

**June 26, 2014**

**Mr. Leonard Lowe**

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

**RE: ICP Report & Corrective Action Plan (CAP)  
Rice Operating Company – EME SWD System  
EME Jct. F-32 (1R427-407): UL/F sec. 32 T19S R37E**

Mr. Lowe:

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. 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 0.5 miles southwest of Monument, New Mexico in Unit F, Section 32, T19S R37E as shown on the Geographical Location Map (Figure 1). NM OSE records indicate that groundwater will likely be encountered at a depth of approximately 27 +/- feet.

In 2012, ROC initiated work on the former F-32 junction box. The site was delineated using a backhoe to form a 30 ft x 30 ft x 12 ft deep excavation and soil samples were screened at regular intervals for both hydrocarbons and chlorides. From the excavation, the four-wall composite and the bottom composite were taken to a commercial laboratory for analysis. The laboratory tests of the four-wall composite showed a chloride reading of 2,040 mg/kg and a gasoline range organics (GRO) readings and a diesel range organics (DRO) reading of non-detect. The bottom composite showed a chloride laboratory reading of 896 mg/kg and a GRO and a DRO reading of non-detect. The excavated soil was blended on site and a composite sample was taken to a commercial laboratory for analysis. The laboratory chloride result for the blended backfill was 656 mg/kg with a GRO reading of non-detect and a DRO reading of 121 mg/kg. A total of 584 yards of blended soil was taken to a NMOCD approved facility for disposal. The site was backfilled with the blended backfill to 6 ft bgs, where a 20 mil reinforced poly liner was installed and properly seated. The remainder of the excavation was backfilled with clean,

imported soil. A sample of this imported soil was taken to a commercial laboratory for analysis and returned a chloride, GRO and DRO result of non-detect. The area was contoured to the surrounding landscape, and the site was seeded with a blend of native vegetation. NMOCD was notified of potential groundwater impact on March 4<sup>th</sup>, 2013 and a junction box disclosure report was submitted to NMOCD with all the 2012 junction box closures and disclosures.

As part of the Investigation and Characterization Plan (ICP) submitted to NMOCD on October 10<sup>th</sup>, 2013 and approved on October 24<sup>th</sup>, 2013, three soil bores were installed at the site on April 17<sup>th</sup>, 2014. As the bores were advanced, soil samples were taken at regular intervals and field tested for chlorides and hydrocarbons. Representative samples from each bore were taken to a commercial laboratory for analysis (Appendix A). Laboratory analysis of SB-1 returned chloride concentrations of 704 at 14 ft bgs and 320 mg/kg at 22 ft bgs. SB-2 returned chloride concentrations of 1,180 mg/kg at 20 ft bgs and 208 mg/kg at 26 ft bgs. SB-3 returned chloride concentrations of 1,140 mg/kg at 18 ft bgs and 160 mg/kg at 24 ft bgs. GRO and DRO analysis returned values of non-detect in all bores at all depths except at SB-2, where the DRO reading was 25.7 mg/kg at 26 ft bgs. The bore holes were plugged in total with bentonite to the ground surface. The lateral extent of the site was defined to the west with the 15 ft west vertical, in which chloride concentrations were low and decreased to 362 mg/kg at 12 ft bgs (Figure 2).

According to the lithology collected during the drilling of the three soil bores, sandstone was encountered in each of the bores beginning at a depth of approximately 20 ft bgs. As the bores were advanced, it was determined that sandstone observed just above the aquifer was very well cemented sandstone. This very well cemented sandstone is indicative of a confined aquifer and will also act as an infiltration barrier preventing the downward migration of residual constituents to groundwater. (Appendix B)

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) using conservative input values incorporating the two foot sandstone layer. Model outputs and the graph are included in Appendix C. With the impact area of 35 ft x 35 ft, the model output concludes that the peak concentration of chlorides in groundwater contributed by the vadose zone soils would be approximately 133.8 mg/L in 16.4 years. Since the estimated increase in chloride concentrations in groundwater from residual chloride migration is below the WQCC standard of 250 mg/L, no action is warranted for the groundwater at this site.

