

1R - 427-180

WORKPLANS

Date:

11-1-11

Texerra

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627 Forest View Way Monument, Colorado 80132

Tel: 719-339-6791 E-mail: lpg@texerra.com

2011 NOV -8 A 12: 48

November 1st, 2011

Mr. Edward Hansen
New Mexico Energy, Minerals, & Natural Resources
Oil Conservation Division, Environmental Bureau
1220 S. St. Francis Drive
Santa Fe, New Mexico 87504

RE: Investigation and Characterization Plan Report and
Corrective Action Plan
Rice Operating Company – EME SWD System
EME Jct. N-18 UL N, Sect 18, Township 20S, Range 37E
NMOCD Case Number 1R427-180

Sent via Email and U.S. Certified Mail Return Receipt No. 7011 0110 0001 5863 4820

Mr. Hansen,

This report presents the results of soil and groundwater investigative work outlined in the Investigation and Characterization Plan for this site (location given in Figure 1), as approved by NMOCD on June 28th, 2010.

Soils in the unsaturated zone within the area of the former junction box exhibited moderately elevated chloride concentrations, averaging 414 mg/kg among the five soil bores and the near-source monitoring well (MW-1) taken on September 16th, 2010 (Figure 2). An up-gradient monitoring well (MW-2) was also installed on September 16th, 2010. The estimated mass of soil chlorides believed to have been contributed from the former junction box is approximately 597 lbs or 270 kg (Table 1), which is low relative to the area encompassed. No significant residual hydrocarbons were found, as evidenced by the laboratory “below detect” levels (see attached laboratory report in Appendix A).

The most recent (August 15th, 2011) groundwater samples tested 860 mg/L in a near-source, down-gradient well (MW-1) and 1,380 mg/L chlorides in the up-gradient well (MW-2); see also Figure 3 and Appendix B. BTEX concentrations were below detection levels for both samples. Given that this site is within a known, regionally chloride impacted area, these data indicate that this site is not contributing significant chloride to groundwater. This is not surprising given that residual soil chloride levels were only moderately elevated and that a clay infiltration barrier was installed at a depth of 6 ft bgs across the site (35ft x 25ft) when the old junction box was replaced in 2004 (Figure 4).

EME Jct. N-18

A soil transport model, MultiMed, was run in order to estimate whether these residual soil chlorides pose a likelihood of affecting groundwater. The model was specified using source area and chloride concentration parameter values taken from Table 1 and other estimated site-specific parameter values given in Table 2. The model projects that the maximum elevation in groundwater chloride concentrations (from the present baseline value) is less than 200 mg/L (Figure 5), indicating that this site poses essentially no risk to future groundwater quality. Model output values (estimated groundwater chloride concentrations beneath the site over time) are given in Appendix C.

Although it is apparent that this site has not impacted groundwater, based on our recent groundwater samples, and is not likely to in the future, based on MultiMed modeling, we recommend that chloride mass equivalent to the contributed residual soil chloride mass (597 lbs or 270 kg, as noted above) be removed from the existing recovery system located at EME A-20 (Figure 6). With a current chloride concentration of 3,700 mg/L in RW-1, approximately 459 barrels will need to be removed to account for the 270 kg of chloride. This proposed remedial measure is intended to serve as the Corrective Action Plan (CAP) for this project. Upon the removal of this mass of groundwater chloride we anticipate submitting to NMOCD a final remediation progress report and request for project termination.

We do not recommend or anticipate conducting surface restoration work, as the affected area is encompassed by a working lease road and is constantly impacted by oil field traffic. Moreover, the vegetation adjacent to the site is apparently healthy (Figure 7).

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

Please do not hesitate to contact either myself or Rice Operating Company if you have any questions or need additional information.

