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REPORTS

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April 2008

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Lovington Abo 1G Site
NMOCD Case # 1R 0415

Closure Report

R. T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. Suite F-142
Albuquerque, NM 87501

April 2008

Lovington Abo 1G Site
NMOCD Case #1R 0415

Closure Report

Prepared for:

Rice Operating Company
122 West Taylor
Hobbs, NM 88240

R. T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. Suite F-142
Albuquerque, NM 87501

1.0 Location

Unit G, Section 1 Township 17S Range 36E
NMOCD # 1R 0415

Plate 1 shows the location of the Abo 1-G site relative to Lovington, New Mexico. Plate 2 is an aerial photograph of the site. Plate 3 shows locations of all subsurface investigations (borings, trenches, and moisture ports) and installed clay caps relative to the release boundaries.

2.0 Work Elements Performed Since March 2006

Throughout 2006 and 2007, Rice Operating Company (ROC) routinely sampled MW-1. All laboratory results from this ground water sampling program are summarized in the 2006 and 2007 Annual Monitoring Reports, which are in Appendix A. Appendix A also contains all significant submissions to NMOCD regarding this site and Forms C-141 C-103.

In October of 2006, ROC supervised sampling of the unsaturated zone in one boring shown on Plate 3.

Confirmatory Boring	Drilled to 50 feet to determine chloride profile since the installation of MW-1 in November, 2004. It is located approximately 15 feet northeast of MW-1.

In December of 2006, Hicks Consultants supervised the sampling of the unsaturated zone in three borings. Plate 3 shows the locations of these borings and other sampling/ monitoring points:

SBE-1	This boring, was drilled to 16 feet but was terminated when it was determined that it penetrated Trench C and would not provide meaningful results.
SBE-2	Drilled to 50-feet to determine the subsurface conditions within the release footprint but outside of the excavation/ barrier program implemented by ROC during late 2005 and early 2006 (see March 3, 2006 report in Appendix A). This location is about 20 feet from SBE-1.
SBB	Drilled to 50-feet at a location about 300-feet southeast from the junction box in undisturbed native vegetation. This boring determined back ground subsurface conditions beneath healthy vegetation.

Appendix B provides the boring logs, field chloride profiles from MW-1, SBE-2 and SBB. Appendix A provides chemical analyses of samples from MW-1.

Beginning in 2007, Hicks Consultants routinely obtained soil moisture readings from the gypsum block installation at the site. Information relating to gypsum block soil moisture monitoring is in Appendix C.

3.0 Conclusions

3.1 Chloride Migration in the Vadose Zone Is 0-3 Feet/Year

The data from moisture monitoring, described in Appendix C, suggest a maximum moisture flux of less than 3 feet/year.

The estimate of vadose zone water flux from moisture monitoring is consistent with the Hydrus 1-D model predictions of flux, which are about 1.4 feet/year (0.12 cm/day) during moisture pulses (generally after El Nino precipitation events) and less at other times. The estimate of moisture migration obtained from comparison of chloride profiles from SB-1 (Oct., 2003) and SBE-1 (Dec., 2006) is approximately 3.2 feet /year (plus or minus 0.33 feet/year because of the variation possible due to the sampling interval)

The observations presented in Plate 4 also support the estimates of chloride migration by the HYDRUS-1D model and soil moisture measurements. All historical evidence suggests that the 1993 release was very similar to the 2003 release and we can assume that the depth of initial penetration of the 1993 release was about 4 feet at SB-01, which is the same depth we observe as center of mass for the 2003 release event. From 1993 to just before the 2003 release, the chloride center of mass at SB-1 migrated downward. The chloride from the 1993 release at SB-01 migrated from a depth of about 4 feet, to a total depth of about 11 feet from 1993 to the time just before the 2003 release - a rate of 0.7 feet/year. We can assume that the 2003 release caused a sudden increase in soil moisture content and a displacement downwards of soil moisture in the upper four feet of the soil profile. This resulted in movement of the moisture (and the deeper chloride mass associated with the 1993 release) from a depth of 11 feet to a depth of about 15 feet. If we include a rapid 4-foot migration pulse due to the 2003 release, the total migration rate is 1.1 feet/year, resulting in the 15-foot deep center of mass observed in SB-1. Given the five-foot sampling interval employed at MW-1, the boring adjacent to SB-1 (see Plate 4), the interpretation of these two releases over the ten-year time interval suggests that the center of chloride mass migrated about 1-foot/year at MW-1.

3.2 Impacts of Release(s) Remain In The Upper 50-feet of the Vadose Zone, 40-feet Above Ground Water

Plate 4 presents the chloride profiles of all borings at the site as well as Trenches A, B and C. The borings are arranged from left to right based upon the distance of each boring from the junction box. Plate 4 presents an interpretation showing three separate release events that caused increases in chloride relative to background concentrations. Elevated chloride in the vadose zone from about 4-8 feet below ground surface is associated with the 2003 event and is most clearly represented in Trench A and SB-1. The 2003 release did not impact Trench B and some of the impacted soil at the 2006 Confirmation Boring was removed during the 2005-06 excavation.

The impact from the 1993 release event is apparent in Trench A (from 10-20 feet bgs) and in the Confirmatory Boring (from 12-18 feet bgs). The bottom of the impact zone is less obvious in SB-1 and MW-1. In SB-1 and MW-1 the chloride from the 1993 release may be superimposed on residual chloride from an earlier unidentified release, which is apparent in the Confirmatory Boring (30-45 feet bgs).

Chloride concentrations in all borings do not exceed 250 mg/Kg at depths greater than or equal to 50 feet below ground surface. Ground water at the site is about 95 feet below ground surface.

3.3 The Increase in Chloride Observed in MW-1 Is Not Caused by the Abo-1G Release

Other sources of chloride must be responsible for the observed concentrations in MW-1 since all of the chloride released from the Abo-1G site remains in the uppermost 50-feet of the vadose zone (depth to water is approximately 95 feet). Figure 1 shows the results of ground water monitoring at the Abo-1G site.

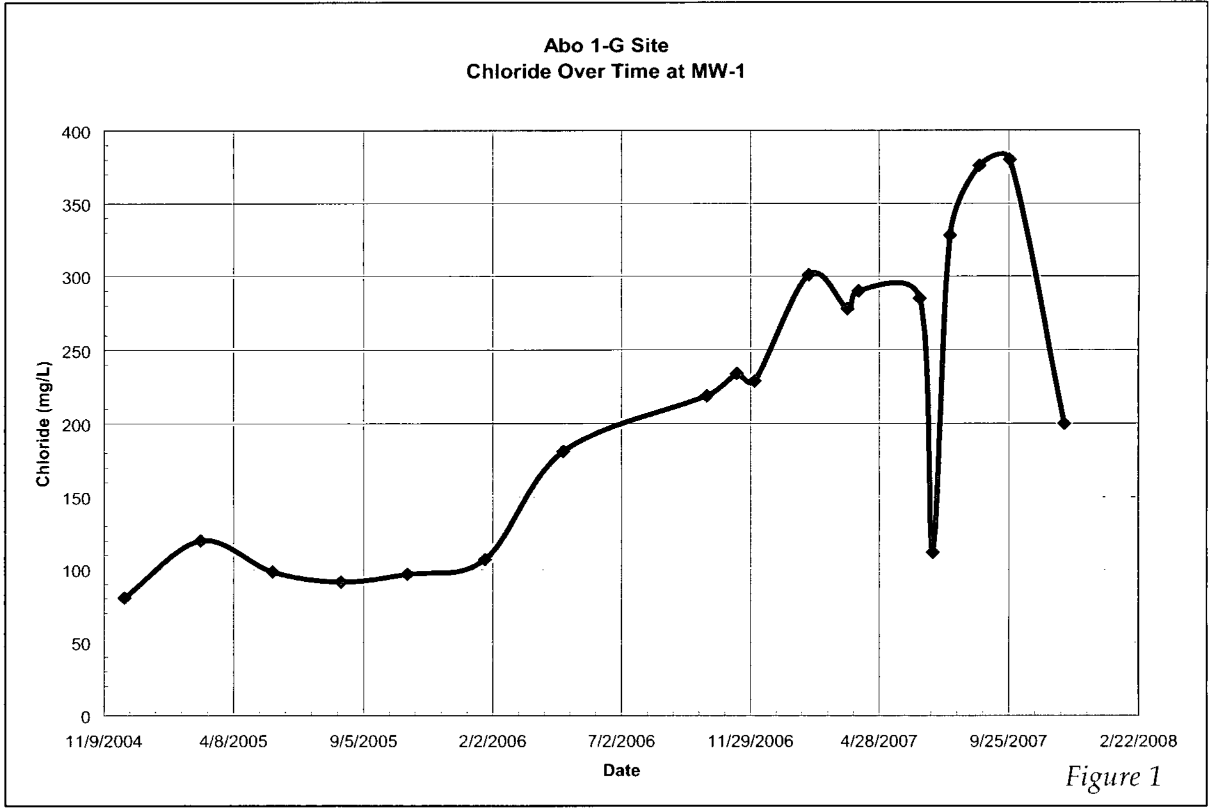


Figure 1

4.0 Request for Closure

- ROC investigated the release of fluids from the Abo-1G release site and found no threat to public health, fresh water or the environment due to petroleum hydrocarbons. All submissions associated with this site are included as Appendix A.

- ROC submitted a plan to close the site which would cause the sequestration of chloride in the upper vadose zone such that this material poses no threat to ground water. This plan also mitigated any threat to public health or the environment.

- NMOCD approved the plan submitted by ROC on August 31, 2005.

- ROC completed the infiltration barrier in accordance with the NMOCD-approved plan in January 2006.

- Monitoring of the infiltration barrier performance demonstrates that the barrier and natural re-vegetation effectively prevent deep percolation of water.

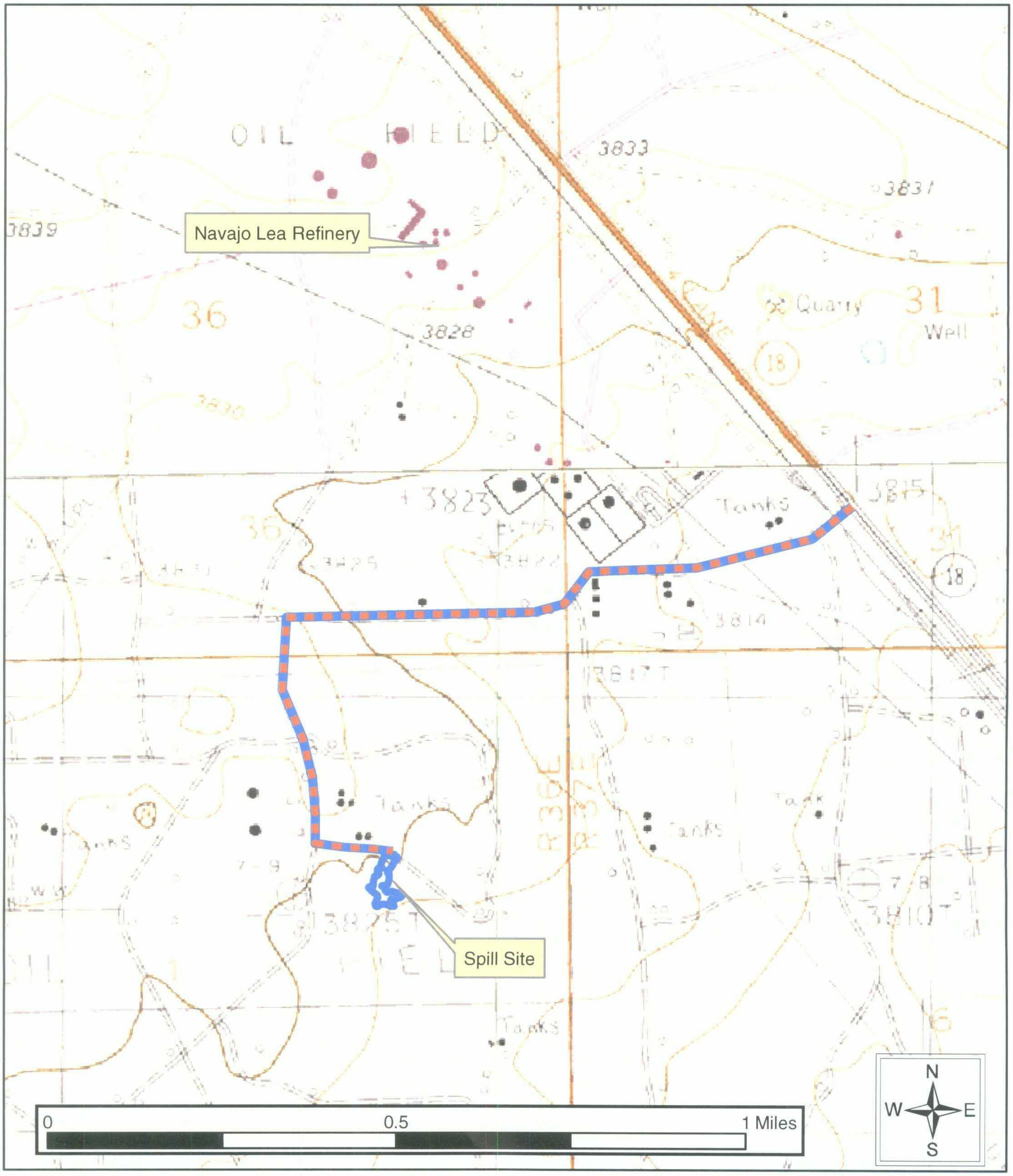
- ROC is willing to relinquish responsibility for the well, MW-1, to the City of Lovington. In the absence of the transfer of responsibility for the well from ROC to the City, ROC will plug and abandon the monitoring well.

- ROC respectfully requests closure of the regulatory file associated with the Abo-1G release site.

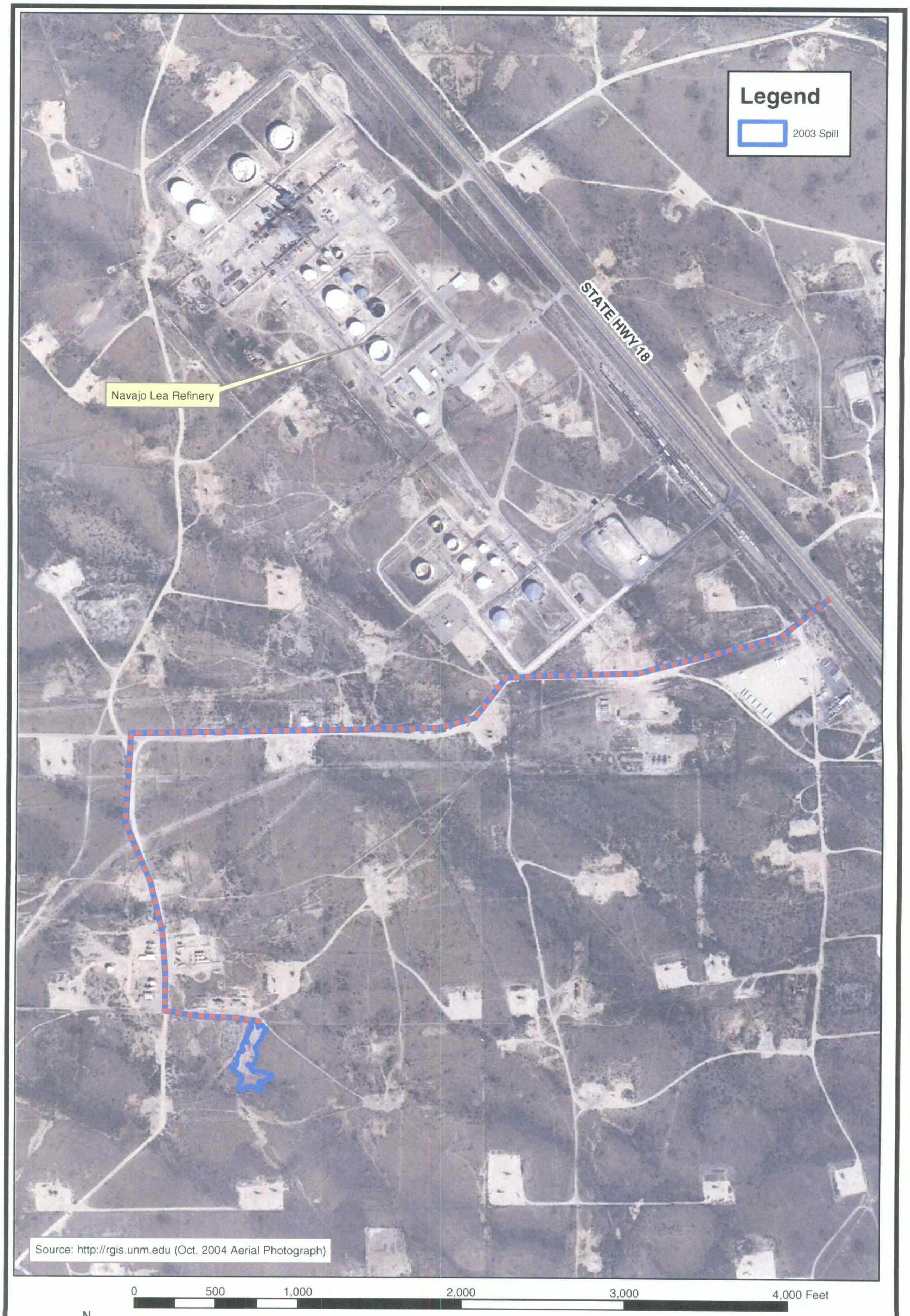
Plates

R. T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. Suite F-142
Albuquerque, NM 87501

Directions: From Lovington, NM, proceed on Highway 18 for approximatly 5.3 miles. Head southwest on an unnamed dirt road (0.5 miles southeast of the Navajo Lea Refinery. Proceed on the dirt road for approximately 0.8 miles. Head south on an unamed dirt road for approximately 0.3 miles. Head east on an unnamed dirt road immediatley south of a tank battery. Proceed east for approximately 550 feet. The spill site is on the south side of the road.