### **Corrective Action Plan**

Based on the soil bore installation information, the existing 30x30-ft, 20 mil liner installed at 6 ft bgs, the very well cemented sandstone layer, 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 the site to six inches deep to remove large rocks and debris. The site will then be backfilled with soil that has a chloride concentration no greater than 500 mg/kg and a

field PID reading below 100 ppm. The area will be contoured to the surrounding area 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 work is completed by scraping and seeding the site, ROC will submit a written report that will include a request for 'remediation termination' and site closure.

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

Sincerely,

A handwritten signature in cursive script, appearing to read 'L Flores'.

Laura Flores  
Project Manager  
RECS  
(575) 390-9593

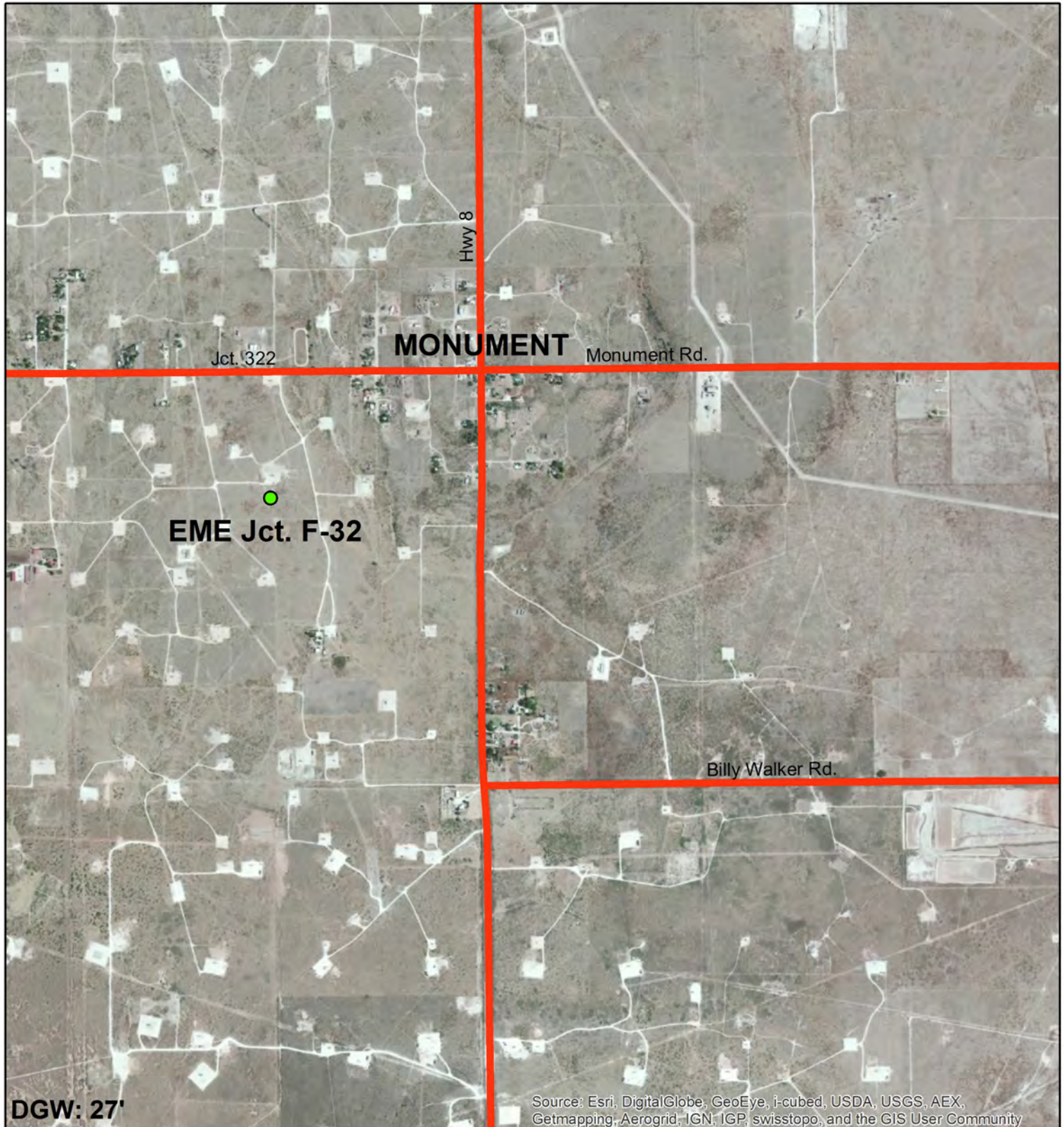
Attachments:

- Figure 1 – Geographical Location Map
- Figure 2 – Soil Bore Installation
- Appendix A – Soil Bore Installation Documentation
- Appendix B – Aquifer Description
- Appendix C – Multimed Documentation

# Figures



# Geographical Location Map



## *EME Jct. F-32*

Legals: UL/F sec. 32  
T-19-S R-37-E  
LEA COUNTY, NM

NMOCD Case #: 1R427-407

## Figure 1

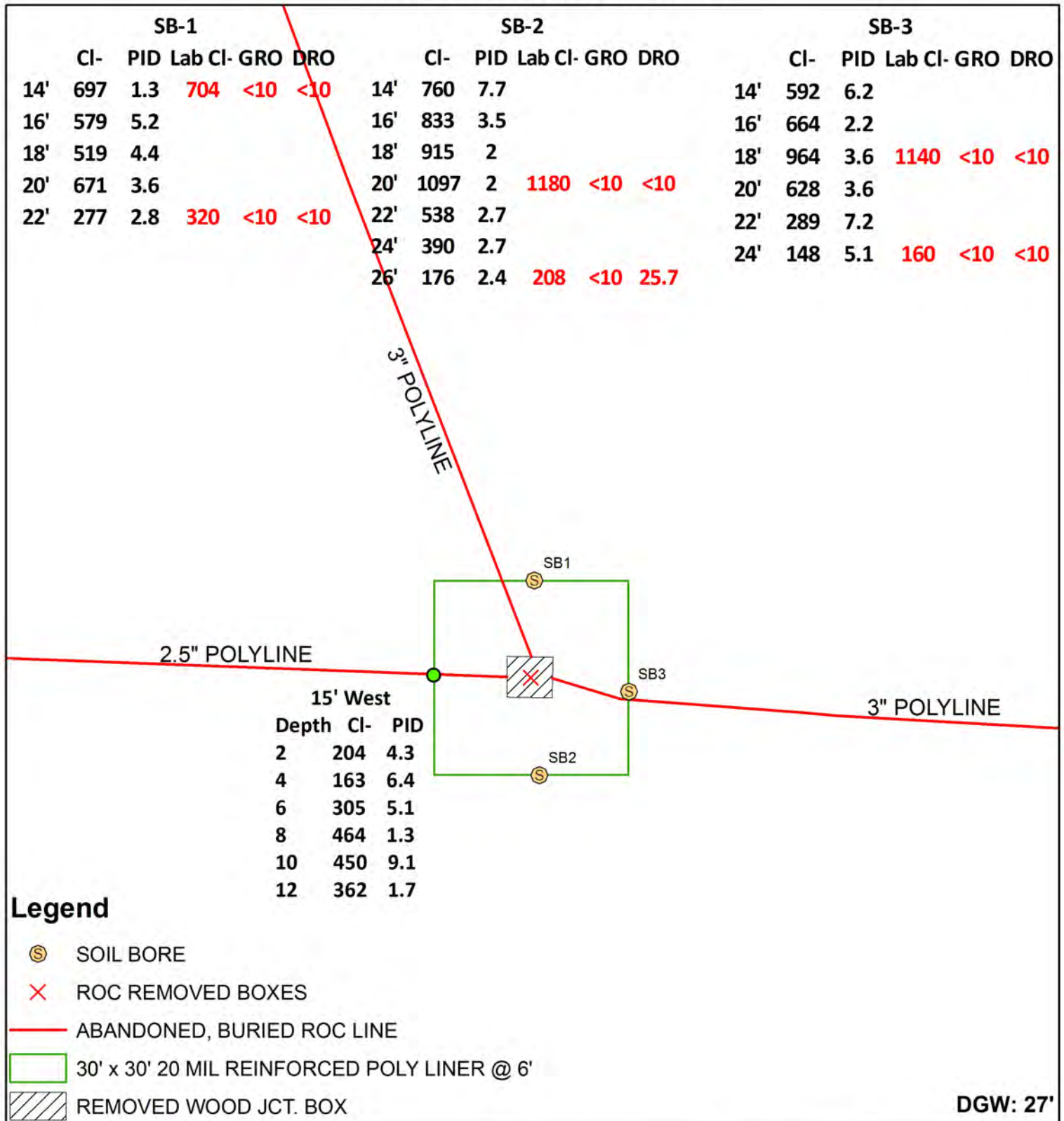


0 0.25 0.5  
Miles

Drawing date: 8/9/13  
Drafted by: L. Weinheimer



# Soil Bore Installation



# Appendix A

## Soil Bore Installation Documentation

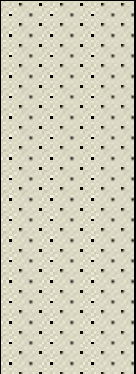



**RICE Environmental Consulting and Safety (RECS)**  
P.O. Box 2948 Hobbs, NM 88241  
Phone 575.393.2967

<b>Logger:</b>	Edward Cesareo		
<b>Driller:</b>	Harrison&Cooper		
<b>Drilling Method:</b>	Air Rotary		
<b>Start Date:</b>	4/17/2014		
<b>End Date:</b>	4/17/2014		<b>Project Name:</b> EME Jct. F-32 <b>Well ID:</b> SB-1 <b>Project Consultant:</b> RECS
Comments: Sampling began at 14'. All samples were taken from cuttings. SB-1 is located 15' north of the former junction box site. DRAFTED BY: Catherine Uršanić TD = 22' GW = 27'			<b>Location:</b> UL/F Sec 32 T-19-S R-37-E <b>Lat:</b> 32°37'10.942"N <b>Long:</b> 103°16'25.548"W <b>County:</b> Lea <b>State:</b> NM






Depth (feet)	Chloride field tests	LAB	PID	Description	Lithology	Well Construction
SS						
2 ft						
4 ft						
6 ft				TAN SAND / ROCK / NO ODOR		
8 ft						
10 ft						
12 ft						
				BROWN SAND / ROCK / NO ODOR		
14 ft	697	Lab Cl-704	1.3			
		GRO <10				
		DRO <10		TAN SAND / NO ODOR		