Sincerely,



L. Peter Galusky, Jr. Ph.D.,P.G.

Attachments: Laboratory reports, MultMed output file

Copy: Rice Operating Company

EME Jct. N-18

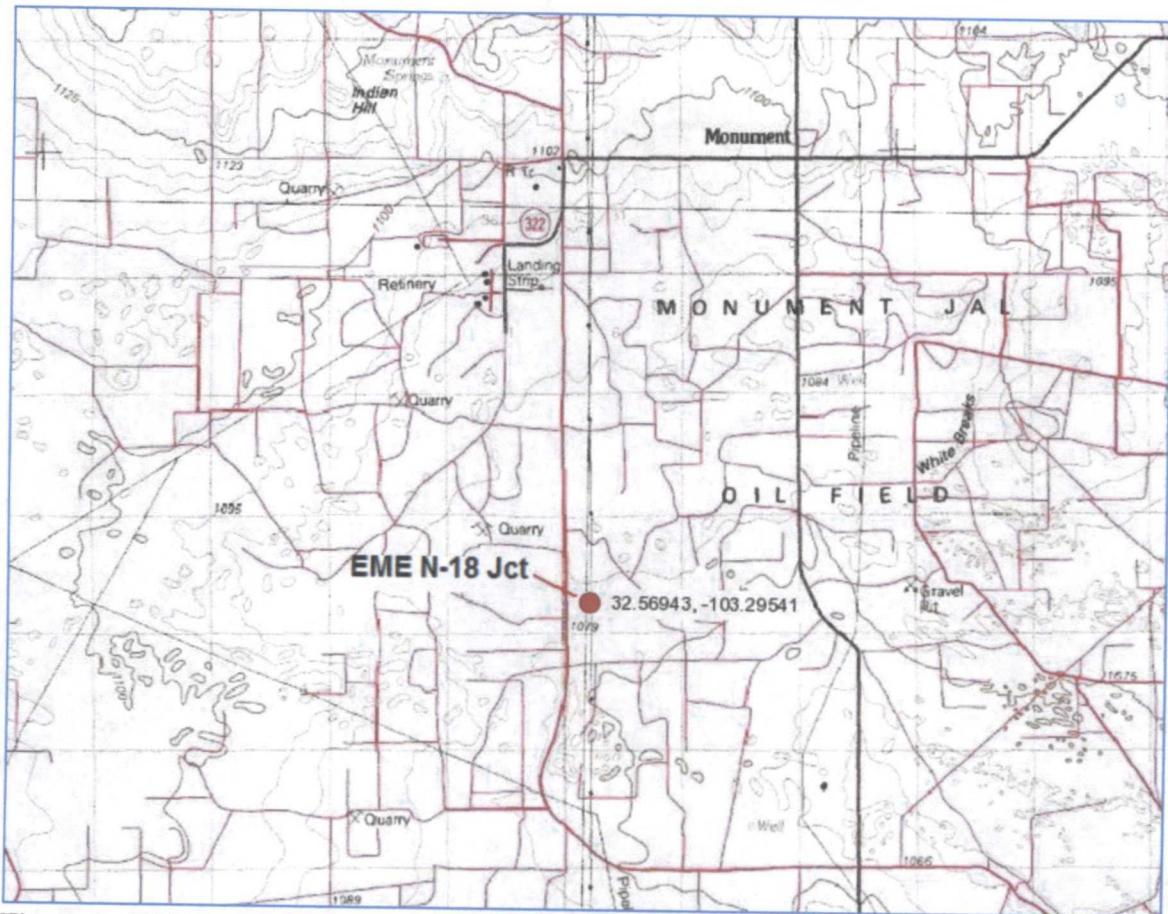


Figure 1 – EME Jct. N-18 location on USGS 1:100,000 topographic base map.

EME Jct. N-18

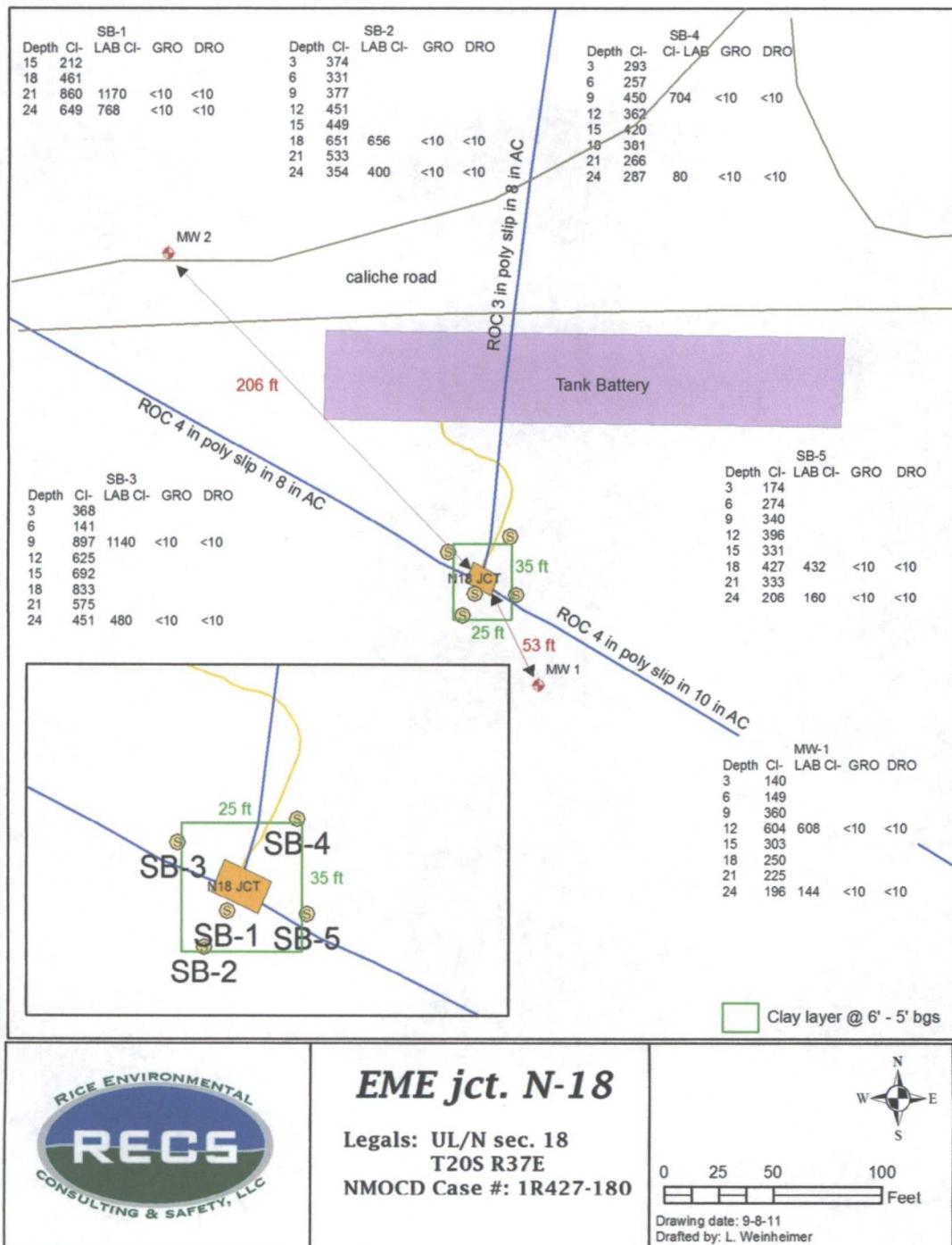


Figure 2 – Soil boring locations and measured chloride and hydrocarbon concentrations.