Site Location Map (USGS Lovington SE 7.5' Quad)	Plate 1
ABO 1G Realease Site, OCD Case #1R0415	April 2008



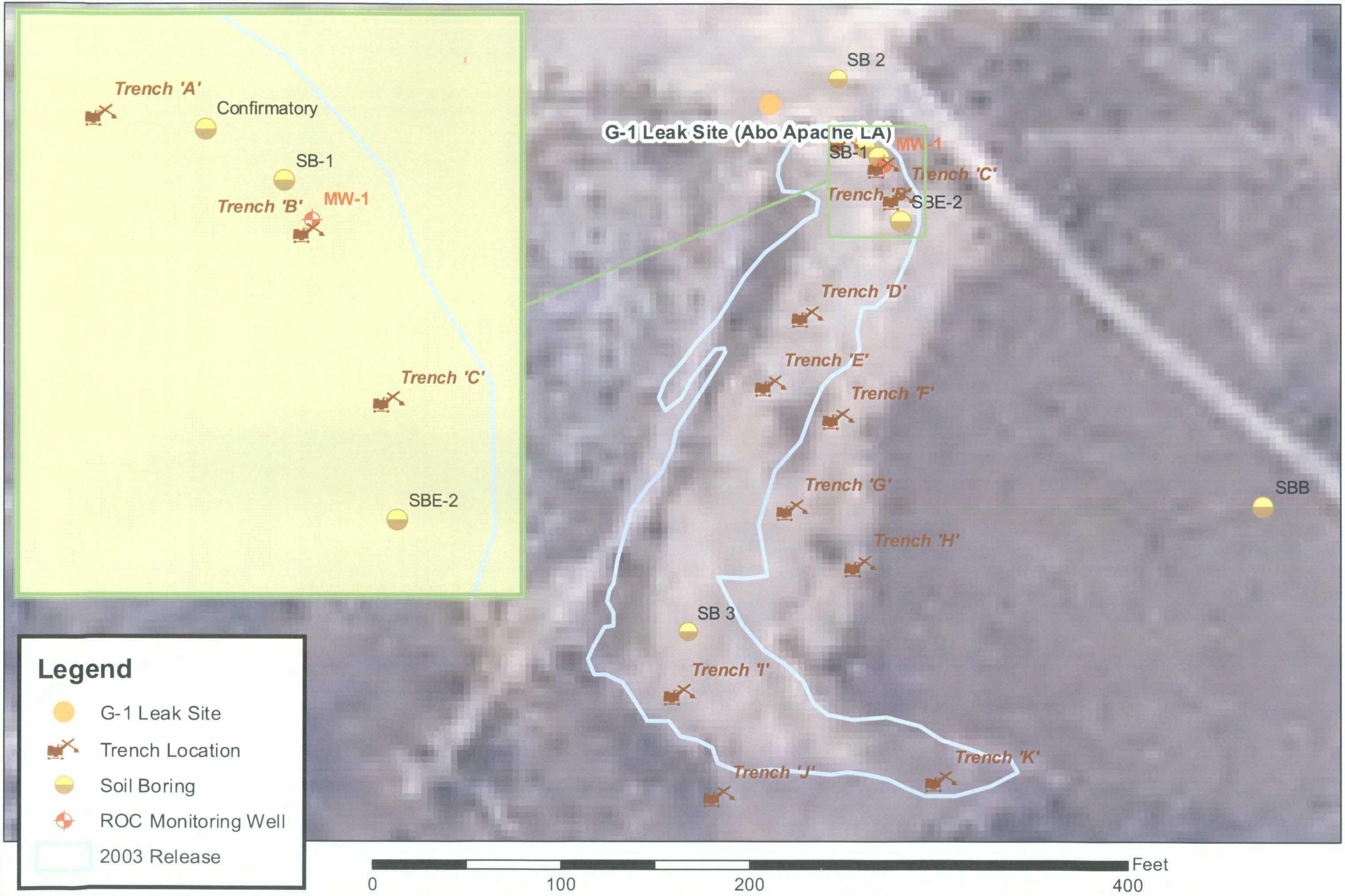
Source: http://rgis.unm.edu (Oct. 2004 Aerial Photograph)

Location of Realese and Sourrounds

Plate 2

ABO 1G Realease Site, OCD Case #1R0415

August 2005



R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

Trench, Boring, and MW location within the 2003 Release

Rice Operating Company

Plate 3

April 2008

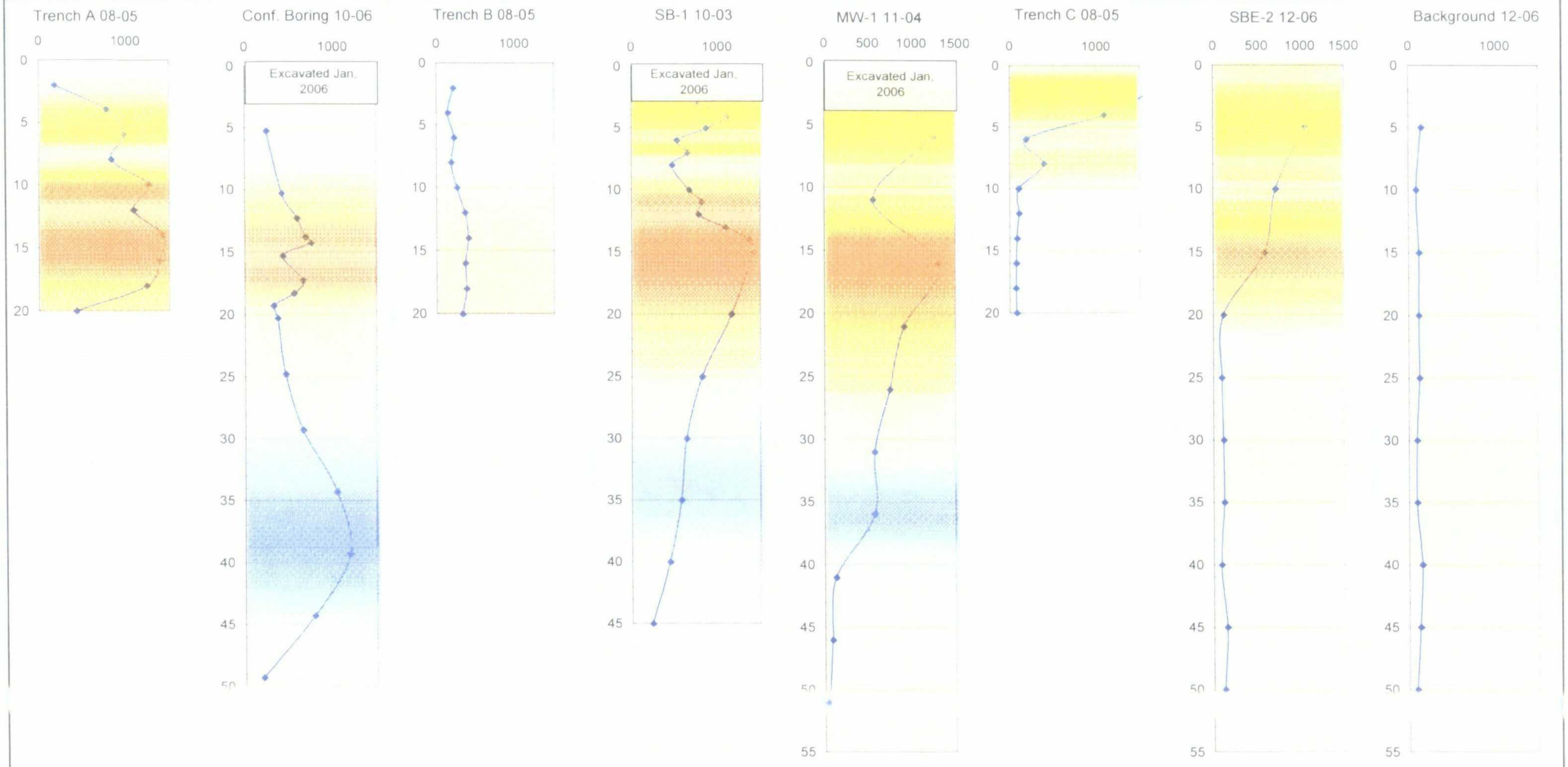
Chloride Profiles are Arranged by Relative Distance from the Junction Box. Trench A is closest to the Junction Box, SB-2 is furthest from the Junction Box.

🟨 Marks common depths of high chloride concentrations cosidered to be from the 2003 release

🟧 Marks common depths of high chloride concentrations considered to be from the 1993 release

🟦 Marks common depths of high chloride concentrations from possible earlier release

☐ Soil excavated and removed during ET Barrier construction



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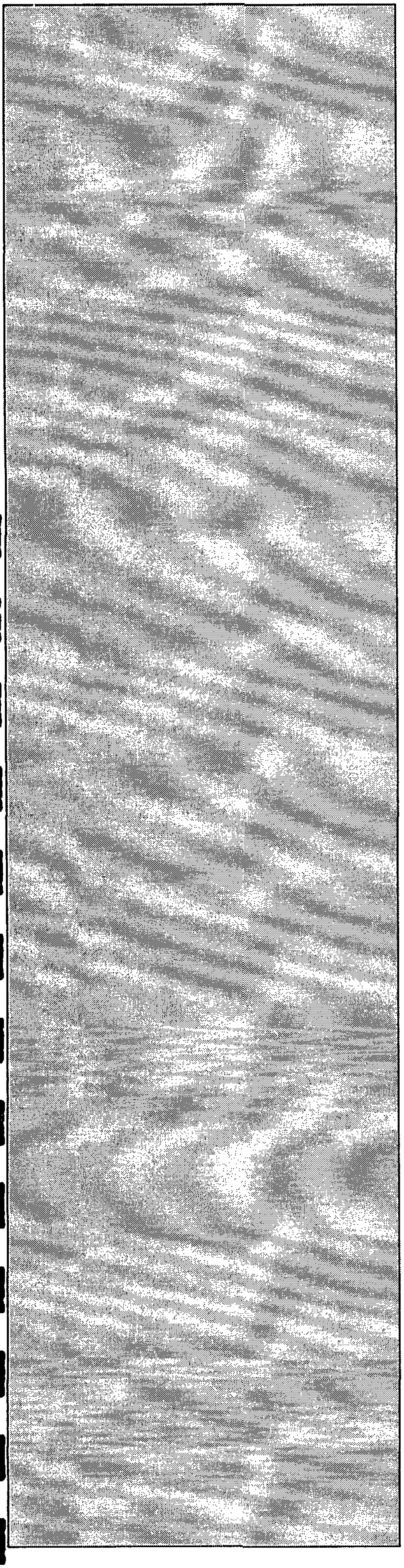
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
505-266-5004

Abo 1-G Site

Chloride Concentration Profiles from Borings and Trenches at Abo 1-G Site

Plate 4

January, 2008



Appendix A:

Previous Submissions & Correspondence

R. T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. Suite F-142
Albuquerque, NM 87501

District I
1625 N. French Dr., Hobbs, NM 88240
District II
1301 W. Grand Avenue, Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised October 10, 2003

Submit 2 Copies to appropriate District Office in accordance with Rule 116 on back side of form

Release Notification and Corrective Action

OPERATOR

☐ Initial Report ☒ Final Report

Name of Company	RICE OPERATING COMPANY	Contact	KRISTIN POPE
Address	122 W. TAYLOR ST., HOBBS, NM 88240	Telephone No.	(575) 393-9174
Facility Name	ABO SWD SYSTEM	Facility Type	SWD DISPOSAL PIPELINE

Surface Owner City of Lovington	Mineral Owner		Lease No.

LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
G	1	17S	36E					LEA

Latitude 32° 52' 02.54" N **Longitude** 103° 18' 14.39 W

NATURE OF RELEASE

Type of Release	PRODUCED WATER	Volume of Release approx. 200 BBLS	Volume Recovered 130 BBLS
Source of Release	SWD PIPELINE	Date and Hour of Occurrence UNKNOWN	Date and Hour of Discovery 10/18/2003 10:30
Was Immediate Notice Given?	☒ Yes ☐ No ☐ Not Required	If YES, To Whom? PAUL SHEELEY	
By Whom?	JOE GATTS	Date and Hour	10/20/2003 11:55
Was a Watercourse Reached?	☐ Yes ☒ No	If YES, Volume Impacting the Watercourse.	N/A

If a Watercourse was Impacted, Describe Fully.*

N/A

Describe Cause of Problem and Remedial Action Taken.*

4-IN. POLYETHYLENE PIPELINE SPLIT; REMAINING SLACK IN PIPELINE WAS REMOVED AND THE CRACK WAS FUSED. REMOVED AND DISPOSED OF STANDING FLUID.

Describe Area Affected and Cleanup Action Taken.*

SEE ATTACHED CLOSURE REPORT BY R. T. HICKS CONSULTANTS

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Signature: Kristin Pope	OIL CONSERVATION DIVISION
Printed Name: KRISTIN POPE	Approved by District Supervisor:
Title: PROJECT SCIENTIST	Approval Date: Expiration Date:
E-mail Address: KPOPE@RICESWD.COM	Conditions of Approval: Attached ☐
Date: 4/3/2008 Phone: (575) 393-9174	

Attach Additional Sheets If Necessary

Submit 3 Copies To Appropriate District Office
District I
1625 N. French Dr., Hobbs, NM 88240
District II
1301 W. Grand Ave., Artesia, NM 88210
District III
1000 Rio Brazos Rd., Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy, Minerals and Natural Resources

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-103
Revised June 10, 2003

WELL API NO. 30-025-12801
5. Indicate Type of Lease STATE ☐ FEE ☒
6. State Oil & Gas Lease No.
7. Lease Name or Unit Agreement Name EUNICE MONUMENT EUMONT (EME)
8. Well Number M-5
9. OGRID Number
10. Pool name or Wildcat SAN ANDRES

SUNDRY NOTICES AND REPORTS ON WELLS

(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT" (FORM C-101) FOR SUCH PROPOSALS.)

1. Type of Well: Oil Well ☐ Gas Well ☐ Other SWD WELL
2. Name of Operator RICE OPERATING COMPANY
3. Address of Operator 122 W. TAYLOR, HOBBS, NM 88240
4. Well Location

Unit Letter M : 100 feet from the SOUTH line and 250 feet from the WEST line

Section 5 Township 20S Range 37E NMPM LEA County

11. Elevation *(Show whether DR, RKB, RT, GR, etc.)* 3525' GL; 3537 KB

12. Check Appropriate Box to Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:		SUBSEQUENT REPORT OF:	
PERFORM REMEDIAL WORK ☐	PLUG AND ABANDON ☐	REMEDIAL WORK ☐	ALTERING CASING ☐
TEMPORARILY ABANDON ☐	CHANGE PLANS ☐	COMMENCE DRILLING OPNS. ☐	PLUG AND ABANDONMENT ☐
PULL OR ALTER CASING ☐	MULTIPLE COMPLETION ☐	CASING TEST AND CEMENT JOB ☐	
OTHER: CLOSE REDWOOD TANKS ☒		OTHER: ☐	

13. Describe proposed or completed operations. (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work). SEE RULE 1103. For Multiple Completions: Attach wellbore diagram of proposed completion or recompletion.

Proposed work according to NMOCD-approved RBCA workplan submitted by R. T. Hicks Consultants of Albuquerque: Delineate vertical and lateral extent of impact by drilling and obtaining samples from the boreholes and converting the boreholes to monitor wells as necessary. The HYDRUS1D model will be employed to evaluate the potential of any impact in the vadose zone to impair groundwater quality at this site. A remedy will be devised based on these results. Drilling will be conducted on November 3, 2003. Replacement tanks will be erected 300 ft west of the current redwood tanks. All major events including boring and sampling will be coordinated to allow 48 hours notice to NMOCD.

OCT 2003
Hobbs
OCD

Depth to groundwater is 33 ft.
The NMOCD Site Assessment Score for M-5 = 20.

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNATURE Kristin Farris TITLE Project Scientist DATE 10-28-03

Type or print name Kristin Farris E-mail address: enviro@leaco.net Telephone No. (505) 393-9174

(This space for State use)

APPPROVED BY ORIGINAL SIGNED BY CHRIS WILLIAMS OC DISTRICT SUPERVISOR/GENERAL MANAGER TITLE DATE [illegible]
Conditions of approval, if any:

Appendix A Table of Contents

R. T. Hicks Consultants, Ltd.

901 Rio Grande Blvd. NW Suite F-142 Albuquerque, NM 87109 505.266.5004 Fax: 505.266.0745

January 22, 2004

Mr. Wayne Price
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Abo 1G Leak Site: Section 1, 17S 36E Unit G

Dear Mr. Price:

Rice Operating Company retained Hicks Consultants to address potential environmental concerns at the above referenced site. This submission proposes a scope of work that we believe will best mitigate any threat to human health and the environment and lead to closure of the regulatory file for this site.

Background

The Abo 1G Discharge Site is located about 6 miles southeast of the center of Lovington, New Mexico. Plate 1 shows the location of the site relative to Route 18, the Hobbs-Lovington Highway. The pipeline failure released produced water with little or no hydrocarbons.

Rice Operating Company (ROC) prepared a Release Notification report that summarizes activities to date. Plate 2 shows the geometry of the release and the locations of soil borings used to characterize the release. Soil boring SB2 is uphill from the spill site and we consider this a "background" location. The soil borings within the area of the release (#1 and #3) show a decline in chloride concentrations from more than 1000 ppm chloride to background levels (about 280 ppm) at 45 feet and 15 feet below land surface respectively. Because the water table lies about 80 feet below land surface, this observed decrease of chloride concentrations suggests that the release from did not create saturated conditions between ground surface and ground water.

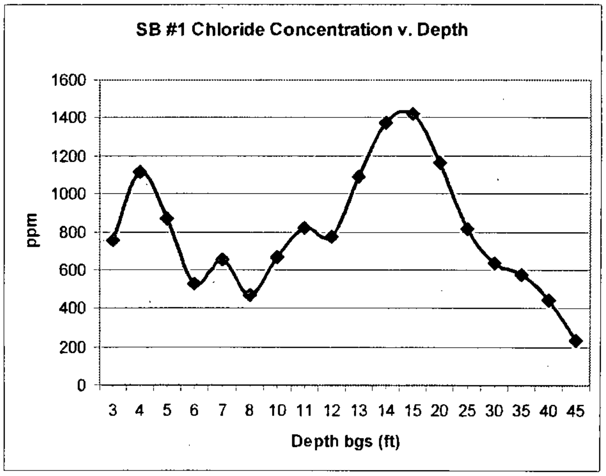


Figure 1 plots the chloride

concentration v. depth for Soil Boring #1. This diagram for Soil Boring #1 shows that the recent release is the second of two releases at or near this site. This data and that from Soil Boring #3 demonstrate that the center of mass from the recent release is at a depth of 4-5 feet below land surface. From 13-20 feet below land surface in Soil Boring #1, a second center of mass exists. As stated earlier, chloride concentrations decline to background levels from 40-45 feet in this boring. ROC confirmed that an earlier release of about 10 barrels did occur in the past near Soil Boring #1.

We conclude that these soil boring data show no evidence of potential ground water impairment. The chloride from the releases remains within the vadose zone. Based upon our experience with other sites, we hypothesize that the chloride will remain in the vadose zone for decades, centuries, or indefinitely. Previous research on the migration and fate of chloride conducted by API suggest that any vertical migration of chloride is so slow that ground water quality cannot be materially impacted by releases of this magnitude. Therefore, we have restricted our proposed activities to reclamation of the surface to its original productive capacity and performing simulation modeling to determine if the residual chloride mass in the vadose zone poses no threat to ground water quality.

1. Evaluate Chloride Flux from the Vadose Zone to Ground Water

We propose to employ HYDRUS1D and a simple ground water mixing model to evaluate the potential of residual chloride mass in the vadose zone to materially impair ground water quality at the site. We will employ predictions of the migration of chloride ion from the vadose zone to ground water then select an appropriate remedy for the land surface and underlying vadose zone. The first simulation is the "no action" alternative, which predicts chloride flux to ground water in the absence of any action by ROC.

For this simulation, we will employ the input parameters to HYDRUS and the mixing model outlined in Table 1. We will assume that vegetation is not present over the release site (no evapotranspiration) and an aquifer thickness of about 35 feet, or whatever value can be justified by examination of the literature and nearby well logs. At other sites, we have found that chloride can be distributed throughout the thickness of the aquifer.

Table 1: Input Parameters for Simulation Modeling

Input Parameter	**Source**
Vadose Zone Thickness – 80 feet	Nearby water supply well logs (Appendix A)
Vadose Zone Texture – caliche and sand	Nearby water supply well logs and on-site borings (Appendix A)
Dispersion Length -	Professional judgment
Soil Moisture - wet	Professional judgment
Vadose Zone Chloride Load – 19 kg/m^2	Appendix B

Length of release perpendicular to ground water flow – 100 meters	Field Measurements (see Plate 2)
Climate	Pearl, NM station (Hobbs)
Background Chloride in Ground Water	City of Lovington water system data
Ground Water Flux	Calculated from regional hydraulic data
Aquifer Thickness	Nearby water supply well logs (Appendix A)

2. Design Remedy and Submit Report

ROC has completed the repair of the pipeline at the site. We do not anticipate additional releases of produced water. Our modeling of similar sites strongly suggests that the relatively small residual chloride loading (19 kg/m^2, Appendix B) in the vadose zone poses a threat to ground water quality. If the modeling described above suggests that a threat does exist, we will use the HYDRUS-1D model predictions to develop a remedy for the vadose zone. If necessary, we will simulate:

1. installation of a low permeability barrier to minimize natural infiltration,

2. surface grading and seeding to eliminate any ponding of precipitation and promote evapotranspiration, thereby minimizing natural infiltration, and

3. a combination of the above potential remedies.

We will select the vadose zone remedy that offers the greatest environmental benefit while causing the least environmental damage.

Once we determine the most appropriate vadose zone remedy, we propose to immediately restore the soil through the addition of fresh water and, if necessary, soil amendments to move the identified chloride mass at the 2-5 foot depth to below the root zone (6-10 feet below land surface). If necessary, we use HYDRUS 1D to simulate this addition of fresh water to determine if any proposed vadose zone remedy might be affected by this soil flushing program. The protocol for the soil restoration program is simple:

1. Sample soils to determine if amendments, such as gypsum, will be necessary to restore soil structure and permeability.

2. If soil amendment is required, we will gently till the surface soil without disturbing the underlying caliche to mix the gypsum with the soil. If amendments are not required, we will forego tilling and the resultant disturbance of the existing soil structure.

3. Then we cover areas of the spill with black plastic to minimize evaporation and apply fresh water to the soil beneath the plastic to flush the chloride from the root zone. When possible, we will irrigate beneath the plastic immediately after precipitation events or immediately before predicted precipitation events. Conducting soil flushing in concert with precipitation events accelerates the process and conserves water.

4. Periodically, we will obtain samples of the soil and underlying material for field chloride analyses. When samples demonstrate that fresh water flushing has moved the chloride to below the root zone, we will remove the plastic and begin the process at another location at the site.

We plan to commence the HYDRUS1D simulations described above immediately. Your approval to move forward with this work plan will speed the implementation of a surface remedy because soil flushing is best conducted in winter when evaporation is low and precipitation is more widespread and easier to predict.

Sincerely,
R.T. Hicks Consultants, Ltd.