Bentonite Seal







Depth (feet)	Chloride field tests	LAB	PID	Description		Lithology		Well Construction	
16 ft	579		5.2	TAN SAND / NO ODOR					
18 ft	519		4.4						
20 ft	671		3.6	TAN SAND / SAND STONE / NO ODOR					
22 ft	277	Lab Cl- 320	2.8						
		GRO <10							
		DRO <10							

<b>Logger:</b>	Edward Cesareo						
<b>Driller:</b>	Harrison&Cooper						
<b>Drilling Method:</b>	Air Rotary						
<b>Start Date:</b>	4/17/2014						
<b>End Date:</b>	4/14/2014	<b>Project Name:</b> EME Jct. F-32 <b>Well ID:</b> SB-2 <b>Project Consultant:</b> RECS					
Comments: Sampling began at 14'. All samples were taken from cuttings. SB-2 is located 15' south of the former junction box site. <b>DRAFTED BY:</b> Catherine Uršanič TD = 26'                      GW = 27'		<b>Location:</b> UL/F Sec. 32 T-19-S R-37-E <b>Lat:</b> 32°37'10.64"N <b>County:</b> Lea <b>Long:</b> 103°16'25.527"W <b>State:</b> NM					
Depth (feet)	Chloride field tests	LAB	PID	Description	Lithology	Well Construction	
				BROWN SAND / NO ODOR			
SS							
2 ft				TAN SAND / ROCK / NO ODOR			
4 ft							
6 ft							
8 ft							
10 ft							
12 ft							
14 ft	760		7.7				

Depth (feet)	Chloride field tests	LAB	PID	Description		Lithology		Well Construction	
16 ft	833		3.5	TAN SAND / ROCK / NO ODOR					
18 ft	915		2.0						
20 ft	1097	Lab Cl- 1180	2.0						
		GRO <10							
		DRO <10							
22 ft	538		2.7	BROWN SAND / SANDSTONE / NO ODOR					
24 ft	390		2.7	VERY WELL CEMENTED SANDSTONE / NO ODOR					
26 ft	176	Lab Cl- 208	2.4						
		GRO <10							
		DRO 25.7							