EME Jct. N-18

Soil & Groundwater Chloride Calculator	
Estimated Mass of Contributed, Residual Chloride from unsaturated zone soil and saturated zone groundwater	
Site:	EME N-18 Jct
This estimate prepared by:	L. Peter Galusky, Jr.
Date:	9/20/11
<u>Model Inputs</u>	
length of affected area (ft)	50 measured/estimated
width of affected area (ft)	50 measured/estimated
depth to water table (ft)	24+ measured
unsat zone affected depth (ft)	10 bottom 10 ft of unsat zone
sat zone affected thickness (ft)	10 prescribed by NMOCD
unsat zone avg Cl- conc of affected soil (ppm)	414 measured/estimated
unsat zone est. natural background Cl- conc (ppm)	140 lowest reading found
unsat zone mass density (lbs/cu yd)	3,000 estimated
Cl- conc of affected groundwater (ppm)	0 no effect found
Cl- conc of up-gradient groundwater (ppm)	1,320 measured
sat zone mass density (lbs/cu yd)	3,000 estimated
<u>Intermediate (calculated) Parameters</u>	
affected area (sq ft)	1,963 calculated
unsat zone Cl- conc attributed to source (ppm)	274 calculated
unsat zone volume of affected soil (cu yds)	727 calculated
unsat zone total mass of affected soils (lbs)	2,180,556 calculated
unsat zone mass of contributed residual soil chloride (lbs)	597 calculated
volume of affected groundwater (cu ft)	25,000 calculated
mass of affected groundwater (lbs)	187,500 calculated
mass of contributed Cl- in affected groundwater	0 calculated
<u>Estimated Contributed Cl- Mass and Equivalent Pumping Volume & Time</u>	
Max potential chlorides from unsaturated zone (soils)	597 calculated
Maximum potential chlorides from affected groundwater	0 calculated
Total mass of contributed chlorides (lbs)	597 calculated
Note: It is assumed that only the lower 10 ft of soils in the affected unsaturated zone will potentially contribute chlorides to groundwater, as an infiltration barrier has been installed across this site. Therefore, in estimating the mass of contributed chlorides from the unsaturated zone only the lower ten feet were considered in the calculations.	

Table 1 – Estimated mass of residual chlorides contributed by operation of the former EME Jct. N-18 box.

EME Jct. N-18

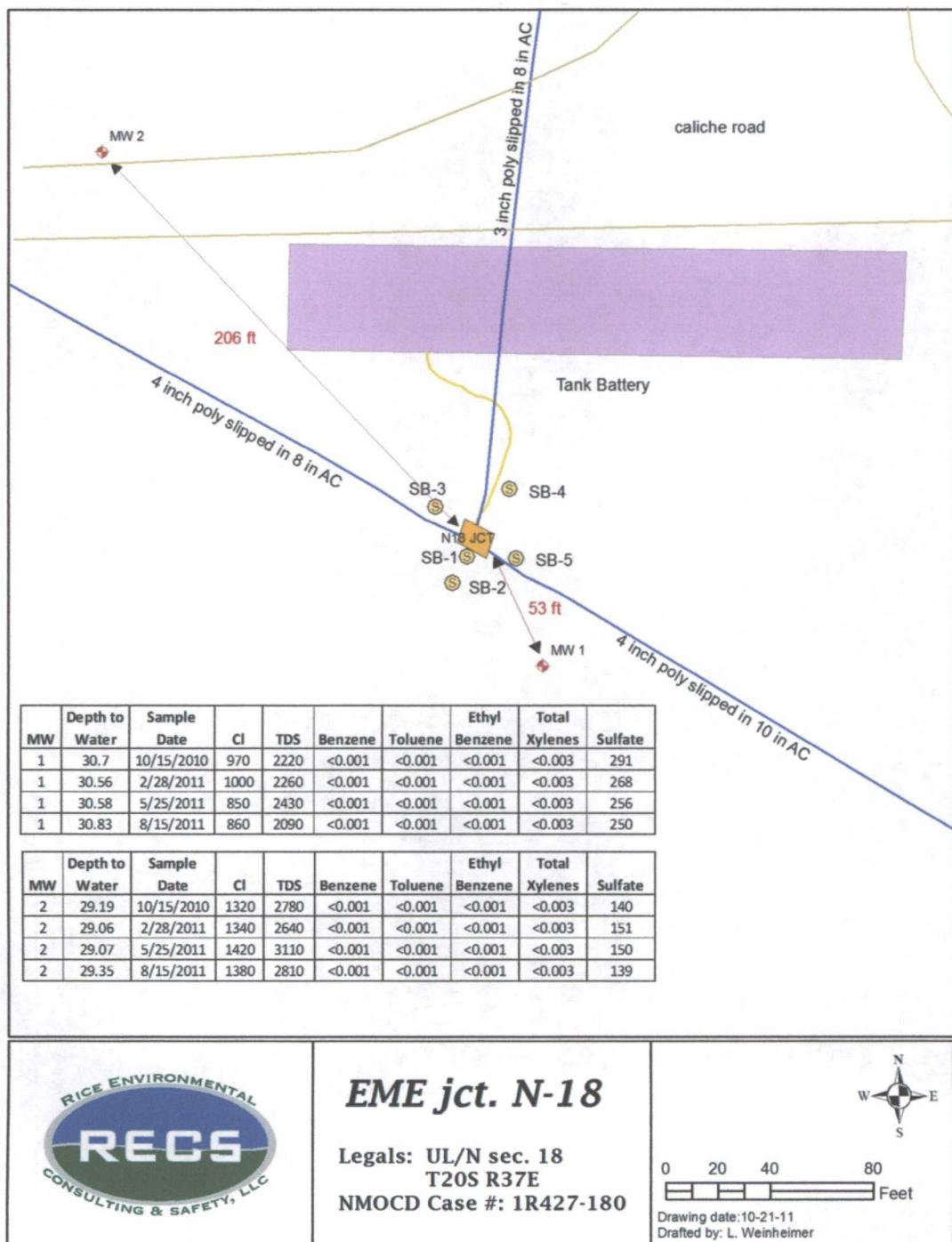


Figure 3 – Monitoring well sampling results.



Figure 4 – Compaction of installed clay infiltration barrier upon removal of former junction box.

EME Jct. N-18

Table 2 – MultiMed input parameter values used in model run.

