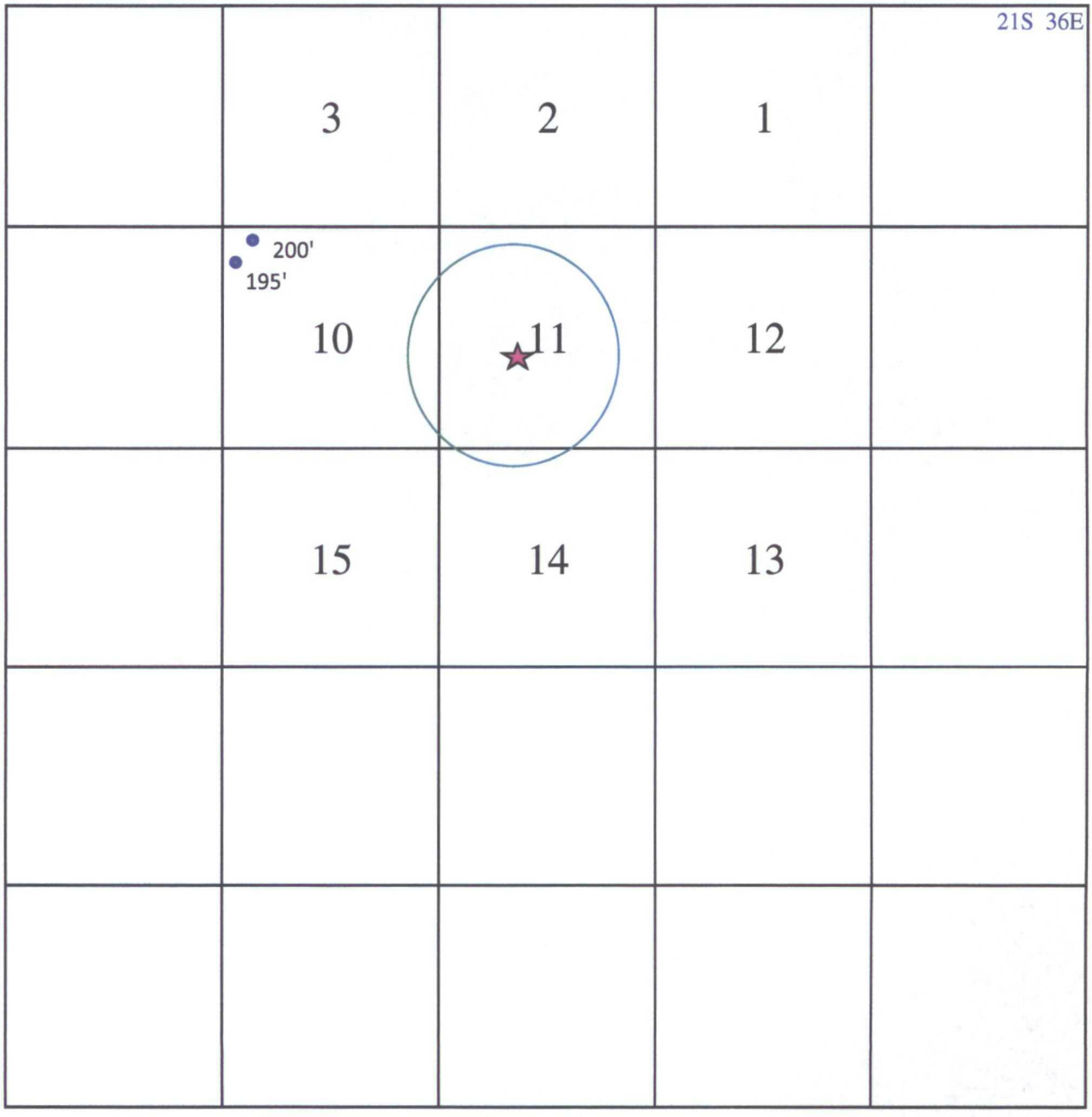
= ROC wells

= Wells of unknown use (USGS)

= Non-production wells (commercial, sanitation, domestic, stock)

= section (1 sq. mile)

= Subject Site



New Mexico Office of the State Engineer
Water Column/Average Depth to Water

(A CLW##### in the POD suffix indicates the POD has been replaced & no longer serves a water right file.)

(R=POD has been replaced, O=orphaned, C=the file is closed)

(quarters are 1=NW 2=NE 3=SW 4=SE)

(quarters are smallest to largest) (NAD83 UTM in meters) (In feet)

POD Number	POD Code	Subbasin	County	Q 64	Q 16	Q 4	Sec	Tws	Rng	X	Y	Depth Well	Depth Water	Water Column
CP 00690			LE		4	4	03	21S	36E	664706	3597487*	340		
CP 00692			LE	3	1	1	10	21S	36E	663405	3596961*	215	195	20
CP 00734			LE			1	10	21S	36E	663713	3596862*	215	200	15

Average Depth to Water: **197 feet**

Minimum Depth: **195 feet**

Maximum Depth: **200 feet**

Record Count: 3

PLSS Search:

Section(s): 1, 2, 3, 10, 11, 12 **Township:** 21S **Range:** 36E

***UTM location was derived from PLSS - see Help**