<b>Logger:</b>	Edward Cesareo						
<b>Driller:</b>	Harrison&Cooper						
<b>Drilling Method:</b>	Air Rotary						
<b>Start Date:</b>	4/17/2014						
<b>End Date:</b>	4/17/2014	<b>Project Name:</b> EME Jct. F-32 <b>Well ID:</b> SB-3 <b>Project Consultant:</b> RECS					
<b>Comments:</b> Sampling began at 14'. All samples were taken from cuttings. SB-3 is located 15' east of the former junction box site. <b>DRAFTED BY:</b> Catherine Uršanič TD = 24'      GW = 27'		<b>Location:</b> UL/F Sec. 32 T-19-S R-37-E <b>Lat:</b> 32°37'10.803"N <b>County:</b> Lea <b>Long:</b> 103°16'25.314"W <b>State:</b> NM					
Depth (feet)	Chloride field tests	LAB	PID	Description	Lithology	Well Construction	
SS				BROWN SAND / ROCK / NO ODOR			
2 ft							
4 ft				TAND SAND / ROCK / NO ODOR			
6 ft							
8 ft							
10 ft							
12 ft							
14 ft	592		6.2				

Depth (feet)	Chloride field tests	LAB	PID	Description		Lithology		Well Construction	
16 ft	664		2.2	TAND SAND / ROCK / NO ODOR					
18 ft	964	Lab Cl- 1140	3.6						
		DRO <10							
		GRO <10							
20 ft	628		3.6						
22 ft	289		7.2						
				VERY WELL CEMENTED SANDSTONE / NO ODOR					
24 ft	148	Lab Cl- 160	5.1						
		DRO <10							
		GRO <10							





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

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April 24, 2014

KATIE JONES

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: EME JCT F-32

Enclosed are the results of analyses for samples received by the laboratory on 04/17/14 14:20.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-13-5. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (\*). For a complete list of accredited analytes and matrices visit the TCEQ website at [www.tceq.texas.gov/field/qa/lab\\_accred\\_certif.html](http://www.tceq.texas.gov/field/qa/lab_accred_certif.html).

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

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

Accreditation applies to public drinking water matrices.

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

Sincerely,

A handwritten signature in black ink that reads "Celey D. Keene". The signature is written in a cursive, flowing style.

Celey D. Keene

Lab Director/Quality Manager

**Analytical Results For:**

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

Received: 04/17/2014  
Reported: 04/24/2014  
Project Name: EME JCT F-32  
Project Number: NONE GIVEN  
Project Location: 19-S/37-E

Sampling Date: 04/17/2014  
Sampling Type: Soil  
Sampling Condition: Cool & Intact  
Sample Received By: Jodi Henson

**Sample ID: SB #1 14' (H401165-01)**

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	704	16.0	04/21/2014	ND	416	104	400	0.00	
TPH 8015M		mg/kg		Analyzed By: CK					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	04/21/2014	ND	188	94.2	200	8.63	
DRO >C10-C28	<10.0	10.0	04/21/2014	ND	215	108	200	12.8	
Surrogate: 1-Chlorooctane	111 %	65.2-140							
Surrogate: 1-Chlorooctadecane	102 %	63.6-154							

**Sample ID: SB #1 22' (H401165-02)**

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	320	16.0	04/21/2014	ND	416	104	400	0.00	
TPH 8015M		mg/kg		Analyzed By: CK					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	04/21/2014	ND	188	94.2	200	8.63	
DRO >C10-C28	<10.0	10.0	04/21/2014	ND	215	108	200	12.8	
Surrogate: 1-Chlorooctane	103 %	65.2-140							
Surrogate: 1-Chlorooctadecane	97.5 %	63.6-154							

Cardinal Laboratories

\*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

**Analytical Results For:**

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

Received: 04/17/2014  
Reported: 04/24/2014  
Project Name: EME JCT F-32  
Project Number: NONE GIVEN  
Project Location: 19-S/37-E

Sampling Date: 04/17/2014  
Sampling Type: Soil  
Sampling Condition: Cool & Intact  
Sample Received By: Jodi Henson

**Sample ID: SB #2 20' (H401165-03)**

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1180	16.0	04/21/2014	ND	416	104	400	0.00	
TPH 8015M		mg/kg		Analyzed By: CK					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	04/21/2014	ND	188	94.2	200	8.63	
DRO >C10-C28	<10.0	10.0	04/21/2014	ND	215	108	200	12.8	
Surrogate: 1-Chlorooctane		96.8 %	65.2-140						
Surrogate: 1-Chlorooctadecane		91.3 %	63.6-154						