MultiMed Input Parameter Value Estimates		
Parameter Group: SOURCE		Notes
Source Length	15 m	... surface footprint of affected area.
Source Width	15 m	... surface footprint of affected area.
Source Infiltration Rate "	0.033 m/yr 1.3 in/yr	... assumed.
Initial Concentration	414 mg/l	... avg residual <u>soil</u> Cl- conc
Source Duration	derived yrs	
Source Decay Coef	2.5% per year	... assumed.
Parameter Group: UNSAT ZONE FLOW		
Flow Layer Thickness	9.14 m	... actual value is 7.32.
Sat Hydraulic Cond	3.60 cm/hr	... assumed
Effective Porosity	0.3	... assumed
Parameter Group: UNSAT ZONE FLOW		
Transport Layer Thickness	9.14 m	... actual value is 7.32.
Bulk Density	1.83 g/cm ³	... assumed
Parameter Group: UNSAT ZONE FLOW		
Aquifer Thickness	20 m	... assumed.
Mixing Zone Thickness	derived m	
Effective Porosity	0.30	... assumed
Sat Hydraulic Cond	30 m/yr	... assumed
Hydraulic Gradient	0.003 m/m	... assumed
Parameter Group: WELL LOC and TIME		
Radial Dist to Receptor Well	1 m	... assumed
Notes:	1- Model would not run with unsat thickness of less than 9.14 m. 2- Model would not run with aquifer thickness << approx. 20 m. 3- Assumed infiltration rate of 1.3 in/yr was used.	

EME Jct. N-18

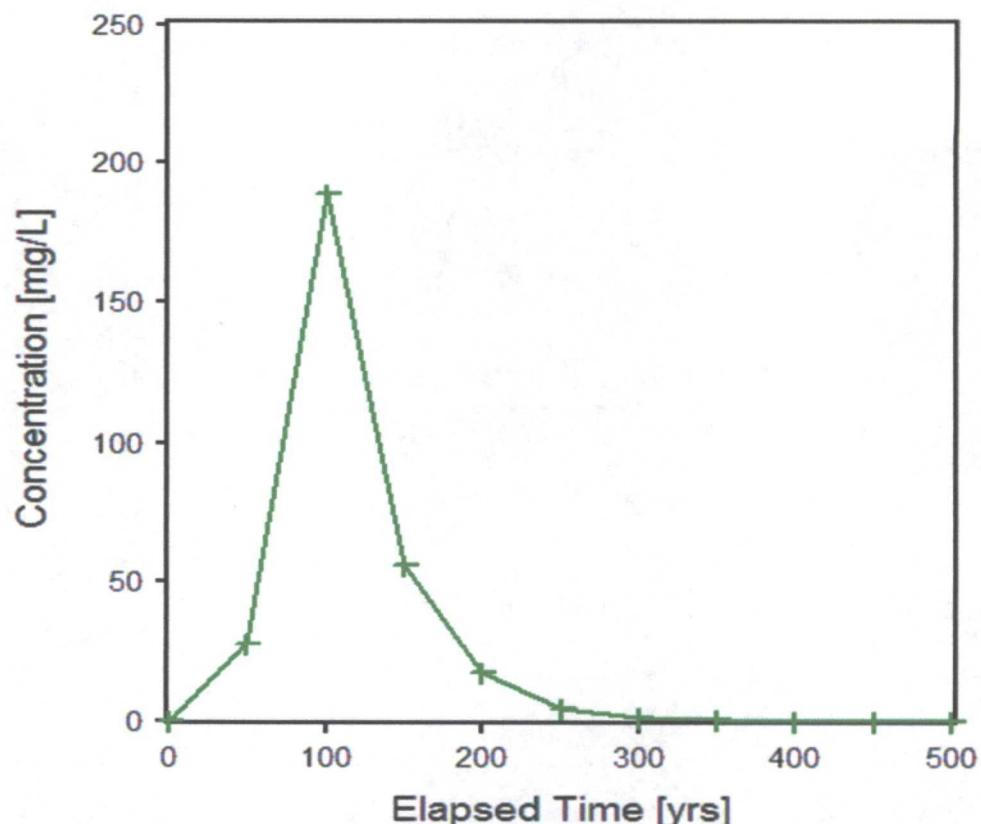


Figure 5 – MultiMed projected elevation (from baseline) in groundwater chloride concentrations over time beneath the EME Jct. N-18 location.