Randall T. Hicks
Principal

Copy:
Rice Operating Company

R. T. HICKS CONSULTANTS, LTD.
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

June 11, 2004

Wayne Price
NMOCD Environmental Bureau
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
Via E-mail

RE: Abo 1G Pipeline Release Corrective Action Plan
Section 1, 17S, 36E, Unit G

Dear Wayne:

On behalf of Rice Operating Company, R.T. Hicks Consultants, Ltd. is pleased to submit the attached Corrective Action Plan for the above-referenced site. We have followed the same approach with this site as in our previously-submitted CAP for the Zachary Hinton site. We would appreciate your comments on this and the Zachary Hinton report as soon as possible to allow us to address your concerns before we complete our reports on the following ROC sites:

B-29	(NMOCD approved work plan)
N-29	(NMOCD approved work plan)
M-5	(NMOCD approved work plan)
Hobbs SWD system	(work plan submitted to NMOCD)
Vacuum G-35	(work plan forthcoming)

Your comments on or approval of the Hobbs SWD system abandonment work plan will allow us to begin the characterization process of this important site. Please expect the work plan for the Vacuum G-35 site shortly.

Sincerely,
R.T. Hicks Consultants, Ltd.

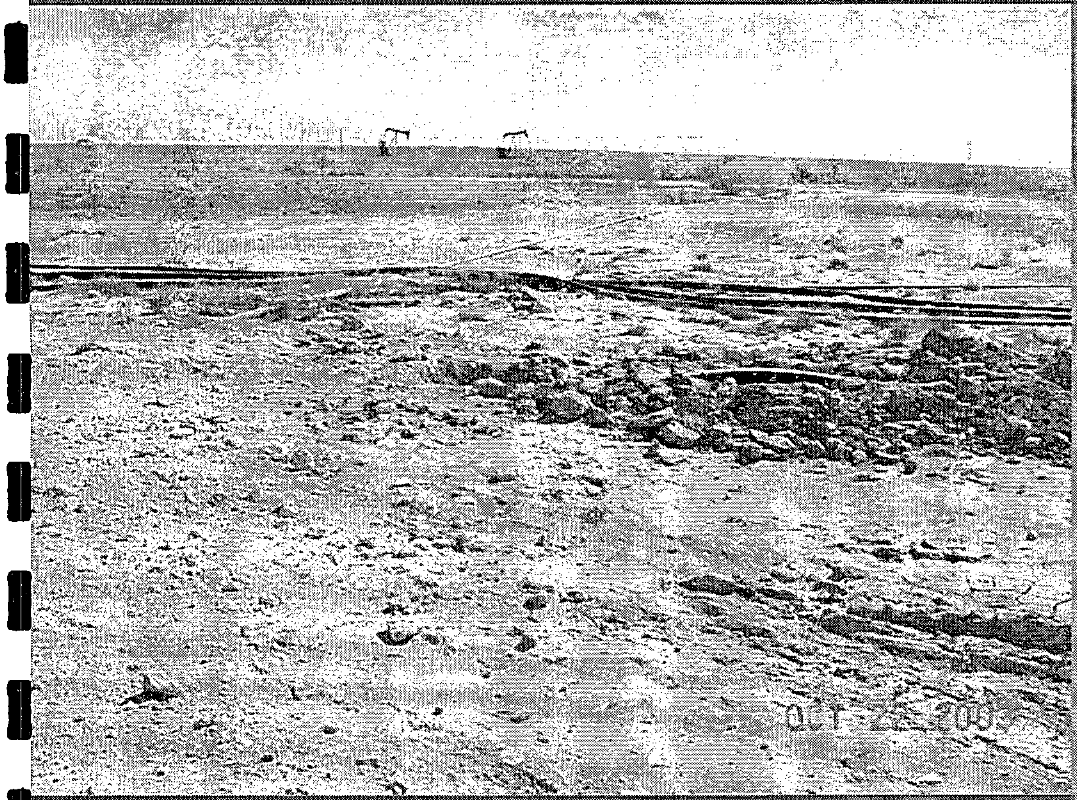
Randall T H

Randall Hicks
Principal

Copy: Rice Operating Company

June 7, 2004

Corrective Action Plan



Abo 1G Release Site

R.T. HICKS CONSULTANTS, LTD.

901 RIO GRANDE BLVD. NW, SUITE F-142, ALBUQUERQUE, NM

June 7, 2004

Abo 1G Release Site Report

Prepared for:

Rice Operating Company
122 West Taylor
Hobbs, NM 88240

R.T. HICKS CONSULTANTS, LTD.
901 RIO GRANDE BLVD. NW, SUITE F-142, ALBUQUERQUE, NM 87104

1.0 BACKGROUND

The Abo 1G Discharge Site is located about 6 miles southeast of the center of Lovington, New Mexico. Plate 1 shows the location of the site relative to Route 18, the Hobbs-Lovington Highway.

On October 18, 2003, Rice Operating Company (ROC) prepared a Release Notification report that estimated the pipeline failure released 190 barrels of produced water and recovered 130 barrels. The pipeline failure released produced water with little or no hydrocarbons. Plate 2 shows the geometry of this release, which affected about 31,000 square feet of rangeland. Plate 2 also shows the locations of soil borings used to characterize the release. ROC is also aware that a 10 barrel release near this same location on occurred on June 3, 2003 and this earlier release impacted a 2,400 square foot area near SB-1.

Figure 1 is a photograph of the site in October, 2003 looking south from a caliche road. The line in the foreground ruptured and produced water flowed south.

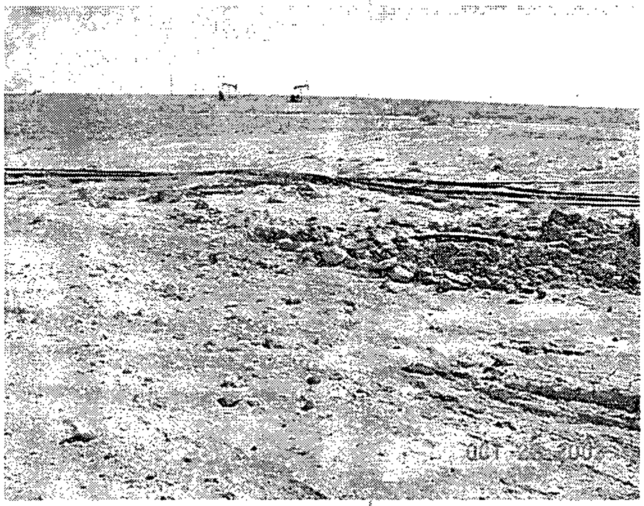


Figure 1. Abo 1G site looking south.

ROC mobilized to the site on November 10, 2003 and drilled three borings as shown on Plate 2. The field procedures employed by ROC were consistent with industry practice and with previously-submitted ROC characterization plans (e.g. junction box plan). Hicks Consultants used the data collected by ROC and obtained additional data from public sources as input to the HYDRUS-1D vadose zone fate and transport model. Hicks Consultants employed the results of the modeling to predict the potential impact to ground water quality as a result of the release and to develop a remedy to protect ground water quality and to restore the ground surface.

2.0 RESULTS OF FIELD PROGRAMS AND INVESTIGATIONS

CHARACTERISTICS OF VADOSE ZONE AND SATURATED ZONE

Next to the pipeline rupture, SB - 01 was drilled to a depth of 45 feet. From field inspection, the site has several inches of sandy soil covering a high-fractured caliche horizon. We examined borehole samples and the on-site cuttings log from SB-01 and concluded that the subsurface is composed of 24 feet of thin caliche layers within sands and silts. Interbedded with these caliche-rich sands and silts are silty clays. Below this uppermost 24 feet is 20 feet of sand and silt. The logs for each of these three ROC borings are included in Appendix A.

In well L-1716 , about 1 mile west of the release site, the driller's log reports "water sand" from 45 feet to 70 feet underlain by 7 feet of "calcium sand" before penetrating water bearing units. At well L-5014, approximately 5 miles north of the site, the driller log identifies caliche from 2 to 28 feet below surface. Below this upper strata is sand and sandy clay to a depth of 190 feet. From 190 to 205 feet below surface, the driller reports a clay zone. This 15 feet of clay is underlain by 10 feet of clay and gravel. The driller penetrated the Dockum Group red beds at 215 feet below grade. Monitoring wells in the Lea Refinery, one mile to the northeast, driller's logs report a 4 foot caliche bed overlying more than 100 feet of very fine to fine grained sands. At the Lea Refinery, April, 1996 water levels are 90 feet below grade (H+GCL, 1996). These well logs are also included in Appendix A.

We conclude that the vadose zone is about 90 feet thick and is composed of a caliche-rich upper horizon underlain by sand with minor amounts of silt. The saturated Ogallala Aquifer, which underlies the location, is dominantly sand. The saturated thickness of the aquifer is about 130 feet. The screened interval of wells in the area range from 20 feet to more than 100 feet.

According to the USGS (http://water.usgs.gov/GIS/metadata/usgswrd/ofr98-548.html#Identification_Information), the hydraulic conductivity of the High Plains Aquifer ranges from less than 25 feet/day to greater than 300 feet per day with an average hydraulic conductivity of 60 feet/day. At this location, where saturated gravel units are restricted to the base of the Ogallala, we estimate the hydraulic conductivity is about 50 feet per day. Geologists who drilled monitoring wells at the Lea Refinery estimated the saturated hydraulic conductivity as ranging from 25-75 feet per day. At the Lea Refinery, the hydraulic gradient is 0.004 feet/foot to the southeast. The resultant ground water flux is probably about 0.2 feet per day.

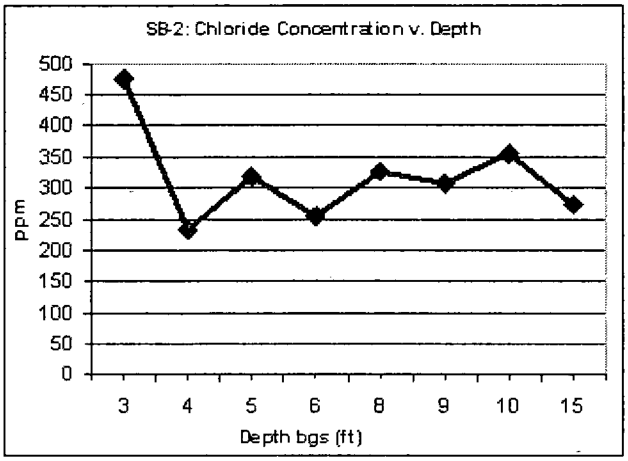


Figure 2. Chloride vs. depth in soil boring 2.

We have no site specific or regional data on the moisture content of the vadose zone. Such data are generally rare. As described in a later section of this report, we used HYDRUS-1D to simulate an initial water content of the unsaturated zone.

CHLORIDE DISTRIBUTION IN THE VADOSE ZONE

Soil boring SB-2 is uphill from the spill site and we consider this a "background" location. At this soil boring, the chloride near the ground surface is 475 ppm. From 4 feet below grade to the total depth of 15 feet, chloride in this caliche-rich horizon ranges between 230 and 356 ppm (Figure 2). Other workers suggest that "background" chloride concentration in Lea County soil can be less than 100 ppm. At this site, where the caliche dominates the upper vadose zone, the background is about 300 ppm.

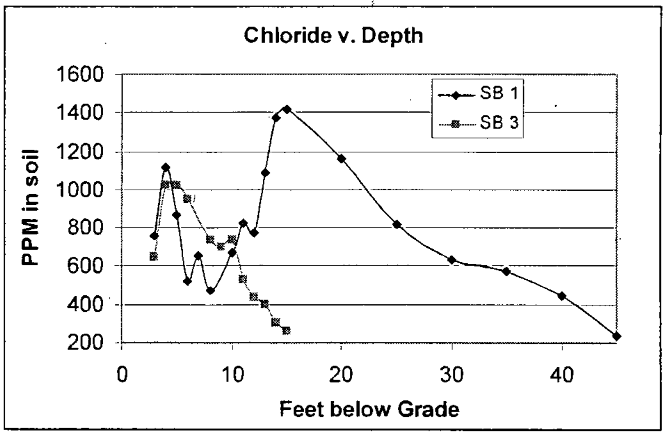


Figure 3. Chloride vs. Depth in soil borings 1 and 3.

The soil borings within the area of the release (#1 and #3) show a decline in chloride concentrations from more than 1000 ppm chloride to background levels at 45 feet and 9 feet below land surface respectively (Figure 3). Because the water table lies about 90 feet below land surface, this observed decrease of chloride concentrations to background suggests that the release did not create saturated conditions between ground surface and ground water.

The pattern for SB-1 shown in Figure 3, which was closest to the pipeline rupture, confirms that the October 2003 release is not the first release at or near this site. An earlier release appears as chloride concentrations above 1000 ppm between 12 and 20 feet below grade and the October release appears as the high chloride between 3 and 6 feet depth. We do not believe that the chloride concentrations between 12 and 20 feet in SB-1 were caused by the 10-barrel release of June 2003.

The data from SB-3 suggests the influence of only the October 2003 release. Data from SB-1 and SB-3 demonstrate that the center of mass from the recent release is at a depth of 4-5 feet below land surface.

Regardless of the source of chloride observed at 12-20 feet below grade in SB-1, we can conclude that these soil boring data show no evidence of imminent ground water impairment. The chloride from the releases remains within the vadose zone. Using these data, and the chloride concentration in the produced water, we can estimate the volume of produced water released at this site.

RELEASE CHARACTERISTICS

ROC provided an analysis of the chloride in the produced water - 19,994 ppm. Because the soil sampling program identified an older spill event at SB-1, we considered the calculated chloride load at SB-3 more representative of the October release. Calculations using the chloride load at SB-3 imply that the spill was 1 in. deep (see Appendix B for these calculations). If 1-inch was the average spill height for the 31,000 square feet of impact (see Plate 2), the total volume of the release would be 440 barrels. However, ROC located SB-3 where the released "pooled", therefore using the chloride load from this boring will probably overestimate the release volume. We suggest that the October event released between 200 and 500 barrels of produced water and 130 barrels were recovered.

Ground water at the Lea Refinery flows toward the southeast. We estimate that the length of the spill parallel to ground water flow is 477 feet.

EVALUATION OF CHLORIDE FLUX FROM THE VADOSE ZONE TO GROUND WATER

We employed the HYDRUS-1D and a simple ground water mixing model to evaluate the potential of residual chloride mass in the vadose zone to materially impair ground water quality at the site. Appendix C presents the background documentation for this modeling approach. We applied the results from the HYDRUS-1D modeling of the migration of chloride ions from the vadose zone to ground water in our selection of an appropriate remedy for the land surface and underlying vadose zone. This simulation is the "no action" alternative, which predicts chloride flux to ground water in the absence of any action by Rice Operating Company.

DATA FOR SIMULATION MODELING

The HYDRUS-1D and mixing model simulation requires input of 11 parameters. As Table 1 shows, site specific data are required for several of these parameters and other data are available from public sources. The source of most of the data is described in the previous section of this report.

Table 1. Input Parameters for Simulation Modeling

Input Parameter	Source
1. Vadose Zone Thickness - 77 feet	Appendix A well logs
2. Vadose Zone Texture - Plate 3	Samples and attached well logs
3. Dispersion Length - 1.85 meters	Professional judgment
4. Soil Moisture	HYDRUS-1D initial condition simulation
5. Chloride in release - 19,994 ppm	Samples of produced water
6. Height of spill on land surface -1.0 inches	Calculated from chloride load at sampling location SB-3 and chloride in released water
7. Length of release parallel to ground water flow - 477 ft	Field Measurements
8. Climate - Arid	Pearl Weather Station near Hobbs Airport
9. Background Chloride in Ground Water - 100 ppm	Professional judgment
10. Ground Water Flux - 6.1 cm/day	Calculated from published data and the Lea Refinery Report
11. Aquifer Thickness - 10 feet	NMOCD suggestion

The vadose zone profile used for the HYDRUS-1D modeling is composed from the well log and samples of SB-1 and information from the logs of wells in the area. For the purpose of this report, we will assume that the ground water is unconfined and is at a depth of 77 feet below land surface. Some driller's logs suggest this depth to water, however we believe that 90 feet is more accurate. The 13-foot difference is probably due to falling water levels in the Ogallala. To be conservative in our approach, we used 77 feet at the thickness of the vadose zone. Plate 3 shows the vadose zone profile (texture) employed in the modeling with the HYDRUS-1D input parameters.

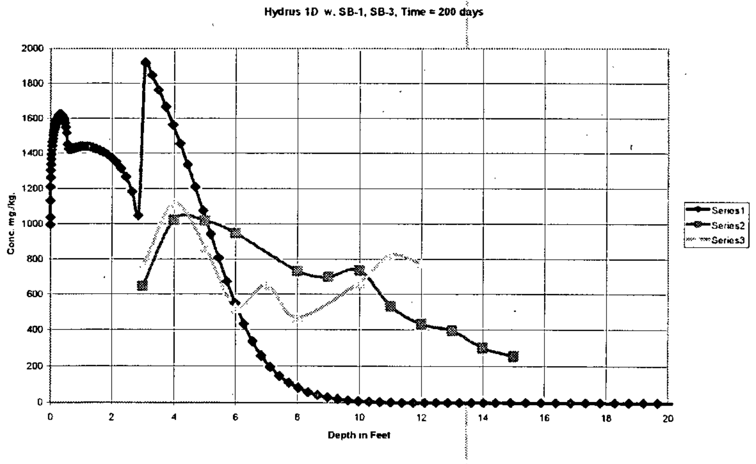
The dispersion length of 1.85 meters is less than 10% of the total length of the HYDRUS-1D model and is consistent with standard modeling protocol.

We installed the profile described above as the initial condition in HYDRUS-1D and ran it with the estimated spill installed as an atmospheric event on day 1 of the simulation. We ran the model for 2 years to create a chloride profile v. depth that we use to "calibrate" the model. Comparison of the solute concentrations computed by HYDRUS-1D with the field measured solute concentrations caused us to simplify the soil profile by using higher hydraulic conductivity in the upper soil profile. The parameters used to model the caliche typically employ a very low saturated hydraulic conductivity. From field inspection, the surface caliche in the area is fractured and filled with fine sands. Because of the stratagraphic location near the ground surface, we believe the caliche at this site has a much higher saturated hydraulic conductivity than that typically used in the HYDRUS-1D model. During intense rainfall events (or produced water spills), water will flow quickly to the subsurface through the fractures via saturated flow. Therefore, we adjusted for this observation and modified the default caliche parameters to behave less like clay and more like sand. Deeper in the vadose zone, fractures become barriers to flow and deeply buried caliche behaves more like clay. From previous modeling experience, the properties of the upper soil profile are the most important in determining flow in the vadose zone. Therefore, adjusting the hydraulic input data for the uppermost vadose zone is relatively important.

The parameters of the lower caliche were also altered to allow the higher hydraulic conductivity. In addition, two intermediate layers were merged using the parameters of the coarser layer. These changes err in favor of ground water protection; they will cause the model to overestimate the flux of chloride from the vadose zone into ground water. After making these adjustments, one can observe the relationship between predicted chloride concentration in soil and actual measurements in Figures 4 and 5.

What are important in the examination of these figures are the distribution of the predicted chloride mass in the vadose zone and

Figure 4. Predicted chloride concentrations in soil at 200 days.



the measured distribution of vadose zone chloride. The simulation of the chloride distribution at 200 days after the release (Figure 4) shows a peak chloride concentration at about 3 feet deep and background concentrations (zero ppm in the model) at 10 feet below grade. The simulation at time=730 days provides a better fit between the predicted chloride concentrations and the measured values. The reason for this "time shift" is due how the model uses the meteorological data from Pearl, New Mexico. The meteorological data consists of 47 years of daily data. Day 1 is NOT the day that the October 2003 release occurred, however. Day 1 of the file is about 50 years ago. The measured values will only correlate exactly with the predicted values if rainfall, wind speed and other atmospheric events between the time of the release and the time of the sampling event were exactly the same as the atmospheric file in the model. We maintain that the "match" between the predicted chloride concentrations and the measured concentrations presented in Figure 5 provide adequate verification of our input parameters for the vadose zone texture.

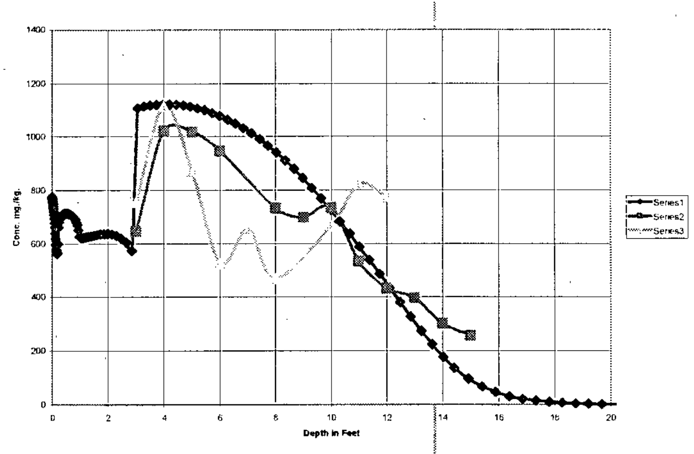


Figure 5. Predicted Chloride concentrations in soil at 730 days.