**Sample ID: SB #2 26' (H401165-04)**

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	208	16.0	04/21/2014	ND	416	104	400	0.00	
TPH 8015M		mg/kg		Analyzed By: CK					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	04/21/2014	ND	188	94.2	200	8.63	
DRO >C10-C28	25.7	10.0	04/21/2014	ND	215	108	200	12.8	
Surrogate: 1-Chlorooctane		98.9 %	65.2-140						
Surrogate: 1-Chlorooctadecane		94.8 %	63.6-154						

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\*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

**Analytical Results For:**

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

Received: 04/17/2014  
Reported: 04/24/2014  
Project Name: EME JCT F-32  
Project Number: NONE GIVEN  
Project Location: 19-S/37-E

Sampling Date: 04/17/2014  
Sampling Type: Soil  
Sampling Condition: Cool & Intact  
Sample Received By: Jodi Henson

**Sample ID: SB #3 18' (H401165-05)**

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1140	16.0	04/21/2014	ND	416	104	400	0.00	
TPH 8015M		mg/kg		Analyzed By: CK					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	04/21/2014	ND	188	94.2	200	8.63	
DRO >C10-C28	<10.0	10.0	04/21/2014	ND	215	108	200	12.8	
Surrogate: 1-Chlorooctane		104 %	65.2-140						
Surrogate: 1-Chlorooctadecane		97.8 %	63.6-154						

**Sample ID: SB #3 24' (H401165-06)**

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	160	16.0	04/21/2014	ND	416	104	400	0.00	
TPH 8015M		mg/kg		Analyzed By: CK					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	04/21/2014	ND	188	94.2	200	8.63	
DRO >C10-C28	<10.0	10.0	04/21/2014	ND	215	108	200	12.8	
Surrogate: 1-Chlorooctane		107 %	65.2-140						
Surrogate: 1-Chlorooctadecane		97.4 %	63.6-154						

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\*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

**Notes and Definitions**

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

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\*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager





# ARDINAL 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

## CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Company Name: RICE Operating				<b>BILL TO</b>				<b>ANALYSIS REQUEST</b>																			
Project Manager: Katie Jones				P.O. #:				<div>Chlorides</div> <div>TPH 8015 M</div> <div>BTEX</div> <div>Texas TPH</div> <div>Complete Cations/Anions</div> <div>TDS</div>																			
Address: 112 W. Taylor				Company:																							
City: Hobbs		State: NM		Zip: 88240		Attn:																					
Phone #:		Fax #:		Address:		City:																					
Project #:		Project Owner:		State:		Zip:																					
Project Name:				Phone #:																							
Project Location: EME JCT - F-32 19-S/37-E				Fax #:																							
Sampler Name: Edward Cesareo																											
FOR LAB USE ONLY																											
Lab I.D.		Sample I.D.		GRAB OR (C)OMP.		# CONTAINERS		MATRIX				PRESERV.		SAMPLING													
								GROUNDWATER WASTEWATER SOIL OIL SLUDGE OTHER:				ACID/BASE: ICE / COOL OTHER:		DATE TIME													
H4D1165																											
1 SB#1 14'				6		1								4-17-14 9:15													
2 SB#1 22'				6		1								4-17-14 9:20													
3 SB#2 20'				6		1								4-17-14 10:40													
4 SB#2 26'				6		1								4-17-14 10:45													
5 SB#3 18'				6		1								4-17-14 11:25													
6 SB#3 24'				6		1								4-17-14 11:30													

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Relinquished By:		Date: 4-17-14		Received By:		Phone Result: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Add'l Phone #:	
Time: 2:20						Fax Result: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Add'l Fax #:	
Relinquished By:		Date:		Received By:		REMARKS:  email results hconder@rice-ecs.com; Lweinheimer@rice-ecs.com; kjones@riceswd.com; Lpena@riceswd.com; Knorman@rice-ecs.com, ecesareo@rice-ecs.com			
		Time:							
Delivered By: (Circle One)				Sample Condition		CHECKED BY:			
Sampler - UPS - Bus - Other:				Cool <input checked="" type="checkbox"/> Intact <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>					

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

#54

# Appendix B

## Aquifer Description

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



THE DRILLING PROFESSIONALS

June 26, 2014

Rice Environmental Consulting & Safety  
122 W Taylor  
Hobbs NM, 88240

Attn: Katie Jones

**RE: EME Jct. F-32**

The subject site EME JCT F-32 is a site that has a confined aquifer. With that being said this aquifer is under pressure confined by a very well cemented sandstone. Monument does have some isolated areas that have confined aquifers. This is one reason they have some natural springs.