EME Jct. N-18

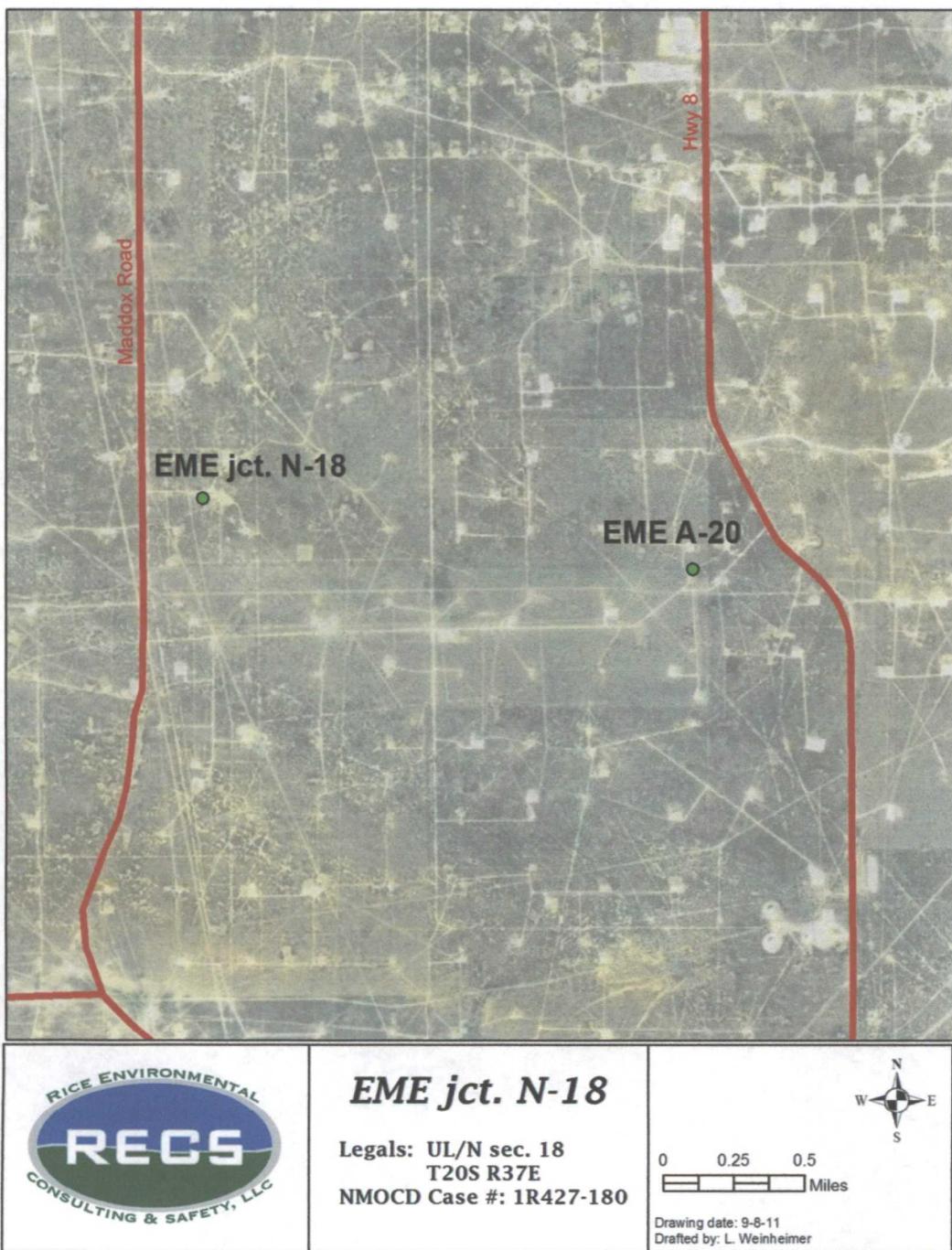


Figure 6 – EME Jct. N-18 in relation to the recovery system located at EME A-20.

EME Jct. N-18



Figure 7 – View of EME Jct. N-18 site showing active lease road.

APPENDIX A - Soil Sample Laboratory Analyses
(... for samples taken September 16th, 2010)



PHONE: (372) 283-7328 • 121 E. MARYLAND • HOBBS, NM 82440

September 20, 2010

HACK CONDER

RICE ENVIRONMENTAL CONSULTING & SAFETY LLC
112 W. TAYLOR
HOBBS, NM 82440

RE: EME JCT N-18

Enclosed are the results of analyses for samples received by the laboratory on 09/16/10 15:36.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-646 8021 Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-646 8260 Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005 Total Petroleum Hydrocarbons

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

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

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

Accreditation applies to public drinking water matrices.

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

Sincerely,

A handwritten signature in black ink that reads "Celey D. Keene".

Celey D. Keene
Lab Director/Quality Manager

Page 1 of 10



PHONE (575) 397-2326 • 121 E. MARLAND • BOX 22, NM 88240

Analytical Results For:

RICE ENVIRONMENTAL CONSULTING & SAFETY,
 HACK CONDER
 112 W. TAYLOR
 HOBBS NM 88240
 Fax To: (575) 397-1471

Received:	09/16/2010	Sampling Date:	09/16/2010
Reported:	09/20/2010	Sampling Type:	Soil
Project Name:	EME JCT N-18	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	EME JCT N-18		

Sample ID: SB - 1 @ 21' (H020866-01)

Chloride, SM4500Cl-B		mg/kg Analyzed By: HM							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1070	16.0	09/17/2010	ND	416	104	400	0.00	
TPH 60LSM									
mg/kg Analyzed By: AB									
GRD C6-C10	<10.0	10.0	09/19/2010	ND	168	84.0	200	1.01	
DRD >C10-C28	<10.0	10.0	09/19/2010	ND	164	81.9	200	3.91	

Surrogate: 1-Chlorooctane 78.5 % 70-130

Surrogate: 1-Chlorooctadecane 62.7 % 70-130

Sample ID: SB - 1 @ 24' (H020866-02)

Chloride, SM4500Cl-B		mg/kg Analyzed By: HM							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	768	16.0	09/17/2010	ND	416	104	400	0.00	
TPH 60LSM									
mg/kg Analyzed By: AB									
GRD C6-C10	<10.0	10.0	09/19/2010	ND	168	84.0	200	1.01	
DRD >C10-C28	<10.0	10.0	09/19/2010	ND	164	81.9	200	3.91	

Surrogate: 1-Chlorooctane 86.2 % 70-130

Surrogate: 1-Chlorooctadecane 85.0 % 70-130

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 112 W. TAYLOR
 HOBBES NM 88240
 Fax To: (575) 397-1471

Received:	09/16/2010	Sampling Date:	09/16/2010
Reported:	09/20/2010	Sampling Type:	Soil
Project Name:	EME JCT N-18	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	EME JCT N-18		

Sample ID: SB - 2 @ 18' (H020866-03)

Chloride SM45000-0		Analyzed By: NM							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPO	Qualifier
Chloride	656	16.0	09/17/2010	ND	416	104	400	0.00	
<hr/>									
TPN 801SM									
Chloride SM45000-0		Analyzed By: AB							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPO	Qualifier
GRO C6-C10	<10.0	10.0	09/19/2010	ND	168	84.0	200	1.01	
DRO >C10-C28	<10.0	10.0	09/19/2010	ND	164	81.9	200	3.91	
<hr/>									
Surrogate: 1-Chlorooctane	90.2%		70-130						
Surrogate: 1-Chlorooctadecane	63.0%		70-130						

Sample ID: SB - 2 @ 24' (H020866-04)

Chloride SM45000-0		Analyzed By: NM							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPO	Qualifier
Chloride	400	16.0	09/17/2010	ND	416	104	400	16.7	
<hr/>									
TPN 801SM									
Chloride SM45000-0		Analyzed By: AB							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPO	Qualifier
GRO C6-C10	<10.0	10.0	09/19/2010	ND	168	84.0	200	1.01	
DRO >C10-C28	<10.0	10.0	09/19/2010	ND	164	81.9	200	3.91	
<hr/>									
Surrogate: 1-Chlorooctane	92.4%		70-130						
Surrogate: 1-Chlorooctadecane	73.4%		70-130						

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112 W. TAYLOR
HOBBS NM 88240
Fax To: (575) 397-1471

Received:	09/16/2010	Sampling Date:	09/16/2010
Reported:	09/20/2010	Sampling Type:	Soil
Project Name:	EME JCT N-18	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	EME JCT N-18		