For the mixing model, the largest dimension of the spill (477 feet) was used for the length of spill parallel to groundwater flow. Climate data from the Pearl Weather Station near the Hobbs, New Mexico airport, approximately 15 miles south of the site, was used. Ground water flux at the Lea refinery is estimated at .4 feet/day to 1.2 feet/ day. (Lea refinery Report) Well logs in Appendix A indicate that 10 feet is a very conservative estimate for the aquifer thickness in that most wells exhibit well screens in excess of 20 feet.

We then ran the HYRDUS-1D model to predict chloride movement through the vadose zone for 71 years. From the output, we found that the center of chloride mass enters the ground water zone between 15 years and 50 years from present.

This flux was then fed into the aquifer mixing model with the resulting output shown in Figure 6. The predicted peak concentration is less than 200 ppm.

In examining Figure 6, it is important to understand that the model assumes that rainfall is distilled water (0 ppm chloride) and that the initial vadose zone water also contains 0 ppm chloride. Attempting to use chloride concentrations other than zero for precipitation and initial soil moisture creates too much complexity in the model. This simplification causes a minor under estimate of the chloride flux to ground water, as described below.

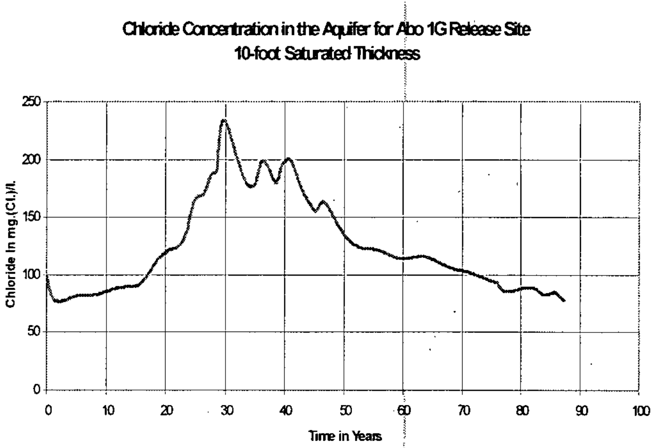


Figure 6. Ground water chloride concentrations in imaginary monitoring well.

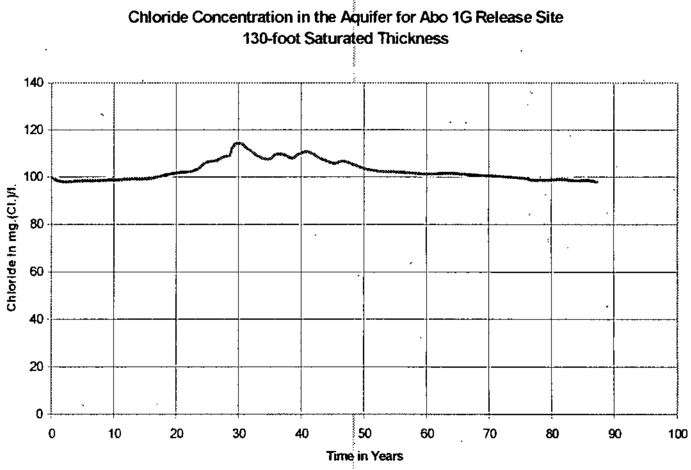
In our model, natural precipitation (0 ppm chloride) moves the released chloride through the vadose zone and dilutes the chloride mass (from above) during transport, just as real rainfall dilutes the real spill. Minor dilution of released chloride also occurs as it moves downward and mixes with 0 ppm pore water. Dilution of the release by pore water also occurs in nature. Thus from time zero to slightly more than 3 years, a flux of 0 ppm chloride enters the aquifer from the vadose zone, diluting the 100 ppm chloride ground water to 75 ppm. This decrease in chloride concentration in the mixing model is due to the relatively high flux through the bottom of the sandy soil vadose zone. After 3 years, the chloride mass from the release begins entering ground water raising chloride concentration. The maximum chloride concentration in a 10-foot thick aquifer beneath the site would occur about 30 years after present and would be less than 200 ppm chloride.

We can confidently conclude that the release(s) that created the chloride load observed in SB-1 will cause minimal impairment of ground water quality at an imaginary well located immediately adjacent to the release. Our predictions show that a well with 20 feet of screened interval located immediately next to the release would observe chloride concentrations less than 150 ppm.

POTENTIAL IMPACT ON CITY OF LOVINGTON WATER SUPPLY WELLS

The water supply wells for the City of Lovington are more than 2000 feet from the release site. These wells do not draw water from only the uppermost 20 feet of the Ogallala Aquifer, but from most or the entire 130-foot thick saturated zone. Let us assume that in the future the City of Lovington or another water user were to install a water supply well at the edge of the release site. The maximum predicted chloride concentration in this fully-penetrating, fully-screened well (130 feet of screen within the 130-foot saturated zone) is 109 ppm or 9 ppm above the assumed 100 ppm background concentration (see Figure 7).

Figure 7. Chloride concentration in imaginary monitoring well with 130 foot saturated thickness

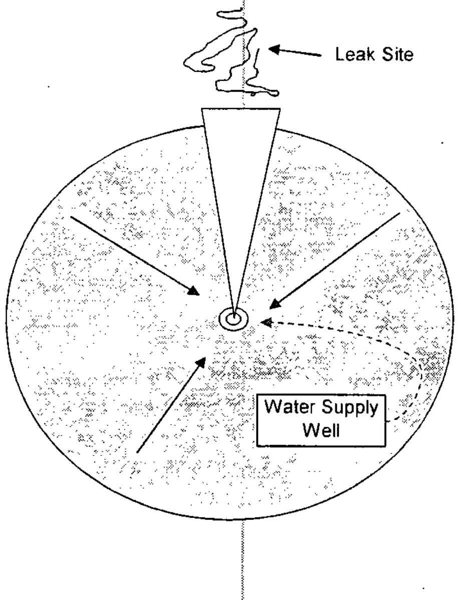


If we wish to predict the potential impact to an existing City of Lovington water supply well that lies 2000 feet from the release site, we must calculate the dilution that will occur as background water is drawn to the well.

For example, let us assume that a City of Lovington supply well creates a cone of depression with a 2000-foot radius and a circumference of 12,560 feet (Figure 8). If we assume this large cone of depression, all of the chloride from the release will eventually be drawn into the well. In our modeling, we assumed that the maximum length of the release parallel to ground water flow was 477 feet. Referring to Plate 2, the maximum width of the release (perpendicular to ground water flow) is 375 feet. Therefore, the supply well will draw in water from the release site (375 feet of the circumference) and background quality water (12,560 feet of the circumference). The water from the site contributes only 3% of the total volume of water pumped by the well. In a simple dilution calculation where 3% of the water drawn into the well will exhibit a chloride concentration of 109 ppm and 97% of the water drawn into the well is background water quality (100 ppm), the resultant concentration in the supply well is 100.27 ppm. In other words, one will not be able to measure the effect of this release on the Lovington water supply wells. Figure 8 shows this hypothetical situation.

We conclude that the chloride from this release site will have no impact on the City of Lovington water supply wells.

Figure 8. Hypothetical situation showing a Lovington water supply well drawing in: i. release ground water containing chloride molecules (represented by the triangular area) and ii. background water.



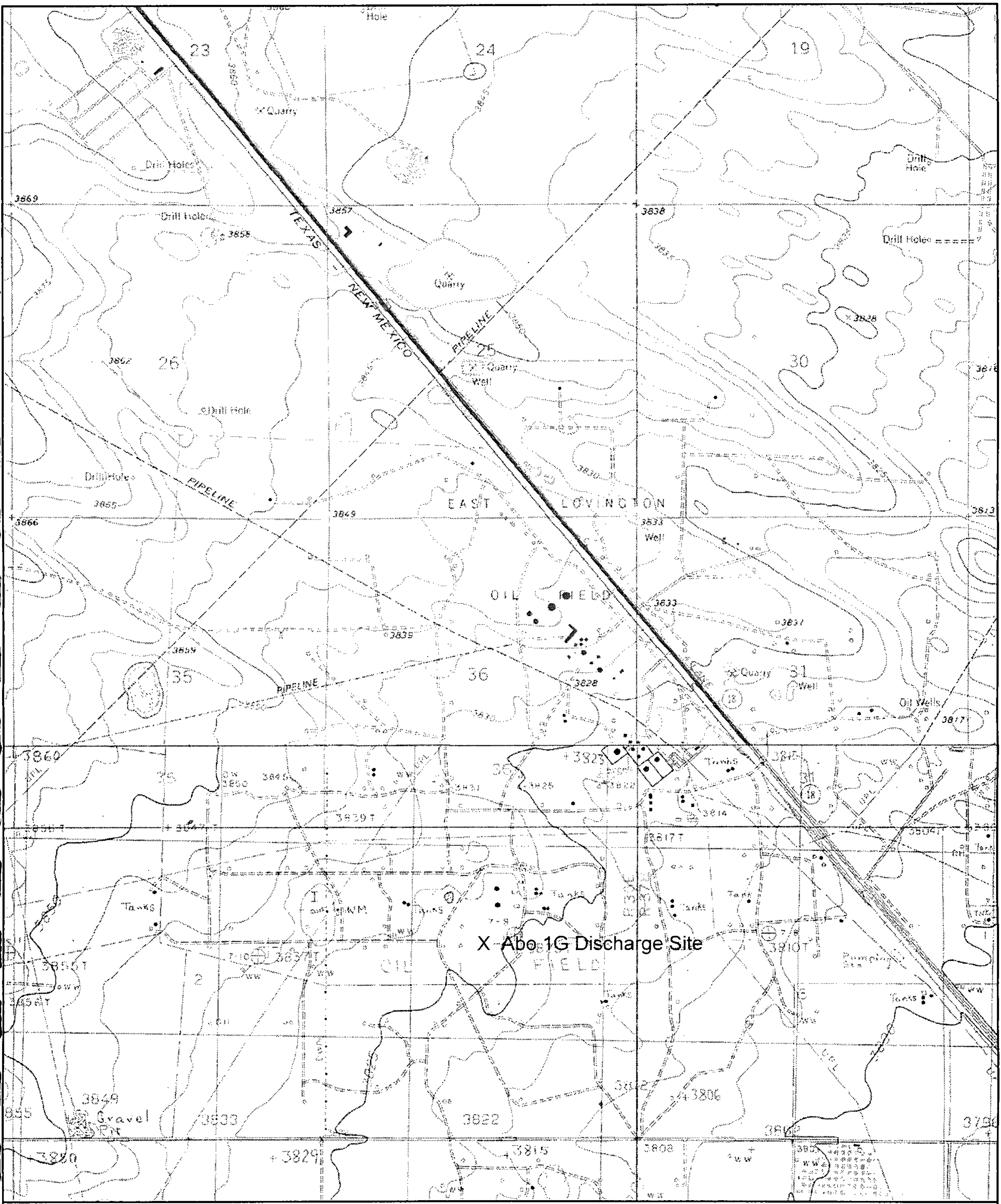
PROPOSED REMEDY

We conclude that the release poses no material threat to ground water quality. Simulations using input parameters that should over-estimate the chloride concentration in ground water show that the release will not cause WQCC Standards to be exceeded at a place of reasonable foreseeable future use.

We recommend closure of the regulatory file.

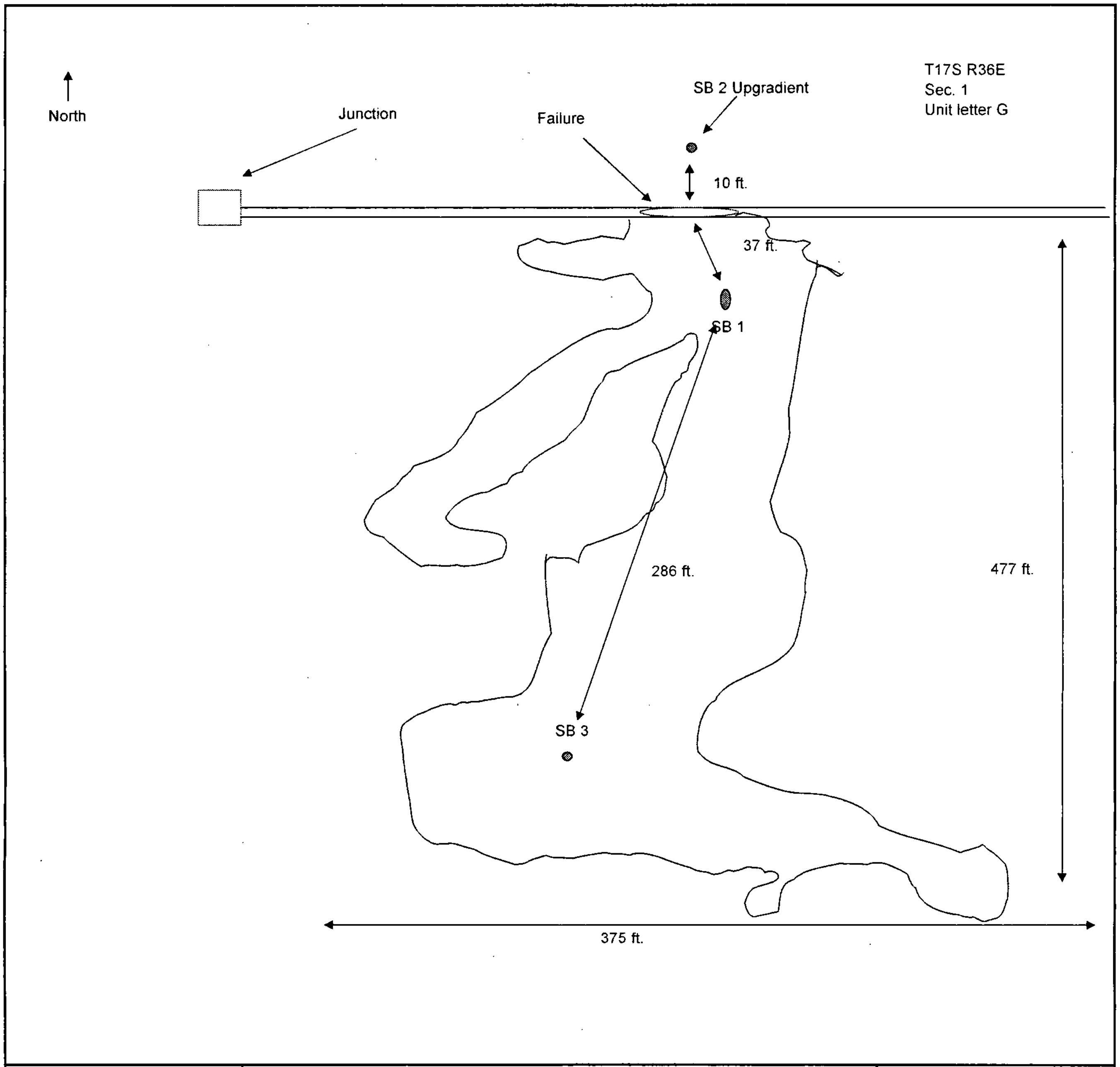
We propose annual inspection of the site and re-seeding when vegetation begins to invade the spill site. Our site visit in April, 2004 showed that the recent heavy rains of the area have permitted some natural re-vegetation of the site.

PLATES



Name: LOVINGTON
Date: 12/18/2003
Scale: 1 inch equals 2000 feet

Location: 032° 52' 53.8" N 103° 18' 23.0" W
Caption: Plate 1: Location Map



R.T. Hicks Consultants 901 Rio Grande NW Albuquerque, NM	**Rice Operating Company**	**Plate 2**
	Abo Release Site Sketch Map	**May-04**

Depth		Lithologic Description	Van Genuchten's parameters as used in adjusted profile	Soil description by USDA soil triangle
0 ft.				
3ft.		0-3ft Top Soil	th_r - .065, th_s -.41, alpha - .075, n - 1.89, Ks - 106.1	sandy loam
		3 -16 ft Clay - very fine sand, caliche	th_r - .078, th_s -.43, alpha - .038, n - 1.58, Ks - 35	fractured caliche, values modified from Jan Hendrick
16 feet		16 - 19 ft.silt - clay, min. caliche	th_r - .089, th_s -.43, alpha - .01, n - 1.23, Ks - 1.68	silty clay loam
19 ft		19 - 22 ft. clay - silt, min. caliche		
22 ft.		22 - 28 ft Silt - v.f. sand ,some caliche	th_r - .078, th_s -.43, alpha - .038, n - 1.58, Ks - 35	fractured caliche, values modified from Jan Hendrick
28 ft.		28 - 32 ft. silt - very fine sand, caliche		
32 ft.		32 - 45 ft., silt - very fine sand, some clay	th_r - .095, th_s -.41, alpha - .019, n - 1.31, Ks - 6.24	clay loam
45 ft.		45 - 70 ft. vf sand	th_r - .067, th_s -.45, alpha - .02, n - 1.41, Ks - 10.8	silt loam
70 ft.		70 - 77 ft. limey sand	th_r - .095, th_s -.41, alpha - .019, n - 1.31, Ks - 6.24	clay loam
77 ft. and water, to				

R.T. Hicks Consultants, Ltd.
901 Rio Grande, Suite F-142
Albuquerque, NM

RICE *Operating Company*

Lovington Abo Release Site

Lovinton Abo Soil Profile at SB-1

Apr-04

APPENDIX A

Form WR-23

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

# 5	in 730	-20-	13
DPN	25-	11350	

(Plat of 640 acres)

(A) Owner of well Jack Gaytan
Street and Number Box 1021
City Lovington State New Mexico
Well was drilled under Permit No. L-~~2480~~-1716 and is located in the NW ¼ NW ¼ NE ¼ of Section 2 Twp. 17 S Rge. 36 E
(B) Drilling Contractor Gayton & Porter License No. WD-163
Street and Number Box 1021
City Lovington State New Mexico
Drilling was commenced Sept. 1 1955
Drilling was completed Sept. 2 1955

Elevation at top of casing in feet above sea level .... Total depth of well 145
State whether well is shallow or artesian Shallow Depth to water upon completion 50

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation
	From	To		
1	77	92	15	Water Sand
2				
3				
4				
5				

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth		Feet	Type Shoe	Perforations	
			Top	Bottom			From	To

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet		Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
From	To				

Section 5 PLUGGING RECORD

Name of Plugging Contractor .... License No. ....
Street and Number .... City .... State ....
Tons of Clay used .... Tons of Roughage used .... Type of roughage ....
Plugging method used .... Date Plugged .... 19....
Plugging approved by:

....
Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug		No. of Sacks Used
	From	To	

FOR USE OF STATE ENGINEER ONLY

Date Received [illegible] 13 1955

OFFICE
[illegible]

File No. L-~~2480~~ 1716 Use Irrig Location No. 12362

Section 6

LOG OF WELL

Depth in Feet		Thickness in Feet	Color	Type of Material Encountered
From	To			
0	1	1		Soil
1	7	6		Rock
7	16	9		Caliche
16	20	4		Boulder
20	26	6		Sand Rock
26	45	19		Sand
45	70	25		Water Sand
70	77	7		Calcium Sand
77	92	15		Quick Sand
92	106	14		Sandy Clay
106	108	2		Sand
108	112	4		Rock
112	134	22		Sandy Clay
134	143	9		Sand
143	145	2		Sandy Clay

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Jack Cayton
Well Driller

LOG FILED

(This form to be executed in triplicate)

WELL RECORD

Renumbered L-4058
Feb 2
1959

Date of Receipt .... Permit No. L-455A

Name of permittee, Lovington Municipal Utilities

Street or P.O., ..., City and State Lovington, New Mexico

1. Well location and description: The shallow (shallow or artesian) well is located in .... ¼, NE ¼,

Lot 9 ¼ of Section 4, Township 16, Range 36; Elevation of top of casing above sea level, 3979 feet; diameter of hole, 16 inches; total depth, 127 feet; depth to water upon completion, 58 feet; drilling was commenced June 2, 1952, and completed June 4, 1952; name of drilling contractor Aqua Drilling Co. Box 1004; Address, Lovington, N.M.; Driller's License No. WD 35

2. Principal Water-bearing Strata:

	Depth in Feet			
	From	To	Thickness	Description of Water-bearing Formation
No. 1	58	59	1	Water Sand
No. 2	69	71	2	Water Sand
No. 3	82	86	4	Quick Sand & Water
No. 4	112	116	4	Water Sand & Shale
No. 5				

3. Casing Record:

Diameter in inches	Pounds per ft.	Threads per inch	Depth of Casing or Liner Top	Bottom	Feet of Casing	Type of Shoe	Perforations From	To

RECEIVED
OCT 27 1952
STATE ENGINEER

4. If above construction replaces old well to be abandoned, give location: .... ¼, ... ¼, ... ¼ of Section ...., Township ...., Range ....; name and address of plugging contractor, ...

date of plugging .... 19...., describe how well was plugged: ....