Copies: File  
Email (Katie Jones)

Ken Cooper

Regulated by: Texas Dept. of Licensing & Regulation, Water Well Division, P.O. Box 12157, Austin, TX 78711, (800) 803-9202

HCI DRILLING / P.O. BOX 96 / WOLFFORTH, TX 79382-0096  
806.866.4026 / HCIDRILL.COM

# Appendix C

Multimed Doumentation

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

EME Jct F-32\_final  
MULTIMED V1.01 DATE OF CALCULATIONS: 10-JUN-2014 TIME: 12:58:12

U. S. ENVIRONMENTAL PROTECTION AGENCY

EXPOSURE ASSESSMENT

MULTIMEDIA MODEL

MULTIMED (Version 1.50, 2005)

1  
Run options  
-----

Rice EME Jct F-32

1R427-407  
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: 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 0.61 1  
-----

DATA FOR MATERIAL 1

-----  
VADOSE ZONE MATERIAL VARIABLES



VARIABLE NAME	UNI TS	DI STRI BUTI ON	PARAMETERS		LI MI TS	
			MEAN	STD DEV	MI N	MA X
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	0.610	0.000	0.000	0.000

## DATA FOR MATERIAL 1

## VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNI TS	DI STRI BUTI ON	PARAMETERS		LI MI TS	
			MEAN	STD DEV	MI N	MA X
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	UNI TS	DI STRI BUTI ON	PARAMETERS	LI MI TS
---------------	--------	-----------------	------------	----------

## EME Jct F-32\_final

			MEAN	STD DEV	MIN	MAX
Thickness of layer	m	CONSTANT	0.610	-999.	-999.	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	-999.	-999.
Percent organic matter	--	CONSTANT	0.000	-999.	-999.	-999.
Bulk density of soil for layer	g/cc	CONSTANT	1.99	-999.	-999.	-999.
Biological decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.

## CHEMICAL SPECIFIC VARIABLES

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

## SOURCE SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Infiltration rate	m/yr	CONSTANT	0.152E-01	-999.	-999.	-999.
Area of waste disposal unit	m <sup>2</sup>	CONSTANT	114.	-999.	-999.	-999.
Duration of pulse	yr	DERIVED	0.100E-08	-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	529.	-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

## AQUIFER SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	

EME Jct F-32_final			MEAN	STD DEV	MIN	MAX
Particle diameter	cm	CONSTANT	-999.	-999.	-999.	-999.
Aquifer porosity	--	CONSTANT	0.300	-999.	-999.	-999.
Bulk density	g/cc	CONSTANT	1.86	-999.	-999.	-999.
Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
Source thickness (mixing zone depth)	m	DERIVED	-999.	-999.	-999.	-999.
Conductivity (hydraulic)	m/yr	CONSTANT	315.	-999.	-999.	-999.
Gradient (hydraulic)		CONSTANT	0.300E-02	-999.	-999.	-999.
Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.	-999.	-999.
Retardation coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Longitudinal dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Transverse dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Vertical dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Temperature of aquifer	C	CONSTANT	20.0	-999.	-999.	-999.
pH	--	CONSTANT	7.00	-999.	-999.	-999.
Organic carbon content (fraction)		CONSTANT	0.000	-999.	-999.	-999.
Well distance from site	m	CONSTANT	1.00	-999.	-999.	-999.
Angle off center	degree	CONSTANT	0.000	-999.	-999.	-999.
Well vertical distance	m	CONSTANT	0.000	-999.	-999.	-999.

TIME	CONCENTRATION
0.500E+01	0.26516E+01
0.100E+02	0.87217E+02
0.150E+02	0.13256E+03
0.200E+02	0.12819E+03
0.250E+02	0.11452E+03
0.300E+02	0.10159E+03
0.350E+02	0.89370E+02

# Chloride Concentration At The Receptor Well

Rice EME Jct. F-32