Sample ID: SB - 3 @ 9' (H020866-05)

Chloride, NaCl mg/kg

Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPO	Qualifier
Chloride	1140	16.0	09/17/2010	ND	416	104	400	16.7	
<hr/>									
TPM 8015M									
mg/kg Analyzed By: AB									
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPO	Qualifier
GRO C6-C10	<10.0	10.0	09/19/2010	ND	168	84.0	200	1.01	
DRO >C10-C28	<10.0	10.0	09/19/2010	ND	164	81.9	200	3.91	

Surrogate: *1-Chloroocane* 89.9 % 70-130Surrogate: *1-Chlorooctadecane* 79.3 % 70-130

Sample ID: SB - 3 @ 24' (H020866-06)

Chloride, NaCl mg/kg

Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPO	Qualifier
Chloride	450	16.0	09/17/2010	ND	416	104	400	16.7	
<hr/>									
TPM 8015M									
mg/kg Analyzed By: AB									
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPO	Qualifier
GRO C6-C10	<10.0	10.0	09/19/2010	ND	168	84.0	200	1.01	
DRO >C10-C28	<10.0	10.0	09/19/2010	ND	164	81.9	200	3.91	

Surrogate: *1-Chloroocane* 94.5 % 70-130Surrogate: *1-Chlorooctadecane* 63.7 % 70-130

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 112 W. TAYLOR
 HOEGS NM, 88240
 Fax To: (575) 397-1471

Received:	09/16/2010	Sampling Date:	09/16/2010
Reported:	09/20/2010	Sampling Type:	Soil
Project Name:	EME JCT N-18	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	EME JCT N-18		

Sample ID: SB - 4 @ 9' (H020866-07)

Chloride SM4500C-D		mg/kg		Analyzed By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	704	16.0	09/17/2010	ND	416	104	400	16.7	
TPH 8015M									
mg/kg									
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	09/19/2010	ND	168	84.0	200	1.01	
DRO >C10-C28	<10.0	10.0	09/19/2010	ND	164	81.9	200	3.91	
Surrogates: 1-Chlorooctane									
59.4 %									
Surrogates: 1-Chlorooctadecane									
75.1 %									

Sample ID: SB - 4 @ 24' (H020866-08)

Chloride SM4500C-D		mg/kg		Analyzed By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	80.0	16.0	09/17/2010	ND	416	104	400	16.7	
TPH 8015M									
mg/kg									
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	09/19/2010	ND	168	84.0	200	1.01	
DRO >C10-C28	<10.0	10.0	09/19/2010	ND	164	81.9	200	3.91	
Surrogates: 1-Chlorooctane									
93.3 %									
Surrogates: 1-Chlorooctadecane									
57.8 %									

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 HOBBS NM, 88240
 Fax To: (575) 397-1471

Received:	09/16/2010	Sampling Date:	09/16/2010
Reported:	09/20/2010	Sampling Type:	Soil
Project Name:	EME JCT N-18	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	EME JCT N-18		

Sample ID: SB - 5 @ 18' (H020866-09)

Chloride, SM4500C-B

mg/kg										Analyzed By: HM	
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier		
Chloride	432	16.0	09/17/2010	ND	416	104	400	16.7			
TPH 60/5M											

Surrogate: 1-Chloroocane	93.9%	70-130
Surrogate: 1-Chlorooctadecane	99.3%	70-130

Sample ID: SB - 5 @ 24' (H020866-10)

Chloride, SM4500C-B

mg/kg										Analyzed By: HM	
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier		
Chloride	160	16.0	09/17/2010	ND	416	104	400	16.7			
TPH 60/5M											

Surrogate: 1-Chloroocane	93.2%	70-130
Surrogate: 1-Chlorooctadecane	106%	70-130

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RICE ENVIRONMENTAL CONSULTING & SAFETY

HACK CONDER
112 W. TAYLOR
ROBBS NM, 88240
Fax To: (575) 397-1471

Received:	09/16/2010	Sampling Date:	09/16/2010
Reported:	09/20/2010	Sampling Type:	Soil
Project Name:	EME JCT N-18	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	EME JCT N-18		

Sample ID: MW - 1 @ 12' (H020866-11)

Chloride, SH45000-0 mg/kg

Analyzed By: HM

Analyze	Result	Reporting Limit	Analyzed	Method Blank	ES	% Recovery	True Value QC	RPD	Qualifier
Chloride	608	16.0	09/17/2010	ND	416	104	400	16.7	
<hr/>									
TPH 801SM mg/kg Analyzed By: AB									
Analyze	Result	Reporting Limit	Analyzed	Method Blank	ES	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	09/19/2010	ND	174	87.1	200	2.17	
DRO >C10-C28	<10.0	10.0	09/19/2010	ND	165	82.4	200	0.797	

Surrogate: 1-Chlorooctane 55.6 % 70-130

Surrogate: 1-Chlorooctadecane 75.1 % 70-130

Sample ID: MW 1 @ 24' (H020866-12)

Chloride, SH45000-0 mg/kg

Analyzed By: HM

Analyze	Result	Reporting Limit	Analyzed	Method Blank	ES	% Recovery	True Value QC	RPD	Qualifier
Chloride	144	16.0	09/17/2010	ND	416	104	400	16.7	
<hr/>									
TPH 801SM mg/kg Analyzed By: AB									
Analyze	Result	Reporting Limit	Analyzed	Method Blank	ES	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	09/20/2010	ND	174	87.1	200	2.17	
DRO >C10-C28	<10.0	10.0	09/20/2010	ND	165	82.4	200	0.797	

Surrogate: 1-Chlorooctane 101 % 70-130

Surrogate: 1-Chlorooctadecane 53.0 % 70-130

Cardinal Laboratories

* = Accredited Analyte

ANALYTIC DATA: Quality and coverage. Cardinal's Quality and Client's methods analysis for any data listing whether based in method or test, shall be limited to the method used by Client or laboratory. All data, including Data for Duplicate and any other Client laboratory shall be treated unless otherwise noted as writing and recorded by Cardinal within thirty (30) days after completion of the analytical work. In no event shall Cardinal be liable for damages or consequential damages, including, without limitation, business interruption, loss of use, or loss of profit incurred by Client, its subcontractors, affiliates or customers arising out of or related to the performance of the services rendered by Cardinal regardless of whether such claim is based upon any of the above stated theories of liability. Results relate only to the samples specified above. This report shall not be reproduced except in full with written approval of Cardinal Laboratories.