FILED
OCT [illegible] 1952
OFFICE
ARTESIAN WELL SUPERVISOR
ROSWELL, NEW MEXICO

FILED
APR [illegible] 1959
OFFICE
[illegible]
ROSWELL, NEW MEXICO

6. Log of Well:

Depth in feet		Thickness in feet	Description of Formation
From	To		
0	2	2	Soil
2	26	24	Caliche & Lime Shale
26	58	32	Sandy Shale
58	59	1	Water Sand
59	69	10	Sand & Shale
69	71	2	Water Sand & Shale
71	82	11	Sand Shale with Streaks of Clay
82	86	4	Quick Sand & Water
86	112	26	Sand & Shale
112	116	4	Tight Water Sand & Clay Shale
116	127	11	Sandy Shale

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Licensed Well Driller

Instructions

This form shall be executed, preferably typewritten, in triplicate and filed with the State Engineer's Office at Roswell, New Mexico, within 10 days after drilling has been completed. Data on water-bearing strata and on all formations encountered should be as complete and accurate as possible.

(This form to be executed in triplicate)

WELL RECORD

Date of Receipt .... Permit No. L-265

Name of permittee, Ernest Mahan

Street or P.O., Box 32, City and State Lovington, N. M.

1. Well location and description: The shallow (shallow or artesian) well is located in NW ¼, NW ¼, SW ¼ of Section 11, Township 16 S, Range 36 E; Elevation of top of casing above sea level, ... feet; diameter of hole, 16 inches; total depth, 120 feet; depth to water upon completion, 45 feet; drilling was commenced Jan. 8, 19 48, and completed Jan. 9, 1948; name of drilling contractor Abbott Bros. ....; Address, Box 637, Hobbs, N. M.; Driller's License No. WD-46

2. Principal Water-bearing Strata:

	Depth in Feet			
	From	To	Thickness	Description of Water-bearing Formation
No. 1	45	120	75	Water sand
No. 2				
No. 3				
No. 4				
No. 5				

3. Casing Record:

Diameter in inches	Pounds per ft.	Threads per inch	Depth of Casing or Liner		Feet of Casing	Type of Shoe	Perforations	
			Top	Bottom			From	To
NONE								

4. If above construction replaces old well to be abandoned, give location: .... ¼, ... ¼, ... ¼ of Section ...., Township ...., Range ....; name and address of plugging contractor, ...

date of plugging ...., 19....; describe how well was plugged: ....

FILED
JAN 11 1952
OFFICE
ARTESIAN WELL SUPERVISOR
ROSWELL, NEW MEXICO

5. Log of Well:

Depth in feet		Thickness in feet	Description of Formation
From	To		
0	4	4	Soil
4	35	31	Caliche
35	45	10	Hard shell
45	120	75	Water sand

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Licensed Well Driller

Instructions

This form shall be executed, preferably typewritten, in triplicate and filed with the State Engineer's Office at Roswell, New Mexico, within 10 days after drilling has been completed. Data on water-bearing strata and on all formations encountered should be as complete and accurate as possible.

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Hulda Heidel Owner's Well No. ______
Street or Post Office Address 1018 West Avenue K
City and State Lovington, New Nexico 88260

Well was drilled under Permit No. L-135 enlarged L-135S and is located in the:

[illegible] a. [illegible] ¼ [illegible] ¼ [illegible] ¼ NW ¼ of Section 11 Township 16S Range 36E N.M.P.M.

b. Tract No. ______ of Map No. ______ of the ______

c. Lot No. ______ of Block No. ______ of the ______
Subdivision, recorded in Lea County.

d. X= ______ feet, Y= ______ feet, N.M. Coordinate System ______ Zone in the ______ Grant.

(B) Drilling Contractor Abbott Bros. License No. WD-46

Address P.O. Box 637, Hobbs, New Mexico 88240

Drilling Began 3/17/77 Completed 3/22/77 Type tools Cable Size of hole 16 in.

Elevation of land surface or ______ at well is ______ ft. Total depth of well 146 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 58 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
58	146	88	Sand	

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
12 3/4"	43	Welded	0	146	146	None	66	146

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 5. PLUGGING RECORD

Plugging Contractor ______
Address ______
Plugging Method ______
Date Well Plugged ______
Plugging approved by:

______
State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received June 14, 1977

Quad ______ FWL ______ FSL ______
Supplemental

File No. L-135 & L-135-Enlgd-S Use Irr Location No. 16.36.11. [illegible]

Section 6. LOG OF HOLE

Depth in Feet		Thickness in Feet	Color and Type of Material Encountered
From	To		
0	2	2	Surface soil
2	26	24	Caliche
26	58	32	Sand-tight
58	112	54	Sand-water
112	128	16	Sand-tight
128	146	18	Sand-water

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Murrell Abbott
Driller H.B

Form WR-23

FIELD ENGR. LOG

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

(Plat of 640 acres)

(A) Owner of well J.W. Taylor Jr.
Street and Number P.O.
City Hope State New Mex.
Well was drilled under Permit No. Comer Lungens Enlgd. L-135 and is located in the N.W. ¼ S.W. ¼ N.W. ¼ of Section 11 Twp. 16So Rge. 36 E.

(B) Drilling Contractor C.O. Aldredge License No. W.D. 79
Street and Number Box ~~52~~ 379
City Lovington State New Mex.
Drilling was commenced Mar. 14 1964
Drilling was completed Mar. 16 1964

Elevation at top of casing in feet above sea level Total depth of well 110 Ft
State whether well is shallow or artesian Shallow Depth to water upon completion 75

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation
	From	To		
1	95	110	15	Small crystlized sand rock & quick sand
2				
3				
4				
5				

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth		Feet	Type Shoe	Perforations	
			Top	Bottom			From	To
			Not cased					

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet		Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
From	To				
		16			2 sacks of drilling mud used to
					hold quick sand back
					while cleaning out well

Section 5 PLUGGING RECORD

Name of Plugging Contractor License No.
Street and Number City State
Tons of Clay used Tons of Roughage used Type of roughage
Plugging method used Date Plugged 19
Plugging approved by:

Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug		No. of Sacks Used
	From	To	

FOR USE OF STATE ENGINEER ONLY

Date Received STATE ENGINEER OFFICE ROSWELL N. MEX. DISTRICT II 1964 MAY 19 AM 8:21 ✓

File No. L-135-Enlgd. Use Irr Location No. 16.36.11.131

Section 6

LOG OF WELL

Depth in Feet		Thickness in Feet	Color	Type of Material Encountered
From	To			
95	IIO	15	red	small crystallized sand rock

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

C. O. Aldredge
Well Driller

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well City of Lovington Owner's Well No. L-9517
Street or Post Office Address P.O. Box 1268
City and State Lovington, N.M. 88260

Well was drilled under Permit No. L 9517 and is located in the:

a. SESE ¼ NE ¼ ~~SE~~SW ¼ SW ¼ of Section 3 Township 16S Range 36E. N.M.P.M.

b. Tract No. ____ of Map No. ____ of the ____

c. Lot No. ____ of Block No. ____ of the ____
Subdivision, recorded in ____ County.

d. X= ____ feet, Y= ____ feet, N.M. Coordinate System ____ Zone in the ____ Grant.

(B) Drilling Contractor Gene Eades License No. WD982

Address Rt. 4 Tahoka, Tx. 79373

Drilling Began 11-27-84 Completed 11-27-84 Type tools Rotary Size of hole 8 in.

Elevation of land surface or ____ at well is ____ ft. Total depth of well 138 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 66 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
66	138	72	Brown water sand w/ sandstone stringers	30

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
5 3/4	160 psi,				134		118	138
5 3/4	Sch. 40 steel for pitless adapter				4			

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 5. PLUGGING RECORD

Plugging Contractor ____
Address ____
Plugging Method ____
Date Well Plugged ____
Plugging approved by:

____
State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received December 10, 1984

Quad ____ FWL ____ FSL ____

File No. L-9517 Use Drinking/Sanitary [illegible] No. 16.36.3.33244

Section 6. LOG OF HOLE

Depth in Feet		Thickness in Feet	Color and Type of Material Encountered
From	To		
0	3	3	Top soil
3	15	12	Caliche
15	21	6	Sandy clay
21	40	19	Sandy clay & sandstone
40	65	25	Sand & sandstone
65	66	1	Hard sandstone
66	138	72	Brown water sand

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller

Form WR-23

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

(Plat of 640 acres)

(A) Owner of well City of Lovington
Street and Number Box 1268
City Lovington State New Mexico
Well was drilled under Permit No. L - 5356 and is located in the
E ½ S ½ ¼ ¼ ¼ of Section 3 Twp. 16 S Rge. 36 E
(B) Drilling Contractor Grady Backus License No. W. D. 322
Street and Number Box 791
City Lovington State New Mexico
Drilling was commenced April 8 19 64
Drilling was completed April 12 19 64

Elevation at top of casing in feet above sea level Total depth of well 164 ft.
State whether well is shallow or artesian Shallow Depth to water upon completion 70 ft.

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation
	From	To		
1	70	84	14 ft.	Sand
2	112	128	16 ft.	Sand
3	138	146	8 ft.	Water Sand
4	153	158	5 ft.	Water Sand
5				

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth		Feet	Type Shoe	Perforations	
			Top	Bottom			From	To
12 in.	30		0	164	164 ft		132	164

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet		Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
From	To				

Section 5 PLUGGING RECORD

Name of Plugging Contractor License No.
Street and Number City State
Tons of Clay used Tons of Roughage used Type of roughage
Plugging method used Date Plugged 19
Plugging approved by:

Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug		No. of Sacks Used
	From	To	

FOR USE OF STATE ENGINEER ONLY

Date Received

1964 APR 28 AM 8:37

File No. L - 5356 Use Expl Location No. 16.36.3.400

Section 6

LOG OF WELL

Depth in Feet		Thickness in Feet	Color	Type of Material Encountered
From	To			
0	1	1 ft.		Soil
1	4	3 ft.		Rock
4	18	14 ft.		Caliche
18	62	44 ft.		Sand
62	70	8 ft.		Sand Stone
70	84	14 ft.		Sand
84	98	14 ft.		Sand & Calcum
98	112	14 ft.		Sandy Clay
112	120	8 ft.		Sand
120	138	18 ft.		Sandy Clay
138	146	8 ft.		Water Sand
146	153	7 ft.		Sandy Clay
153	158	5 ft.		Sand
158	164	6 ft.		Sandy Clay

The undersigned hereby certifies that; to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Well Driller

Form WR-23 Orig. in S.F.

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

(Plat of 640 acres)

(A) Owner of well City of Lovington

Street and Number

City Lovington State New Mexico

Well was drilled under Permit No. L-3901 and is located in the S W ¼ N W ¼ S E ¼ of Section 10 Twp. 16 S Rge. 36 E

(B) Drilling Contractor Clayton Drlg. Co. License No. WD-183

Street and Number Box 1021

City Lovington State New Mexico

Drilling was commenced June 25 1958

Drilling was completed June 28 1958

Elevation at top of casing in feet above sea level Total depth of well 104 ft.

State whether well is shallow or artesian Shallow Depth to water upon completion 66 ft.

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation
	From	To		
1	66	74	8	Water Sand
2	82	90	8	Quick Sand
3				
4				
5				

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth		Feet	Type Shoe	Perforations	
			Top	Bottom			From	To
7 in. O.D.	26	8	[illegible]	104	105	None	65	100

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet		Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
From	To				
20	104	8 in.	200 lbs.		Dry Mix

Section 5 PLUGGING RECORD

Name of Plugging Contractor License No.

Street and Number City State

Tons of Clay used Tons of Roughage used Type of roughage

Plugging method used Date Plugged 19

Plugging approved by:

Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug		No. of Sacks Used
	From	To	

FOR USE OF STATE ENGINEER ONLY

FILED

Date Received JUL 9 1958

File No. L-3901 Use Dom. Location No. 16.36.10.413

Section 6

LOG OF WELL

Depth in Feet		Thickness in Feet	Color	Type of Material Encountered
From	To			
0	2	2		Soil
2	20	18		Caliche
20	28	8		Boulder
28	66	38		Sand
66	74	8		Water Sand
74	82	8		Sandy Clay
82	90	8		Quick Sand
90	104	14		Sand

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

CATRON WATER WELL DRILLING COMPANY
Well Driller

Form WR-23

STATE ENGINEER OFFICE

WELL RECORD

FIELD ENGR LOG

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

City of Lovington
(A) Owner of well P.O. Box 1268
Street and Number Lovington New Mex.
City L- 5014 State
Well was drilled under Permit No. 10 1 and is located in the
¼ ¼ ¼ of Section Twp. Rge. 32E
(B) Drilling Contractor Box 791 License No.
Street and Number Lovington New Mex.
City Nov. 27, State 62
Drilling was commenced Dec. 9, 19 62
Drilling was completed 19
1900 216 Ft.

(Plat of 640 acres)

Elevation at top of casing in feet above sea level Shallow Total depth of well 66 Ft.
State whether well is shallow or artesian Depth to water upon completion

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation
	From	To		
	70	76	6	Sand
1	82	94	12	Quick Sand
2	112	116	4	Sand
3	132	137	5	Sand
4	164	168	4	Sand ?
5	176	190	12	Sand

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth		Feet	Type Shoe	Perforations	
			Top	Bottom			From	To
12	3/16 Wall						9	21

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet		Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
From	To				

Section 5 PLUGGING RECORD

Name of Plugging Contractor License No.
Street and Number City State
Tons of Clay used Tons of Roughage used Type of roughage
Plugging method used Date Plugged 19
Plugging approved by:

Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug		No. of Sacks Used
	From	To	

FOR USE OF STATE ENGINEER ONLY

ROSWELL, N. MEX.
DISTRICT II
STATE ENGINEER OFFICE

Date Received 1962 DEC 13 AM 8:11 ✓

File No. L-5014 Use Expl. Location No. 16.36.10.240.

Section 6

LOG OF WELL

Depth in Feet		Thickness in Feet	Color	Type of Material Encountered
From	To			
0	2	2		Soil
2	8	6		Clachie
8	12	4		Bolder
12	28	16		Clichie
28	70	42		Sandy Clay
70	76	6		Water Sand
76	82	6		Sandy Clay
82	94	12		Quick Sand
94	112	18		Sandy Clay
112	116	4		Sand
116	132	16		Sandy Clay
132	137	5		Sand
137	164	27		Sandy Clay
164	168	4		Sand
168	178	10		Sandy Clay
178	190	12		Sand
190	205	15		Clay
205	215	10		Clay & Gravel
215	216	1		Red Bed

L S Elev ____
Depth to K____Trc____
Elev of K____Trc____

Loc. No.____
Hydro. Survey   Field Check

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Grady Barker
Well Driller

SOURCE OF ALTITUDE GIVEN
Interpolated from Topo. Sheet____
Determined by Inst. Leveling____
Other____

L-5014   16.36.10.240

APPENDIX B

Depth	Lithologic Description	Measured Soil Chloride Concentration mg/kg	Bulk Density of Sample kg/m3	Thickness of Column (ft)	Calculated Chloride Mass in Column (kg/m2)
0 feet	0-1ft Top Soil				
10 feet	1-22 ft Caliche	525	1858	10	3.23
20 feet		1088	1858	11	7.37
30 feet	22-31 ft Sand & Caliche	1161	1858	5	3.57
		636	1858	4	1.57
40 feet	31-45 ft Sand	573	1858	7	2.47
		236	1858	7	1.02
		Calculated Chloride Load			19.22

R.T. Hicks Consultants **901 Rio Grande NW** **Albuquerque, NM**	**RICE** *Operating Company*	Soil Bore #1
	Calculation of Chloride Load, Abo Leak, Lea County, New Mexico	Apr-04

Calc. of hydrus cl Inputs, C_hyd = a * .003489 mmol/cm^3

CL in mg/kg	Cl in mmol/cm^3	Depth to bndy in ft.	Depth to bndy. in cm.
		1	30.5
525	0.183173	11	335.5
1088	0.379603	22	671
1161	0.405073	27	823.5
636	0.2219	31	945.5
573	0.19992	38	1159
236	0.08234	45	1372.5

Calc. Chloride load in kg./m^2	19.228		
Area of spill in ft^2	30000		
Totlal Cl in kg. (= Cl load * area)	53584.96		
Conc. of the spill mg.(Cl)/liter (from field test)	19994		
Volume of spill in liters (= Total Cl * 1000)/ Conc.)	2680.052		
volume of spill in ft.^3	94.63264	Vol. in barrels, assumes a barrel is 42 gal.	16.85587
height of spill in inches (= vol.of spill / area)	0.037853		
Area of spill in m^2	2786.819		

ABO leak

Unit G, Sec. 1, T17S, R36E

Calculation of Lovington Abo Spill Height, SB-1

Calc. Chloride load in kg./m^2	(From calc., see other sheet)	19.228
Area of spill in ft^2	(Field measurements, ROC)	30818
Area of spill in m^2		2866.84445
Totlal Cl in mg.	(= Cl load * area)	55123685085
Conc. of the spill mg.(Cl)/cm^3	(from field test)	247.04
Volume of spill in liters	(= (Total Cl * 1000)/ Conc.)	223136.6786
volume of spill in ft.^3		7878.956122
height of spill in inches	(= vol.of spill / area)	3.067930218
height of spill in cm.		7.783354922

Barrel size	42
theta_v assumed .15	
Vol. in barrels, assumes a barrel is 42 gal.	1403.392

Calculated Chloride load at SB-3

Soil Bore #3

Depth bgs (ft	$[Cl^-]$ ppm	Soil density Kg./m^3	Depth in ft.	Cl. in each layer in kg.
3	647	1858	3	1.194808711
4	1023	1858	1	0.629721438
5	1018	1858	1	0.626643621
6	947	1858	1	0.582938614
8	733	1858	2	0.902416059
9	700	1858	1	0.430894435
10	736	1858	1	0.45305472
11	533	1858	1	0.328095334
12	432	1858	1	0.265923423
13	396	1858	1	0.243763137
14	301	1858	1	0.185284607
15	256	1858	1	0.15758425
	Total CL. in kg./m^2 for SB-3			6.00112835

Calculation of Lovington Abo Spill Height, SB-3

Calc. Chloride load in kg./m^2	(From calc.)	6.00112835
Area of spill in ft^2	(Field measurements, ROC)	30818
Area of spill in m^2		2866.84445
Totlal Cl in mg.	(= Cl load * area)	17204301503
Conc. of the spill mg.(Cl)/cm^3	(from field test)	247.04
Volume of spill in liters	(= Total Cl / Conc.*1000)	69641.7645
volume of spill in ft.^3		2459.050705
height of spill in inches	(= vol.of spill / area)	0.957512118
height of spill in cm.		2.429213224

theta_v assumed .15	
Vol. in barrels, assumes a barrel is 42 gal.	438.0038

The SB-3 spill data was used in the HYDRUS-1D runs to calibrate the model to the soil. For the long time run with the adjusted soil, the chloride load at SB-1 was installed as the initial condition in the soil profile. This adds the chloride load from the earlier spill to the long time simulation.

APPENDIX C

1.0 FACTORS INFLUENCING THE MIGRATION OF CHLORIDE FROM A RELEASE

Chloride ion migration is controlled by a combination of factors related to the vadose zone, the aquifer and the characteristics of a release. Eleven factors control chloride ion migration. Here we discuss how these factors affect the movement of the chloride ion through the vadose zone and in the aquifer.

1. Vadose Zone Texture

The proportion of sand, silt, and clay in a soil or sediment defines vadose zone texture. Texture affects the flow of water and the transport of dissolved chloride. In the vadose zone, fine-grained layers containing silt and clay, which generally have relatively high moisture content, can often transmit water more quickly than drier coarse-grained units containing sand and gravel. A vadose zone composed of layers of fine-grained and coarse-grained units will often transmit water more slowly than a homogeneous, fine-grained profile. In the unsaturated zone, open fractures do not transmit water.

2. Water Content in the Vadose Zone

The soil moisture content is the volumetric fraction of water in a soil or sediment. Climate and soil texture influence soil moisture contents. Wetter, more humid environments result in higher moisture contents. Fine grained and heterogeneous soils retain water better than coarse-grained, more homogeneous soils. Therefore, the more heterogeneous and finer grained the material, the greater the water content.

The water content of a soil or sediment affects its ability to transmit fluids because the hydraulic conductivity increases with increasing water content. The hydraulic conductivity of a sandy soil with water content of 20% can be 1,000 times greater than the same soil in an arid climate where water content is only 5%. Although chloride ion from a release may migrate much faster in a wet soil profile, the natural water in the soil also dilutes the chloride concentration and provides some mitigation of its effects on ground water quality.