Celey D. Keene, Lab Director/Quality Manager

Page 7 of 10



PHONE (317) 283-2224 • 191 E. MARLAND • NOBLESVILLE, IN 46060

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 SMMS000-B does not require samples be received at or below 6°C
- Samples reported on as received basis (net) unless otherwise noted on report.

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A handwritten signature in black ink that reads "Celey D. Keene".

Celey D. Keene, Lab Director/Quality Manager

Page 8 of 10

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Görlitz-Cottbus-Kreis-Preisgericht verleiht Preise für herausragende Leistungen im Bereich der Berufsbildung und beruflichen Entwicklung junger Menschen.

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

APPENDIX B - Groundwater Sample Laboratory Analyses
(... for samples taken August 15th, 2011)



PHONE (575) 393-2326 • 101 E. MARYLAND • HOBBS, NM 88240

August 24, 2011

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

RE: EME JUNCTION N-18

Enclosed are the results of analyses for samples received by the laboratory on 08/18/11 17:25.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021 Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260 Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005 Total Petroleum Hydrocarbons

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

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

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

Accreditation applies to public drinking water matrices.

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

Sincerely,

A handwritten signature in black ink that appears to read "Celey D. Keene".

Celey D. Keene
Lab Director/Quality Manager

Page 1 of 5



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:	08/18/2011	Sampling Date:	08/15/2011
Reported:	08/24/2011	Sampling Type:	Water
Project Name:	EME JUNCTION N-18	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Aaron Berry
Project Location:	T20S-R36E-SEC18 N-LEA CTY., NM		

Sample ID: MONITOR WELL #1 (H101756-01)

mg/L		Analyzed By: CMS							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.001	0.001	08/20/2011	ND	0.018	91.4	0.0200	4.82	
Toluene*	<0.001	0.001	08/20/2011	ND	0.019	93.6	0.0200	6.73	
Ethylbenzene*	<0.001	0.001	08/20/2011	ND	0.020	99.4	0.0200	6.76	
Total Xylenes*	<0.003	0.003	08/20/2011	ND	0.056	93.1	0.0600	6.09	
Surrogate: Dibromofluoromethane		140.9%	70-130						
Surrogate: Toluene-d5		93.2%	70-130						
Surrogate: 4-Bromofluorobenzene		76.5%	70-130						
Chloride, SM4500Cl-B		mg/L	Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	860	4.00	08/19/2011	ND	108	108	100	0.00	
Sulfate 375.4	mg/L		Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sulfate	250	10.0	08/19/2011	ND	18.5	92.5	20.0	1.08	
TDS 160.1		mg/L	Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	2090	5.00	08/19/2011	ND	231	96.2	240	3.36	

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Celey D. Keene, Lab Director/Quality Manager

Page 2 of 5



PHONE (575) 393-2326 • 101 E. MARYLAND • HOBBS, NM 88240

Analytical Results For:

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

Received:	08/18/2011	Sampling Date:	08/15/2011
Reported:	08/24/2011	Sampling Type:	Water
Project Name:	EME JUNCTION N-18	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Aaron Berry
Project Location:	T205-R36E-SEC18 N-LEA CTY., NM		

Sample ID: MONITOR WELL #2 (H101756-02)

Matrix 8220B		Analyzed By: CMS							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.001	0.001	08/20/2011	ND	0.018	91.4	0.0200	4.82	
Toluene*	<0.001	0.001	08/20/2011	ND	0.019	93.6	0.0200	6.73	
Ethylbenzene*	<0.001	0.001	08/20/2011	ND	0.020	99.4	0.0200	6.76	
Total Xylenes*	<0.003	0.003	08/20/2011	ND	0.056	93.1	0.0500	6.09	
Surrogate: Dibromoethane		137%	70-130						
Surrogate: Toluene-d8		94.7%	70-130						
Surrogate: 4-Bromofluorobenzene		71.8%	70-130						
Matrix 844500C-8		Analyzed By: HDM							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1380	4.00	08/19/2011	ND	108	108	100	0.00	
Sulfate 375.4	mg/L		Analyzed By: HDM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sulfate	139	10.0	08/19/2011	ND	18.5	92.5	20.0	1.08	
Matrix 160.1		Analyzed By: HDM							
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	2810	5.00	08/19/2011	ND	231	96.2	240	3.36	

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Celey D. Keene, Lab Director/Quality Manager

Page 3 of 5



PHONE (575) 393-2326 • 101 E. MARLAND • NOGGS, NM 88240

Notes and Definitions

ID	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Inadequate time to reach temperature.
-	Chloride by SM45000-B does not require samples be received at or below 6°C
	Samples reported on as as received basis (wet) unless otherwise noted on report

Cardinal Laboratories

*=Accredited Analyte

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Celeste D. Keene

Celeste D. Keene, Lab Director/Quality Manager

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APPENDIX C – MultiMed Output

```
MULTIMED V1.01 DATE OF CALCULATIONS: 28-OCT-2011 TIME: 13:27:58
U. S. ENVIRONMENTAL PROTECTION AGENCY
EXPOSURE ASSESSMENT
MULTIMEDIA MODEL
MULTIMED (Version 1.50, 2005)

1 Run options
-----
Chemical simulated is Chloride

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration Specified By User: 3.300E-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
1 9.14 1

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

-----
LIMITS VARIABLE NAME UNITS DISTRIBUTION PARAMETERS
----- MIN MAX MEAN STD DEV
-----
```

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

EME Jct. N-18

-999.	-999.	Depth of the unsaturated zone 0.000	m	CONSTANT	9.14	0.000
----- VADOSE ZONE FUNCTION VARIABLES						

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

-999.	Residual water content -999.	--	CONSTANT	0.116	-999.	
-999.	Brook and Corey exponent, EN -999.	--	CONSTANT	-999.	-999.	
-999.	ALFA coefficient -999.	1/cm	CONSTANT	0.500E-02	-999.	
-999.	Van Genuchten exponent, ENN -999.	--	CONSTANT	1.09	-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						

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

-999.	Thickness of layer -999.	m	CONSTANT	9.14	-999.	
-999.	Longitudinal dispersivity of layer -999.	m	DERIVED	-999.	-999.	
-999.	Percent organic matter -999.	--	CONSTANT	0.000	-999.	