3. Dispersion Length of Chloride in the Vadose Zone

The dispersion length describes the amount of mixing a solute such as chloride will undergo in the vadose zone. Dispersion causes dilution of solute concentrations through mixing with ambient vadose water or ground water in a longitudinal direction parallel to water flow as well as in a transverse direction perpendicular to water flow. Systems with larger dispersion lengths produce greater mixing. Soil and aquifer heterogeneity tend to increase dispersion.

The dispersion length is very difficult to measure in the field. Researchers and field personnel rely upon professional judgement and published values (from laboratory or field experiments) to arrive at the dispersion length for a particular site. In general, researchers employ a dispersion length that is 7-10% of the total model length. When modeling a ten meter thick vadose zone, one may set the dispersion length at 10% of ten meters (100 cm).

4. Depth to Ground Water or Vadose Zone Thickness

The vadose zone is the region between the land surface and ground water table, and its thickness is defined by the depth to the ground water table. The vadose zone (also referred to as the unsaturated zone) includes the capillary fringe (pore space completely filled with water, under negative soil water pressure) and the overlying soil and sediment where the pore space is partially filled with water. Because ground water table depth rises and falls due to seasonal fluctuations in precipitation, ground water pumping withdrawals, and other factors, the thickness of the vadose zone is not constant. Like soil texture, the thickness of the vadose zone affects the time required for a release at the ground surface to reach the water table. The thicker the vadose zone, generally, the longer the travel time from ground surface to the water table. A relatively thick vadose zone also has more open pore space to temporarily store released fluid. A thick vadose zone can attenuate the effects of a chloride ion release more effectively than a thin vadose zone.

5. Climate

Precipitation and evaporation affect the water content of the vadose zone (before a release) and exert control over the migration of chloride after a release. In a humid climate regular and generous precipitation over the annual cycle can create relatively uniform infiltration patterns and a predictable soil water profile. In arid climates, where rainfall occurs in short-duration thunderstorms punctuated by long periods of drought, the infiltration is not uniform and occurs only immediately after large precipitation events. Arid climates exhibit vadose zones with relatively low water contents.

In humid climates with relatively uniform infiltration patterns, one could employ monthly climate data for simulation modeling. In arid climates, daily precipitation and evaporation data are necessary.

6. Chloride Concentration of Release

Chloride concentration in oil field brine water can be 100,000 ppm, or much lower if the producing formation contains fresh water due to infiltration of precipitation over geologic time. One of the easiest input parameters to measure in the oil and gas fields is the chloride concentration of the produced water. The chloride concentration in other types of released fluids can also be measured. The effect of chloride concentration in a released substance is straightforward: the higher the chloride concentration, the greater the environmental threat.

7. Release Volume and Chloride Mass

The volume of the release multiplied by the chloride concentration of the release yields the total mass of chloride released to the environment. The total mass released is a very important input parameter because it determines for a specific site the risk for ground water impairment. In the absence of reliable data on the volume of a release, the total mass of chloride can generally be estimated by a field investigation.

8. Height of Spill

Chloride ion releases occur in bermed areas when produced water storage tanks fail or within the natural terrain due to transmission line leaks and other transportation accidents. Releases may pond in a berm, pit, or natural depression, or can be dispersed over a large area. If the release is contained within a berm, the spill height is equal to or less than the height of the berm. In an open field, the spill height may vary. For a given site the amount of chloride ion infiltration into the soil is a function of the hydraulic head or ponding depth. As the ponding depth increases, so does the hydraulic head, (pressure, at the soil/chloride ion spill interface). Understanding the depth of ponding and the total amount of infiltration per unit area guides the characterization efforts. A large amount of infiltration may require deep drilling for site characterization while a small release may require sampling with a hand shovel.

9. Ground Water Flux

Ground water moves through an aquifer in response to its capacity for transmitting water, or, hydraulic conductivity (m/day), and the driving force caused by a sloping water table (hydraulic gradient). The hydraulic conductivity of aquifers can be measured in the field, and can be found in publications that often provide estimates of this parameter. The hydraulic gradient can be measured in the field by determining the depth to water at three wells of known surface elevation. Multiplication of the hydraulic conductivity by the hydraulic gradient yields the ground water flux, which is the volume of water flowing through a unit area of aquifer over a specified time period (expressed in $m^3/(m^2 * day) = m/day$). The lower the ground water flux, the higher the probability that a release will cause unacceptable ground water quality impairment.

10. Aquifer Thickness

A thick aquifer contains more water than a thin aquifer. A given amount of chloride that enters from the vadose zone in a thick aquifer will result in a lower chloride concentration than the same amount entering a thin aquifer since aquifers that contain more water can be more effective at diluting contaminates. A thick aquifer that exhibits a large ground water flux may be able to absorb chloride from a large surface release without any severe impact to water quality.

11. Aquifer Ambient Chloride Concentration

Ambient chloride concentrations of ground water will influence whether or not a release causes unacceptable ground water quality impairment. If ground water has a low chloride concentration, even a considerable release may not cause chloride concentrations to exceed the US EPA Secondary Standard of 250 ppm or preclude the use of the water for agricultural needs. A high chloride concentration in ground water increases the risk that a chloride ion release will render the groundwater unfit for use. Simple field measurements from nearby well water or published data can supply an accurate estimate of the ambient chloride concentration in an aquifer.

1.1 HETEROGENEITY

Heterogeneity, most often caused by the layering of different sediment or soil types within a vadose zone, is more common in nature than not. Heterogeneity affects the distribution of chloride and other solutes through its strong influence on dispersion and hydraulic permeability.

One of the most common simplifying assumptions employed by regulators and guidance manuals is the assumption of homogeneity. However, a clay lens one meter thick found 3 meters below a release in a sandy soil will have a profound effect on the migration of chloride through the vadose zone. Heterogeneity can increase the attenuation of a release and help mitigate the effects on ground water quality.

1.2 RELEASE VOLUME, SPILL HEIGHT, AND CHLORIDE CONCENTRATION OF THE RELEASE

We have found that knowledge of the volume of a release is less important than understanding (1) the chloride load per unit area and (2) the geometry of the release with respect to ground water flow. Because release volume is seldom known with accuracy, we have combined chloride concentration in the release and spill height into a single parameter: chloride load/ unit area. We then used the release volume and spill height to calculate the size of a circular release. As described below, we used the diameter of the release as the length of a release parallel to ground water flow. If an oblong release geometry is oriented parallel to ground water flow, more chloride will enter the aquifer along a specific flow line, yeilding a higher chloride concentration in the down gradient well. If the long axis of the oval release is perpendicular to ground water flow, the impact to a well will be less. By re-arranging and combining these factors, we reduced the total number of factors from 11 to 10.

2.0 MODELING APPROACH

The modeling of chloride ion migration from the soil surface through the vadose zone into a shallow aquifer towards a monitoring well would require a sophisticated three-dimensional model, which takes into account the full coupling between unsaturated flow in the vadose zone and saturated flow in the aquifer. Such an approach is outside the scope of this study since generally acceptable three-dimensional models capable of such simulations are still being developed. Moreover, the computer time necessary to conduct such simulations would have been prohibitive for regulators and oil field personnel.

We used an approach based upon the assumption that flow through the vadose zone is mainly downward. This assumption is reasonable for humid climates where precipitation exceeds evapotranspiration most of the year. It is also reasonable in arid climates when the ground water table is so deep that no upward flow due to capillary rise can be maintained. Under these conditions, it is possible to de-couple the modeling of water flow and chloride transport in the vadose zone from the modeling of water flow and chloride transport in the aquifer. We assume that flow in the vadose zone is one-dimensional downward and flow in the aquifer is one-dimensional horizontal. This assumption allows us to first simulate water flow and chloride transport through the vadose zone using the model HYDRUS-1D. The output from HYDRUS-1D is the downward water flow seeping out of the vadose zone and the downward chloride flux over time. These outputs are used as inputs into the model for the aquifer. In this study, we used two models for the aquifer: MODFLOW and a simple groundwater mixing model. MODFLOW is a standard code for modeling water flow and solute transport through aquifers (Domenico & Schwartz, 1998). Since it takes quite some time to setup a simulation in MODFLOW, we used a validated excel spreadsheet mixing model to generate results more cost effectively.

2.1 VADOSE ZONE MODEL: HYDRUS-1D

2.1.1 Model Overview

HYDRUS-1D (Simunek et. al, 1998) is used to simulate one-dimensional transport of water, heat, and solute movement in variably saturated porous media. The HYDRUS- 1D model was developed by the George E. Brown Jr., Salinity Laboratory, USDA, ARS, Riverside, California and is distributed by the International

Ground Water Modeling Center (IGWMC), Golden, Colorado. A Microsoft Windows™ based Graphics User Interface (GUI) supports HYDRUS-1D.

The HYDRUS-1D model numerically solves the Richards' equation for water flow and Fickian-based advection-dispersion equations for heat and solute transport. The HYDRUS-1D flow equation includes a sink term (a term used to specify water leaving the system) to account for transpiration by plants. The solute transport equation considers advective, dispersive transport in the liquid phase, diffusion in the gaseous phase, nonlinear and non-equilibrium sorption, linear equilibrium reactions between the liquid and gaseous phases, zero-order production, and first-order degradation. The heat transport equation describes conduction as well as convection.

HYDRUS-1D can handle large numbers of soil layers, and uses the van Genuchten-Mualem, Brooks-Corey, Kosugi lognormal, and Durner dual porosity models to describe soil hydraulic properties. When values of soil hydraulic properties are unavailable, HYDRUS-1D can estimate them from a small catalog of values based on major textural classes (e.g., sand, sandy loam, etc.) or neural network based predictions.

The HYDRUS-1D code can simulate a wide range of boundary conditions. These are constant and time-variable pressure heads and fluxes, free drainage, seepage face, and an atmospheric boundary condition. An atmospheric boundary condition can be used to either generate run-off when the precipitation rate exceeds the infiltration capacity of the soil, or store excess water on the land surface allowing the water to infiltrate when precipitation stops. Time-variable conditions can be entered hourly, daily, or any general time interval.

We used HYDRUS-1D for the vadose zone simulations of this research project because we are interested in the vertical transport of water and chloride through the vadose zone. The outputs from HYDRUS-1D are the daily water flow and chloride flux from the vadose zone over the time period of the simulation expressed as cm day^{-1} and mg cm^{-2} day^{-1} respectively. These outputs are used as inputs into the simple mixing model.

2.1.2 Applicability of HYDRUS-1D for Chloride ion Releases

Surface or near surface releases of chloride ion migrate through the vadose zone under variably saturated conditions as a function of release volume, topography, and climatic conditions (i.e., precipitation and evapotranspiration). Although other vadose zone models exist that satisfy this criterion, we selected HYDRUS-1D over other models for the following three reasons:

1. It can simulate water and solute transport through heterogeneous porous media: horizons and sediments of varying geology;
2. It can incorporate daily climatic data; and
3. We are familiar with the model.

Dr. Jirka Šimùnek of our team developed the HYDRUS-1D model with his colleagues Dr. van Genuchten and Dr. Sejna; Dr. Jan Hendrickx, another team member, has used the HYDRUS-1D model for many years for evaluation of groundwater recharge and salt movement through the vadose zone.

2.2 SATURATED ZONE MODEL: MIXING MODEL AND MODFLOW

As stated, the objective of this part of this study is to evaluate the impact of choride releases on ground water quality as measured in a well adjacent to and down gradient of the release. The chloride flux leaving the vadose zone, the horizontal flux in the unconfined aquifer, the original chloride concentration in the ground water, and the thickness of the unconfined aquifer also affect the chloride concentration of the aquifer. Since the water flux seeping from the vadose zone and its chloride concentration vary with time, no simple analytical solutions are available for determination of the time-varying chloride concentration in the well.

Therefore, we implemented a simple spreadsheet ground water mixing model for the determination of the chloride concentration in the well. This mixing model uses the output of the HYDRUS-1D model as input. We have to define the aquifer volume, (the mixing compartment underneath the spill) as a first step in the ground water mixing modeling process. Assuming a circular spill area and a unidirectional horizontal flux in the aquifer, the highest impact will occur where the ground water has the longest exposure to the incoming chloride from the vadose zone. This takes place along the diameter of the circular spill. Therefore, the length of the mixing compartment is made equal to the diameter of the spill area, *D*. The depth of the mixing compartment is the thickness of the aquifer, *H*. The width, *W*, of the mixing compartment is taken equal to unity (one) to simplify the calculations.

Now we will develop the relation between the water flux seeping out of the vadose q_v, the chloride concentration in the vadose zone flux , C_v, the horizontal flux in the aquifer underneath the release entering the compartment, $q_{in,}$ the original chloride concentration in the aquifer, C_{in}, the horizontal flux in the aquifer underneath the release leaving the compartment, q_{out}, and the chloride concentration of the aquifer flux leaving the area underneath the chloride ion release, C_{out}. The latter concentration is the one that will be monitored in the down gradient well. We make the following reasonable assumptions to determine C_{out}:

1. Ground water flow is in steady state. The discharge entering into the mixing compartment from the vadose zone, q_vHDHW, plus the horizontal discharge in the aquifer entering the mixing compartment at its up-gradient side, q_{in}HHHW, are equal to the discharge leaving the mixing compartment, q_{out}HHHW.

2. Changes in thickness of the saturated aquifer are small compared to the total thickness of the aquifer H.

3. The thickness of the aquifer, H, and its porosity, n, are constant.

4. Mixing of the chloride entering the mixing compartment is complete and immediate. This assumption appears invalid from data published in the recent literature (LeBlanc et al., 1991; Zhang et al., 1998). We can use the results of the mixing model as an excellent indicator of the mean chloride concentration in a supply well penetrating the aquifer underlying the release, but not as an indicator of the chloride distribution in the aquifer.

The volume of the mixing compartment, V, will be constant under these assumptions, and is equal to:

$$V = D \times H \times W \times n \qquad \textbf{(2-1)}$$

The water balance of the mixing compartment is equal to:

$$q_{in} \times H \times W + q_v \times D \times W = q_{out} \times H \times W \qquad \textbf{(2-2)}$$

We can eliminate variable W from Eqs. [2-1] and [2-2] by putting W= 1 m.

The chloride balance of this mixing compartment during any time period dt is:

$$\left[\left(q_{in} \times C_{in} \times H + q_{v} \times C_{v} \times D\right) - \left(q_{in} \times H + q_{v} \times D\right) \times C_{out}\right]dt = \left[D \times H \times n\right]dC$$

(2-3)

where dC is the change of chloride concentration occurring during time period dt.

Rearranging Eq. [2-3] we obtain the ordinary differential equation:

$$\frac{dC}{dt} = \frac{q_{in} \times C_{in} \times H + q_{v} \times C_{v} \times D - \left(q_{in} \times H \times q_{v} \times D\right) \times C_{out}}{H \times D \times n}$$

(2-4)

As soon as chloride from the release enters the ground water, the volume average concentration in the mixing compartment is C_{out} after complete mixing has occurred. Thus the chloride concentration of the water leaving the department, C_{out}, becomes:

$$C = C_{out} \qquad \text{and} \qquad dC = dC_{out}$$

(2-5)

Therefore, we can convert Eq. [2-4] in a forward finite difference expression:

$$\frac{C_{out}^{i+1} - C_{out}^{i}}{t^{i+1} - t^{i}} = \frac{q_{in}^{i} \times C_{in}^{i} \times H + q_{v}^{i} \times C_{v}^{i} \times D - \left(q_{in}^{i} \times H + q_{v}^{i} \times D\right) \times C_{out}^{i}}{H \times D \times n}$$

(2-6)

which yields an explicit expression for C_{out}^{i+1},

$$C_{out}^{i+1} = C_{out}^{i} + \frac{\left[q_{in}^{i} \times C_{in}^{i} \times H + q_{v}^{i} \times C_{v}^{i} \times D - \left(q_{in}^{i} \times H + q_{v}^{i} \times D\right) \times C_{out}^{i}\right] \times \left[t^{i+1} - t^{i}\right]}{H \times D \times n}$$

(2-7)

Using the output from HYDRUS-1D: the chloride concentration, C_v^i, of the water, q_v^i, entering the ground water table on day, t^i, we have put into a spreadsheet the mixing model of Eq.

[2-7]. By changing the values for spill diameter, D, ground water flux, q_{in}, original chloride concentration in the aquifer, C_{in}, and the aquifer thickness, H, we have evaluated the effect of these four factors of an unconfined aquifer.

Figure 2-1 *Comparison between MODFLOW and the Mixing Model*

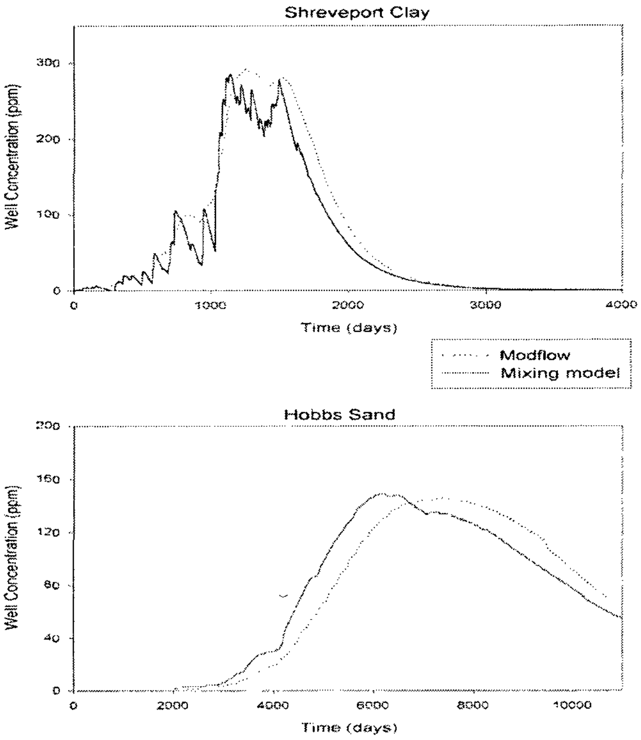


Figure 2-1 presents two comparisons between the chloride concentrations in the well located down gradient of the entry point of the release obtained with the mixing model Eq. [2-7] and those obtained with the model MODFLOW. The two comparisons deal with two complete different sets of environmental and release factors. In Shreveport the vadose zone texture is clay, the dispersion length 0.1 m, release chloride concentration 10,000 ppm, spill height 0.6 m, and aquifer flux 0.05 m/day. In Hobbs, vadose zone texture is sand, dispersion length 2.0 m, release chloride concentration 100,000 ppm, spill height 0.025 m, and aquifer flux 0.004 m/day. The maximum chloride concentrations predicted by the two models is quite similar, although the time of arrival to the maximum concentration is different between the two models. We have conducted this part of the study using the less expensive mixing model Eq. [2-7]. (Our approach using HYDRUS-1D in combination with MODFLOW and Eq. [2-7] is valid for situations where the vadose zone seepage flux, q_v, is downward. A downward flux in the vadose zone is always found in the profiles with a deep ground water table depth. However, in the profiles with a ground water table depth between **0 – (+/-) 10** m an upward flux from ground water table towards the soil surface does occur as a result of capillary rise. The magnitude of the upward capillary flux depends on soil type and climate.

A large amount of precipitation enables the downward vadose zone flux to dominate the chloride transport in both the sandy and clayey soil in the humid climate of Shreveport. Occasionally in the clayey soil an upward flux is encountered during short periods without rain.

An upward flux is sometimes found in the sanyd soil but is prevalent in the clay soil in the arid climate of Hobbs. For example, when the ground water table depth is 3 m, the average upward flux in a clay profile would be 0.04 cm/day or 13.5 cm/year; this upward capillary flux causes the chloride and soil water from the release to stay in the vadose zone and protects the ground water from impairment. In hydrogeological situations where capillary rise is common, vadose zone water movement towards ground water is sporadic. However, a big storm can push chloride ion into a shallow aquifer very quickly.

There is a strong dynamic interaction between all eleven factors, outlined in section 1.1., when water leaving the vadose zone, q_v, changes direction frequently in response to precipitation events (downward movement) and evapotranspiration (upward movement). In dry climates with shallow ground water (less than 3 m), upward movement of ground water into the vadose zone thnce to the atmosphere is common. The only manner to correctly simulate the interaction between these factors is by employing a two- or three-dimensional model, such as HYDRUS-2D. However, since the main objective of this study is ground water impairment and the effect of capillary rise in diminishing the leaching of chloride to the ground water, and is not the chloride ion concentration in the root zone, we used the mixing model Eq. [2-7] for ground water table depths of 3 m. We used the equation only for downward fluxes and made it inactive when the vadose zone flux q_v, goes upward. It was initiated again with the next occurrence of a downward flux, q_v, taking the C_{out} value of the previous occurrence of a downward q_v. In this manner a conservative estimate is obtained of the chloride concentration in the monitoring well assuming perfect mixing for shallow groundwater tables.