EME Jct. N-18

-999.	Bulk density of soil for layer -999.	g/cc	CONSTANT	1.83	-999.
-999.	Biological decay coefficient -999.	1/yr	CONSTANT	0.000	-999.
1	CHEMICAL SPECIFIC VARIABLES				
LIMITS	VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS	
MIN	MAX			MEAN	STD DEV
-999.	Solid phase decay coefficient -999.	1/yr	CONSTANT	0.000	-999.
-999.	Dissolved phase decay coefficient -999.	1/yr	CONSTANT	0.000	-999.
-999.	Overall chemical decay coefficient -999.	1/yr	CONSTANT	0.000	-999.
-999.	Acid catalyzed hydrolysis rate -999.	1/M-yr	CONSTANT	0.000	-999.
-999.	Neutral hydrolysis rate constant -999.	1/yr	CONSTANT	0.000	-999.
-999.	Base catalyzed hydrolysis rate -999.	1/M-yr	CONSTANT	0.000	-999.
-999.	Reference temperature -999.	C	CONSTANT	25.0	-999.
-999.	Normalized distribution coefficient -999.	ml/g	CONSTANT	0.000	-999.
-999.	Distribution coefficient -999.	--	DERIVED	-999.	-999.
-999.	Biodegradation coefficient (sat. zone) -999.	1/yr	CONSTANT	0.000	-999.
-999.	Air diffusion coefficient -999.	cm ² /s	CONSTANT	-999.	-999.
-999.	Reference temperature for air diffusion -999.	C	CONSTANT	-999.	-999.
-999.	Molecular weight -999.	g/M	CONSTANT	-999.	-999.
-999.	Mole fraction of solute -999.	--	CONSTANT	-999.	-999.
-999.	Vapor pressure of solute -999.	mm Hg	CONSTANT	-999.	-999.
-999.	Henry's law constant -999.	atm-m ³ /M	CONSTANT	-999.	-999.
0.000	Overall 1st order decay sat. zone 1.00	1/yr	DERIVED	0.000	0.000
0.000	Not currently used 0.000		CONSTANT	0.000	0.000
0.000	Not currently used 0.000		CONSTANT	0.000	0.000
1	SOURCE SPECIFIC VARIABLES				
LIMITS	VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS	
MIN	MAX			MEAN	STD DEV
-999.	Infiltration rate -999.	m/yr	CONSTANT	0.330E-01	-999.
-999.	Area of waste disposal unit -999.	m ²	DERIVED	0.139E+04	-999.
	Duration of pulse	yr	DERIVED	50.0	-999.

EME Jct. N-18

-999.	-999.				
-999.	Spread of contaminant source	m	DERIVED	-999.	-999.
-999.	-999.				
-999.	Recharge rate	m/yr	CONSTANT	0.000	-999.
-999.	-999.				
0.000	Source decay constant	1/yr	CONSTANT	0.250E-01	0.000
0.000	0.000				
-999.	Initial concentration at landfill	mg/l	CONSTANT	414.	-999.
-999.	-999.				
-999.	Length scale of facility	m	CONSTANT	20.1	-999.
-999.	-999.				
-999.	Width scale of facility	m	CONSTANT	24.4	-999.
-999.	-999.				
0.000	Near field dilution		DERIVED	1.00	0.000
0.000	1.00				
1					
				AQUIFER SPECIFIC VARIABLES	
LIMITS	VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS	
MIN	MAX			MEAN	STD DEV
-999.	Particle diameter	cm	CONSTANT	-999.	-999.
-999.	-999.				
-999.	Aquifer porosity	--	CONSTANT	0.300	-999.
-999.	-999.				
-999.	Bulk density	g/cc	CONSTANT	1.70	-999.
-999.	-999.				
-999.	Aquifer thickness	m	CONSTANT	20.0	-999.
-999.	-999.				
-999.	Source thickness (mixing zone depth)	m	DERIVED	3.00	-999.
-999.	-999.				
-999.	Conductivity (hydraulic)	m/yr	CONSTANT	30.0	-999.
-999.	-999.				
-999.	Gradient (hydraulic)		CONSTANT	0.300E-02	-999.
-999.	-999.				
-999.	Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.
-999.	-999.				
-999.	Retardation coefficient	--	DERIVED	-999.	-999.
-999.	-999.				
-999.	Longitudinal dispersivity	m	FUNCTION OF X	-999.	-999.
-999.	-999.				
-999.	Transverse dispersivity	m	FUNCTION OF X	-999.	-999.
-999.	-999.				
-999.	Vertical dispersivity	m	FUNCTION OF X	-999.	-999.
-999.	-999.				
-999.	Temperature of aquifer	c	CONSTANT	20.0	-999.
-999.	-999.				
-999.	pH	--	CONSTANT	7.00	-999.
-999.	-999.				
-999.	Organic carbon content (fraction)		CONSTANT	0.000	-999.
-999.	-999.				
-999.	Well distance from site	m	CONSTANT	1.00	-999.
-999.	-999.				
-999.	Angle off center	degree	CONSTANT	0.000	-999.
-999.	-999.				
-999.	Well vertical distance	m	CONSTANT	0.000	-999.
-999.	-999.				
1					
				TIME	CONCENTRATION
				0.000E+00	0.00000E+00
				0.500E+02	0.27562E+02
				0.100E+03	0.18901E+03
				0.150E+03	0.55758E+02
				0.200E+03	0.17119E+02

EME Jct. N-18

0.250E+03	0.46315E+01
0.300E+03	0.14038E+01
0.350E+03	0.38302E+00
0.400E+03	0.11000E+00
0.450E+03	0.30663E-01
0.500E+03	0.74366E-02