3.0 SENSITIVITY ANALYSIS OF FACTORS DETERMINING CHLORIDE ION FATE

3.1 PURPOSE

After a brine release, the concentration of chloride in the vadose zone decreases with time and distance traveled through the vadose zone towards ground water because of dilution with ambient soil water. Further dilution occurs in the aquifer after the chloride reaches the ground water. The maximum chloride concentration occurring at a well down gradient from the release will depend on all the factors that affect chloride transport through the vadose zone and shallow aquifer. Understanding these factors is critical for the design and implementation of a site characterization program after a chloride ion release. The degree of ground water quality impairment determines to a large extent the need for a ground water remedy. The purpose of this sensitivity study is to evaluate which of the eleven factors have the greatest effect on prediction of maximum chloride concentration in the well down gradient of the release.

3.2 MODELING SPECIFICS

We needed to optimize our simulation efforts in order to obtain the maximum amount of information from the modeling. Statistics of experimental designs (e.g. Law & Kelton, 2000; Snedecor & Cochran, 1967; Steel & Torrie, 1980) allow us to decide which combination of factors to simulate so that the desired information can be obtained with the lowest possible number of simulations.

The factors used in experimental design statistics are the input variables to our simulation models. The outputs of our simulations are the responses. The responses that we consider in this study are the maximum chloride concentration, C_{max}, occurring in the well and the time at which the maximum chloride concentration reaches the well, T_{max}.

We have opted for a 2^k *factorial design* that requires us to choose two levels of each factor in this study. This design results in a total of 2^k simulation runs, where k is the number of factors. We chose the two values for each factor so that they represent two opposite conditions such as an arid and a humid climate. The factors can be qualitative like climate or quantitative like depth to ground water. The two input values should not be too extreme or unrealistic. Additionally, the two values should not be too similar or the simulations may not adequately evaluate important aspects of the transport process under consideration. The 11 factors of this sensitivity analysis (see Table 3-1) resulted in 2^{11} or 2,048 different chloride ion release scenarios.

3.2.1 VADOSE ZONE FACTORS

Climate

We selected the two contrasting climates of Lea County, New Mexico, and Shreveport, Louisiana for the sensitivity analysis. Lea County is located in the arid southwest, and Shreveport is in the humid south. Lea County's annual precipitation and potential evapotranspiration is 14 inches and 59 inches, respectively, while annual precipitation and potential evapotranspiration for Shreveport is 46 inches and 67 inches, respectively. Lea County and Shreveport also differ in how precipitation occurs. In Lea County, the majority of precipitation occurs during the "monsoon" of July-August and much of the remainder of the year resembles drought conditions. Shreveport's precipitation falls throughout the year.

Table 3-1: *Vadose zone, aquifer, and brine release factors determining maximum chloride concentration arriving at a monitoring well down gradient.*

Factor	Factor	Factor	Maximum Chloride Concentration	
#	Description	Abbreviation	Decrease	Increase
1	Climate	clim	Arid	Humid
2	Soil Texture	soil	Clay	Sand
3	Initial Water Content	wcin	Wet	Dry
4	Chloride Dispersion Length	disp	2.0 m	0.1 m
5	Ground Water Depth	gwl	30 m	3 m
6	Ground Water Flux	qaq	0.05 m/day	0.001 m/day
7	Ambient Aquifer Cl Concentration	cin	0 ppm	100 ppm
8	Aquifer Thickness	thick	30 m	3 m
9	Release Volume	vol	100 barrels	10,000 barrels
10	Release Height	depth	0.025 m	.6m
11	Release Chloride Concentration	clcon	10,000 ppm	100,000 ppm
10*11	Release Chloride Mass	clmass	250 g/m^2	60,000 g/m^2

Vadose Zone Texture

We selected sand and clay as contrasting soil textures for the sensitivity analysis. Sand and clay differ not only in grain size but also in their ability to retain and transmit water. Sand has a relatively high-saturated hydraulic conductivity and low water retention; whereas clay has a relatively low saturated hydraulic conductivity and high water retention.

Water Content in Vadose Zone

We hypothesized that higher initial water content in the vadose zone would result in slower chloride ion movement because the initial moisture must be displaced before the chloride ion can move downward through the vadose zone. We used HYDRUS-1D to predict initial water contents for both vadose zone textures in both Lea County and Shreveport. We used these predictions as initial conditions in the sensitivity analysis.

We ran simulations for one hundred years or until we achieved dynamic equilibrium between soil water content and climatic conditions for both the wet and dry initial conditions. To create *wet* conditions, we ran simulations without any vegetation (low evapotranspiration); and ran simulations with vegetation (high evapotranspiration) in *dry* conditions. We used evergreen plants capable of transpiring soil water all year round with a 3 meter (~10 ft) deep root zone. Transpiration of soil water created a drier soil profile than simulations without vegetation.

Dispersion Length of Chloride in Vadose Zone

For the sensitivity analysis, we selected minimum and maximum chloride dispersion lengths of 0.10 m (0.33 ft) and 2.0 m (6.6 ft), respectively. The larger dispersion length will produce greater mixing of chloride ion with ambient soil water in the vadose zone, and it is expected to result in a lower maximum chloride concentration in the well. Conversely, the smaller dispersion length will result in minimal mixing, e.g. minimal attenuation of the release, and larger maximum chloride concentrations. We based our selection of dispersion lengths on values reported in the literature (Gelhar, 1993).

Depth to Ground Water

Deep ground water allows for more storage of chloride ion and more attenuation of the maximum chloride concentration during its downward migration. We selected ground water depths of 3.0 m (9.8 ft) and 30 m (98 ft) for the sensitivity analysis. These depths represent reasonable values for a shallow and deep aquifer, respectively.

3.2.2 AQUIFER FACTORS

Ground Water Flux

Ground water flux represents the rate of ground water movement and effects the ability of an aquifer to dilute chloride and other constituents of a chloride ion release. A large ground water flux produces greater dilution.

We based our selection of minimum and maximum groundwater fluxes on literature values for the Ogalalla aquifer, Southern Lea County, New Mexico (Native and Smith, 1987). We used 0.10 cm/day (0.0033 ft/day) and 5.0 cm/day (0.16 ft/day) as minimum and maximum values, respectively. The maximum flux is lower than some of the ground water fluxes reported in the literature (e.g. 40 cm/day by Zhang et al., 1998) and, thus, is a conservative estimate.

Aquifer Ambient Chloride Concentration

We selected ambient chloride concentrations for ground water of 0 ppm and 100 ppm. One hundred parts per million or less is typical for ground water of the Ogallala aquifer (Nicholson and Clebsch, 1961) and the Carrizo-Wilcox aquifer in Caddo Parish, Louisiana (Rapp, 1992). Although 10-ppm chloride is a more characteristic minimum value for the Ogallala and Carrizo-Wilcox aquifers, we selected 0.0 ppm to create a greater difference between minimum and maximum chloride concentrations of ground water.

Aquifer Thickness

The thicker the aquifer, the more opportunity for mixing (dilution), and the lower the predicted chloride concentration will be in the aquifer. We selected two aquifer thicknesses, 3.0 m (9.8 ft) and 30 m (98 ft). Three meters are approximately equal to the length of most well screens used to monitor the chloride changes. Therefore, an aquifer thickness of 3 meters provides a good estimate of expected chloride concentrations at a monitor well in a thicker aquifer under conditions of limited vertical mixing. Many unconfined, alluvial aquifers are greater than 30 m thick, but we have selected 30 m as the maximum value. A 30 m thick saturated sandy formation with a hydraulic conductivity of at least 0.0005 m/s (140 ft/day) is classified as a good aquifer (Freeze and Cherry, 1979).

3.2.3 CHLORIDE ION RELEASE FACTORS

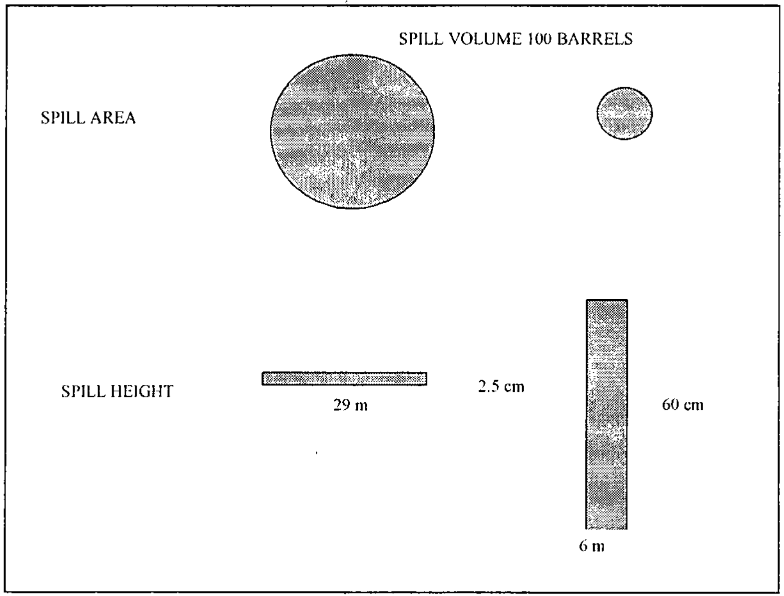
Release Volume

We used minimum and maximum release volumes of 100 bbl (16 m^3) and 10,000 bbl (1,600 m^3), respectively. These release volumes are representative of large and very large releases based on the experience of oil and gas industry personnel.

In the one-dimensional HYDRUS-1D model we used only spill height as an input variable. The spill volume was introduced into the mixing model using the diameter of the spill. For example, a 100 barrel release resulting in a chloride ion release of 0.025 m height with circular shape will have a diameter of 29 m while a release of 0.6m height will have a diameter of only 6m (Figure 3-1). Table 3-2 summarizes the four chloride ion release areas evaluated with the mixing model. These four release areas are combinations of the two spill heights (0.025 and 0.6 m) and two release volumes (large: 100 barrels and very large: 10,000 barrels).

We represented all spill areas as circles, and then, used the mixing model to evaluate mixing along the diameter of each circular spill (see Table 3-2). The diameter of each circle represents the longest path groundwater must flow beneath each release area, and thus provides a conservative estimate of groundwater quality impairment at a well immediately down gradient of a release.

Figure 3-1. *Schematic of Two Possible Brine Release Characteristics After a Release of 100 Barrels.*



Chloride Concentration of Release

We selected chloride concentrations of 10,000 and 100,000 ppm, as the minimum and maximum concentrations for the chloride ion release input parameter in consultation with experienced professionals. These concentrations are representative of most chloride ion releases.

Table 3-2. *Characteristics of brine releases in this study.*

Volume	Depth		Area		Diameter
Barrels	m^3	m	m^2	acres	m
100	16	0.025	640	0.16	29
		0.6	26.67	0.007	6
10000	1600	0.025	64000	16	285
		0.6	2666.67	0.7	58

The mixing model does not consider density differences between the density of the chloride ion arriving at the aquifer and the density of the water in the aquifer. These differences (even if small) may cause chloride ion to sink in an aquifer (LeBlanc et al., 1991; Zhang et al., 1998) and would influence the distribution of chloride ion in the aquifer. Since our approach assumes complete mixing in the aquifer, the chloride distribution is not taken into account. Water extracted from a well by bailing or pumping typically would represent a well mixed sample. The results of the mixing model help to identify environmental and release characteristics that cause groundwater quality impairment and provide a measure of the overall impact of a chloride ion release on an aquifer.

Height of Spill

We selected 0.025 m (1 inch) and 0.6 m (2 ft) as the minimum and maximum spill heights, respectively, of brine water on the land surface, based on observations of oil and gas industry personnel. A 0.6 m (two-foot) height represents a discharge of 1600 m^3 (10,000-bbls) of chloride ion to a 2670 m^2 (0.7 acre) bermed area or large depression. Releases to flat or gently sloped areas are likely to result in initial heights of 0.025m (an inch) or less.

Chloride Mass

Table 3-1 presents a final factor, "Release Chloride Mass". This factor, which is the product of "Release Height" and "Release Chloride Concentration", is the mass of chloride released to the ground surface per unit area. As Table 3-1 shows, a chloride ion release (see Release Chloride Concentration) of 100,000 ppm chloride that ponds to a depth of 0.6 meters (see Release Height) causes a subsurface chloride input of 60,000 grams per square meter (the Release Chloride Mass).

3.3 SIMULATION RESPONSES

The simulations with the HYDRUS-1D code and the mixing model yield large amounts of information about the flow of water and the transport of chloride through the vadose zone and the underlying aquifer. As mentioned above, we have selected two critical response variables for the sensitivity analysis: (i) the maximum chloride concentration in a down gradient monitoring well, C_{max}, and (ii) the time of arrival of the maximum chloride concentration at the monitoring well, T_{max}.

Maximum Chloride Concentration

The maximum chloride concentration defines the center of mass of a release as it migrates through the vadose zone into the aquifer and reaches a well. For this reason, we used the maximum chloride concentration, C_{max}, to identify those factors listed in Table 3-1 that have a significant influence on chloride migration through the vadose zone and the aquifer as the release moves toward the well. Evaluation of C_{max} can also identify the environmental conditions that result in significant attenuation of chloride ion. For example, for those simulations where C_{max} is much less than the original chloride concentration of released chloride ion, environmental factors cause significant chloride ion attenuation. Additionally, an evaluation of C_{max} can be used to identify release scenarios that pose little or no threat to groundwater quality. For instance, simulations that predict a C_{max} less than the EPA Secondary Water Quality Standard of 250-ppm chloride will not cause water quality impairment. On the other hand, when predictions of C_{max} are greater than 250-ppm, ground water quality may be threatened by the release. Thus, the maximum chloride concentration in the well informs us about the risk for ground water impairment and its severity.

Time of Arrival of Maximum Concentration at the Well

Time of arrival of maximum concentration, T_{max}, is the time required for the chloride center of mass to reach the well. It dictates the urgency to implement a field investigation and possible remedy. A relatively rapid response is required if simulations suggest a chloride concentration of 250 ppm or more at a well within a few years. However, when input factors combine to predict that decades or centuries are required for a well to show ground water impairment, an immediate ground water investigation may be of little value.

3.4 STATISTICAL ANALYSIS OF THE RESPONSES AT MONITORING WELL

Following the statistical approach by Law & Kelton (2000) for simulation modeling and analysis, we determined the impact of each factor presented in Table 3-1 on the migration of chloride ion through the vadose zone and aquifer. We did this by inspecting the effect of each factor on the maximum chloride concentration in a down gradient well, C_{max}, and the arrival time of this concentration, T_{max}, at the well.

Table 3-3*. Main effects of the vadose zone, aquifer, and brine release factors on the maximum chloride concentration*

Factor	Effect on Cmax	
	ppm	Relative Effect
Height of Brine Release	4,340	1
Release Chloride Concentration	4,017	0.93
Thickness of Aquifer	3,237	0.75
Soil	2,070	0.48
Aquifer Flux	1,994	0.46
Dispersion Length	1,545	0.36
Climate	1,184	0.27
Ground Water Depth	1,081	0.25
Volume of Brine Release	932	0.21
Ambient Cl Concentration	76	0.02
Initial Water Content of Soil	25	0.01

3.4.1 MAXIMUM CHLORIDE CONCENTRATION

Table 3-3 presents the sensitivity of C_{max} to each of the 11 factors considered in this study (Table 3-1). The factors are sorted according to their impact on C_{max} in Table 3-3. The most important factors are the Height of Chloride ion Release and the Release Chloride Concentration. Changing the Height of Chloride ion Release from 0.025 to 0.6 m while holding all other factors fixed results in an average increase of maximum chloride concentration of 4,340 ppm. Changing the Release Chloride Concentration from 10,000 to 100,000 ppm results in an average increase of 4,017 ppm in maximum chloride concentration in the well. The absolute concentration values depend on the set up of the simulation experiment. We have added the relative effects of each factor in Table 3-3. The factors Height of Chloride ion Release and Release Chloride Concentration have relative effects of 1.00 and 0.93 respectively, much higher than of any other factor. The predicted difference in C_{max} due to the difference in Release Chloride Concentration is 93% of predicted difference for the Height of Chloride ion Release. The predicted difference in C_{max} for the two climate's indices, however, was only 27% of predicted difference for the Height of Chloride ion Release. As Table 3-3 shows, Initial Water Content of Soil exerts the smallest influence on the prediction of C_{max}.

The two most important factors, Height of Chloride ion Release and the Release Chloride Concentration, determine the Mass of Chloride entering the soil surface during a release. If the Height of Chloride ion Release or the Release Chloride Concentration increases, the Mass of Chloride increases and consequently, the maximum chloride concentration increases. Because the Mass of Chloride appears to be the key factor in determining the maximum chloride concentration arriving at a down gradient monitoring well, we repeated the sensitivity analysis using Mass of Chloride instead of Height of Chloride ion Release and Release Chloride Concentration. We eliminated the Initial Water Content of Soil in the second sensitivity analysis since this factor has very little impact on C_{max}.

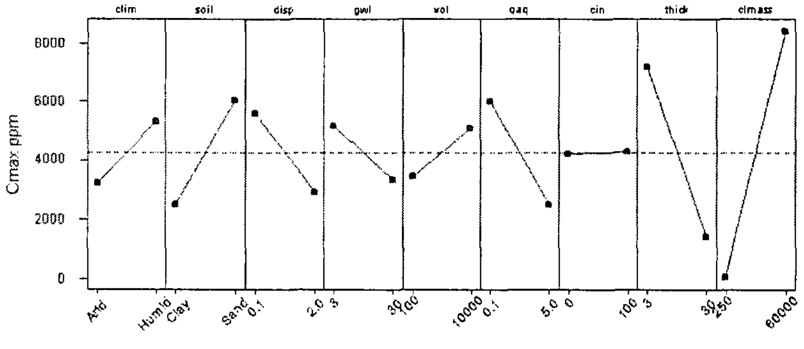


Figure 3-2 *The effect of nine brine release, vadose zone, and aquifer factors*

The results of the second analysis are presented in Table 3-4 and in Figure 3-2. The mean chloride concentration of all 256 scenarios with

Mass of Chloride 250 g/m^2 is 89 ppm and that of all 256 scenarios with Mass of Chloride 60,000 g/m^2 is 8,446 ppm (See Figure 3-2). The difference between these two values is 8,357 ppm, which is the predicted sensitivity of the maximum chloride concentration for an increase of factors fixed.

Table 3-4. *Main effects and important interactions of the vadose zone, aquifer, and brine release factors on the maximum chloride concentration arriving at the monitoring well C_{max} and the time of arrival of the maximum concentration T_{max}.*

Factor	Effect on C_{max}		Effect on T_{max}	
	ppm	Relative Effect	Years	Relative Effect
Main Effects				
Chloride Mass	8357	1	52	0.46
Aquifer Thickness	5632	0.67	5	0.04
Soil	3560	0.43	106	0.93
Aquifer Flux	3525	0.42	7	0.06
Dispersion Length	2699	0.32	11	0.06
Climate	2099	0.25	114	1
Ground Water Depth	1826	0.22	104	0.91
Volume of Brine Release	1631	0.2	0	0
Ambient Cl Concentration	82	0.01	44	0.39
Interaction Effects				
Chloride Mass x Aquifer Thickness	5573	0.67		
Chloride Mass x Soil	3519	0.42		
Chloride Mass x Aquifer Flux	3509	0.42		
Aquifer Thickness x Aquifer Flux	2529	0.3		
Aquifer Thickness x Soil	2509	0.3		
Soil x Aquifer Flux	1223	0.15		
Soil x Climate			98	0.86
Climate x Depth Ground Water			95	0.83
Soil x Depth Ground Water			90	0.79

The Thickness of Aquifer also has a large impact with a sensitivity of 5,632 ppm for a change from 3 to 30 m. All other factors are less important. For comparison, we have determined the relative impacts of each factor by dividing each affect by the influence of the Mass of Chloride (Table 3-4). The most important factors Mass of Chloride and Thickness of Aquifer with relative affects of 1.00 and 0.67, respectively. The factors Soil, Aquifer Flux, and Dispersion Length have relative affects of 0.43, 0.42, and 0.32, respectively. The factors Climate, Ground Water Depth, and Volume of Chloride ion Release have much less impact with relative affects of 0.25, 0.22, and 0.20. Ambient Chloride Concentration (Relative effect 0.01) has virtually no effect.

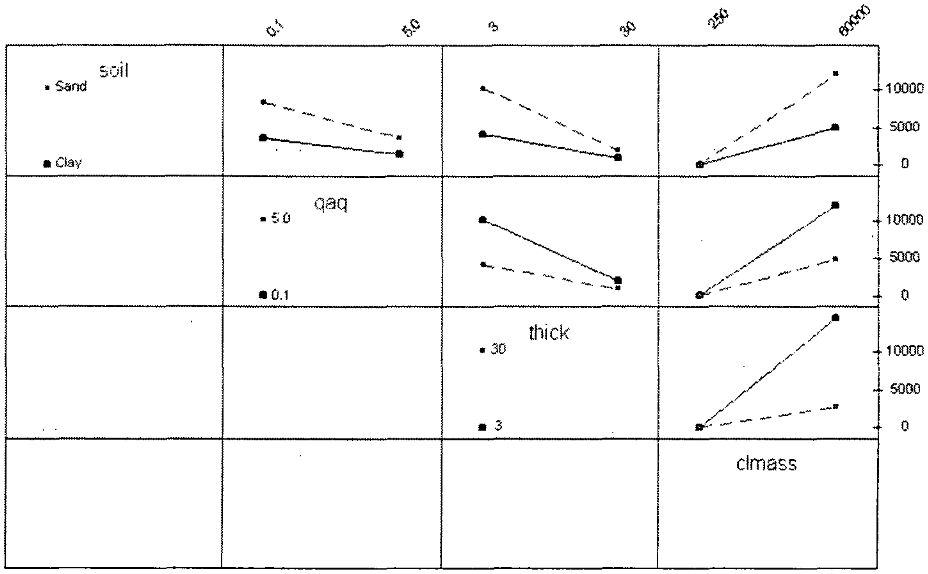
We know that the predicted maximum and minimum values of C_{max} for a factor of interest can depend on the values of other factors. Where this is the case, the two factors are said to interact. An Analysis of Variance revealed that six interactions affect the maximum chloride concentration. These are the interactions be-

- Chloride Mass and Thickness of Aquifer,
- Chloride Mass and Vadose zone texture,
- Chloride Mass and Aquifer Flux,

- Thickness of Aquifer and Aquifer Flux,
- Thickness of Aquifer and Vadose zone texture, and
- Vadose Zone Texture and Aquifer Flux.

Table 3-4 shows the relative importance of each interaction and the interactions are presented in Figure 3-3. As shown in Figure 3-3, if Mass of Chloride increases from 250 to 60,000 g/m^2 above an aquifer with a thickness of 3 m, the maximum chloride concentration at the well increases from 118 to 14,501 ppm. The same increase of Mass of Chloride occurring above an aquifer with a thickness of 30 m causes only a modest chloride increase from 60 to 2,757 ppm. In a sandy vadose zone, C_{max} increases from 110 to 11,985 ppm in response to the different chloride loads to the ground surface. However, different chloride ion releases to a clay result in smaller differences, 68 to 4,906 ppm, but fall within the range of responses in a sandy zone.

Figure 3-3. *Interaction effects between the factors soil, flux in aquifer, thickness of aquifer, and chloride load on the maximum chloride concentration in a downgradient monitoring well.*



The implication of the results of our sensitivity analysis is that determination of Mass of Chloride per unit surface area and Thickness of Aquifer is critical for the evaluation of ground water impairment. Knowledge of Vadose Zone Texture Conditions, Aquifer Flux, Dispersion length, Climate, Ground Water Depth, and Volume of Chloride ion Release can provide useful additional information, while ambient Chloride Concentration and Initial Water Content of Soil provide little relevant information.

The results of the sensitivity analysis cannot be used to directly evaluate field sites because they are based on the average change of maximum chloride concentration. For each factor, the maximum chloride concentration exhibits a wide range of values as is shown in Table 3-5.

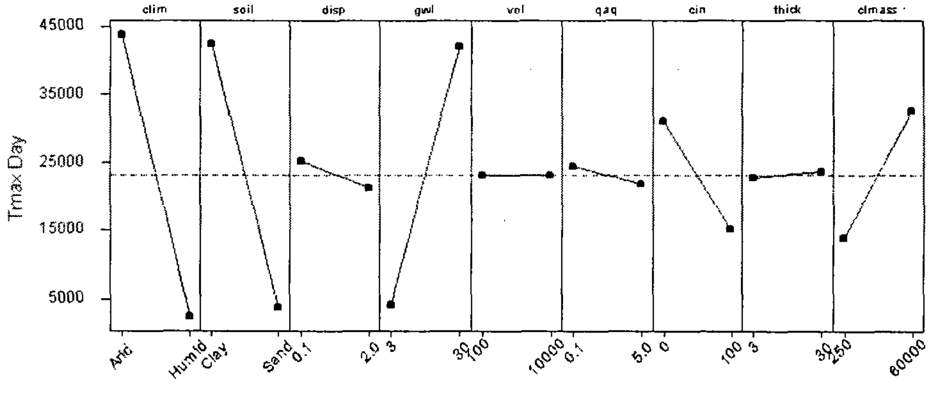
Table 3-5. *Statistics of maximum chloride concentrations (ppm) determined in the sensitivity analysis.*

Main Effect	Level	Mean	Minimum	Maximum
Mass of Chloride	250 g/m2	89	0	303
	60,000 g/m2	8,446	0	46,633
Thickness of Aquifer	30 m	1,429	0	15,354
	3 m	7,195	0	46,633
Soil	Clay	2,487	0	37,233
	Sand	6,047	2	46,633
Aquifer Flux	0.05 m/day	2,505	0	29,779
	0.001 m/day	6,030	0	46,633
Climate	Arid	3,218	0	44,372
	Humid	5,317	0	46,633
Ground Water Depth	30 m	3,354	0	40,758
	3 m	5,181	0	46,633
Volume of Brine Release	100 barrels	3,452	0	41,603
	10,000 barrels	5,083	0	46,633
Dispersion Length	2.0 m	2,918	0	25,653
	0.1 m	5,617	0	46,633
Ambient Cl Concentration	0 ppm	4,226	0	46,593
	100 ppm	4,308	0	46,633

3.4.2 ARRIVAL TIME OF MAXIMUM CHLORIDE CONCENTRATION

We present the effects of the factors on the arrival time of the maximum chloride concentration at the well in Table 3-4. The arrival time strongly depends on climate (relative effect of 1.0 in Table 3-4), vadose zone texture, and depth of ground water. In the arid climate of Lea County, New Mexico, a chloride ion release will require an additional 114 years (40,515 days) for the maximum concentration to arrive at a well than a similar release in the humid climate of Shreveport, Louisiana. The vadose zone texture and ground water table effects are of the same order of magnitude (106 and 104 years respectively). Other factors are less important. Figure 3-4 graphically displays this same information. Our Analysis of Variance identified three important interactions that effect the length of time required

Figure 3-4 *The effect of nine brine release, vadose zone, and aquifer factors on the time when the maximum chloride concentration arrives in a downgradient monitoring well.*

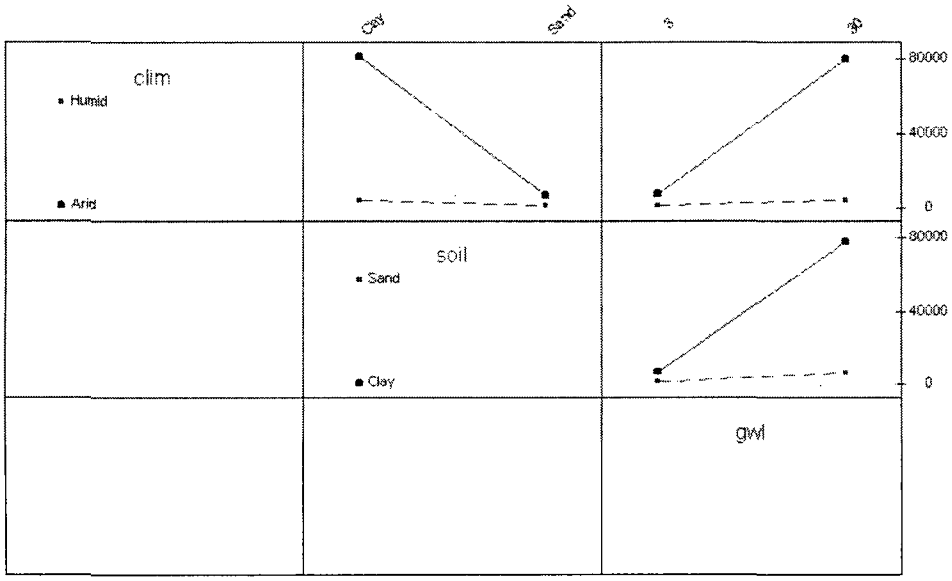


for C_{max} to reach a well:

- Vadose Zone Texture and Climate,
- Climate and Depth to Ground Water, and
- Vadose Zone Texture and Depth to Ground Water.

The lower right section of Figure 3-5 shows that the depth to ground water has little effect on the arrival time of C_{max} if the texture of the vadose zone is sand. In a clay profile, however, the time of arrival is very different: nearly 80,000 days (219 years). This same relationship is expressed with the interaction between Climate and Depth to Ground Water (plotted in the upper right portion of Figure 3-5). In a humid climate, the texture of the vadose zone has little impact on the arrival time of C_{max}. However, in the arid Lea County, a release to a clay profile will require over 200 years longer for C_{max} to reach a well than the same release to a sandy vadose zone would.

Figure 3-5. *Interaction effects between the factors climate, soil, and ground water depth on the time when the maximum chloride concentration arrives in a down gradient monitoring well.*



R. T. HICKS CONSULTANTS, LTD.

901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

August 31, 2004

Mr. Wayne Price
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Abo 1G Leak Site: Section 1, 17S 36E Unit G

Dear Wayne:

Due to the close proximity of the City of Lovington water supply wells to this release, we prepared the Corrective Action Plan of June 7, 2004 using highly "conservative" input values for the HYDRUS-1D model simulation. Specifically, we employed:

- the highest observed chloride values observed in boreholes
- a 10-foot aquifer thickness rather than the full thickness penetrated by the nearby supply wells,
- the absence of a vegetative cover that would reduce infiltration.

The predicted chloride concentration in an imaginary ground water monitoring well located immediately down gradient from the release site was less than 250 mg/L. We also predicted the potential impact to the closest Lovington water supply wells if the simulated chloride flux from this release actually intercepted ground water. Our predictions suggest the impact to the City of Lovington wells is smaller than the measurement error of most laboratory instruments.

We expected these results. Our modeling study for the American Petroleum Institute examined over 2000 brine release scenarios, many of which were similar to the Abo 1G release. We found that in an arid climate, such as Lovington, these types of releases rarely impair ground water quality. We also knew that many "dig and haul" responses to produced water releases actually cause more environmental damage than they cure. Therefore, we counseled Rice Operating Company (ROC) to examine the science first and then implement a remedy. This remains good advice for brine releases.

August 2004 Field Event

On August 16, 2004, ROC staff obtained shallow soil samples from the release site. Plate 1 shows the location of these samples and the field chloride values. ROC designed this field program to identify areas of residual chloride in shallow soil.

We can see from Figure 1 that recent rainfall has driven some of the chloride mass below the root zone, permitting vegetation. As our work with API and the site-specific modeling demonstrates, the relatively small mass of chloride below the root zone represents no threat to fresh water, human health or the environment. This evidence of natural restoration is good news. Vegetation over this spill site will reduce infiltration of precipitation and reduce the chloride flux to ground water.

Remedy Amendment

Rice Operating Company and Hicks Consultants were surprised and pleased by the rapid natural restoration of the ground surface at this site. However, despite the recent rains, some areas remain barren due to high chloride in soil (See also Plate 1). ROC proposes to accelerate the surface restoration process and establish a vegetative cap over the release. As stated above, a vegetative cove will significantly reduce the infiltration of precipitation and thereby reduce the flux of chloride to ground water, creating a "belt and suspenders" response action.

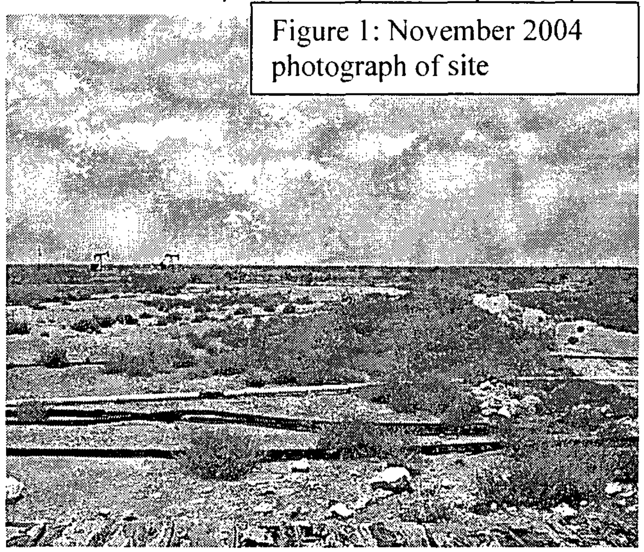


Figure 1: November 2004 photograph of site

ROC proposes the following actions:

1. Remove as much of sterile topsoil from the site as possible without tearing the underlying caliche.
2. Remove any weeds with seed and till the areas now supporting growth.
3. Import sufficient topsoil to cover the spill site and raise the elevation of the site to prevent any ponding of stormwater.
4. Seed the site with an appropriate mix.
5. Monitor the progress of vegetation growth at the site on a monthly basis and add fresh water to assist the growth if necessary.
6. Provide NMOCD with a brief letter report upon completion of this proposed action.
7. Provide NMOCD with photographic evidence of re-vegetation in 12 months.

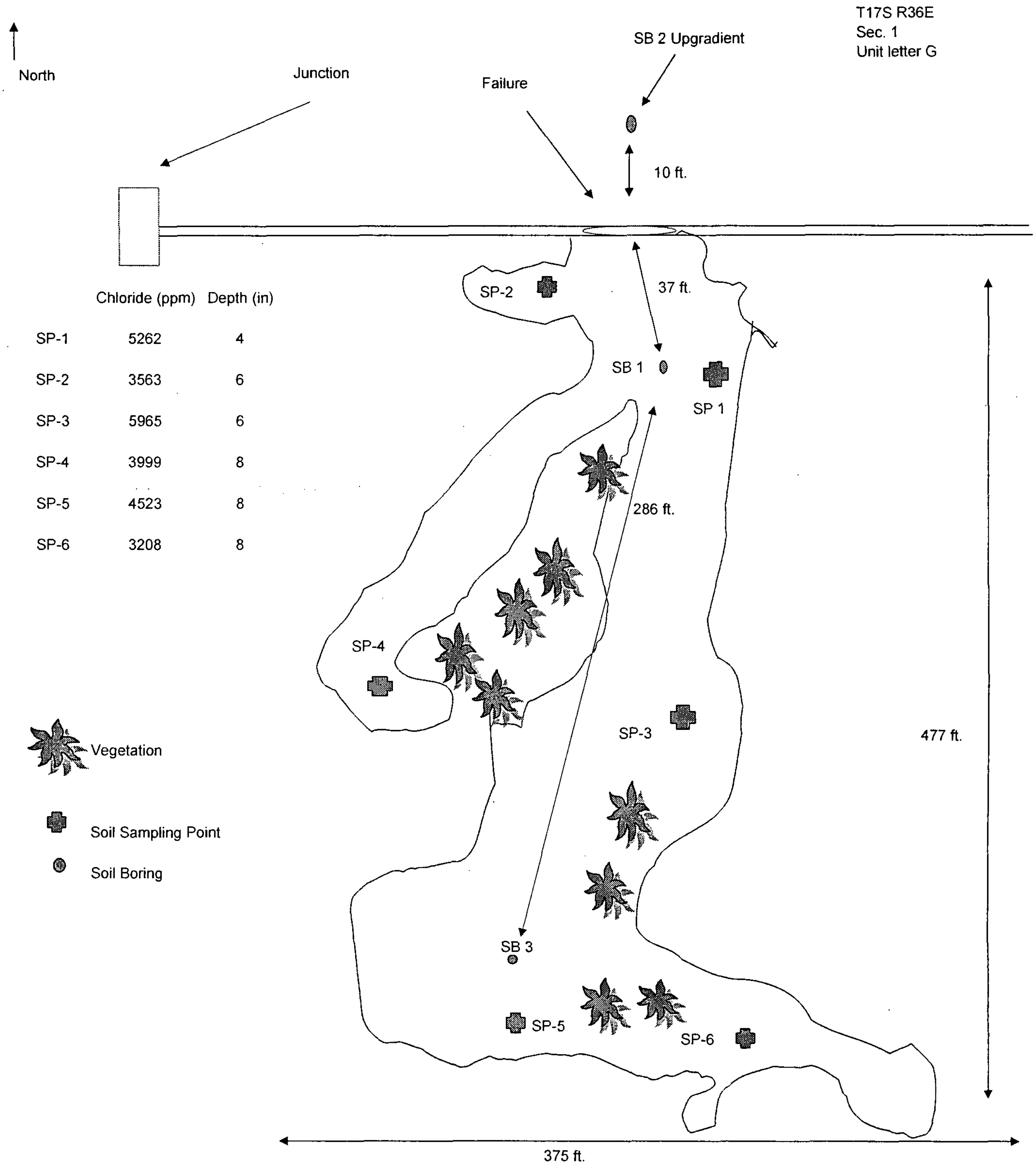
We look forward to NMOCD approval of this supplement to our Corrective Action Plan. Please contact Kristin Pope or me if you have any questions regarding this proposed action.

Sincerely,
R.T. Hicks Consultants, Ltd.

Randall T H

Randall Hicks
Principal

Copy: Kristin Pope, Rice Operating Company



	Chloride (ppm)	Depth (in)
SP-1	5262	4
SP-2	3563	6
SP-3	5965	6
SP-4	3999	8
SP-5	4523	8
SP-6	3208	8

R.T. Hicks Consultants
901 Rio Grande NW
Albuquerque, NM

Rice Operating Company

Abo Release Site Sketch Map

Plate 1

Aug-04

R. T. HICKS CONSULTANTS, LTD.
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November 1, 2004

Mr. Wayne Price
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Abo 1G Leak Site:
Section 1, 17S 36E Unit G
Response to NMOCD email and Notification of Field Activities

Dear Wayne:

Rice Operating Company (ROC) intends to move forward with the construction of a ground water monitoring well as we discussed at our meeting last week. Please accept this letter as our notification of field activities, which we will commence on November 4 or 5. You or individuals in the Hobbs District Office may contact Dave Hamilton on his cell phone (505-977-4671) on Wednesday November 3 to determine the start date for this monitoring well.

We intend to perform the following actions to respond to your recent comments on the Corrective Action Plan.

1. We will construct a 2-inch monitoring well with 5 feet of screen above the observed water table and 15 feet of screen within the water table. Because the water levels in the Ogallala Aquifer are generally declining, we are placing more screen in the saturated zone than typically requested by NMOCD. We will locate this well adjacent to SB-1 (see Plate 1 of our August 31, 2004 letter, attached)
2. During the air-rotary boring of this well, we will collect 2.5-foot split spoon samples at five-foot intervals from 5 feet bgs to 50 feet bgs. From 50 feet bgs to the water table (about 77 feet).
3. We will examine the split spoon samples and cuttings and create a lithologic profile of the vadose zone.
4. ROC staff will evaluate the split spoon samples in the field for chloride concentration using the silver nitrate titration method.
5. We will submit two sample splits to a laboratory for analysis of chloride in soil as quality assurance for the field sampling protocol.
6. At least two weeks after completion of the well, ROC will collect a water sample for analysis of chloride and TDS.
7. After completion of the boring/well, ROC will remove the high-chloride, thin soil zone remaining on the caliche sub-strata. ROC will specifically instruct the contractor to avoid removal of the caliche substrata and soil

that shows evidence of re-vegetation. ROC will then import top soil, grade the site to avoid ponding after precipitation events, and seed the area.

8. We will submit a letter report with the results of the vadose zone sampling, the initial water sampling results, documentation of the soil importation/exportation program, and a short discussion that compares the vadose zone chloride results to the previous results from SB-1.

If we find that this proposed vadose zone sampling shows that the migration of chloride is similar to that predicted by the HYDRUS-1D model presented in our June 7, 2004 report, we will conclude that this previously-submitted simulation and prediction is field-verified. We will then recommend closure of the regulatory file for this spill site. We remind NMOCD that the input parameters employed in our June 7, 2004 report were highly conservative. For example, the model in our report does not consider re-vegetation of the site. Establishing a vegetative cap over the site will greatly reduce infiltration and the resultant chloride flux to ground water will be much less than the input value used in our prediction.

Regardless of our conclusion regarding the accuracy of the previously-submitted HYDRUS-1D simulation, ROC will monitor chloride concentration in ground water at the site on a quarterly basis for two years. If chloride concentrations remain consistent with background values, we will plug and abandon this well. If chloride concentrations in ground water are greater than 250 mg/L during the proposed 2-year monitoring program, ROC will discuss the need for additional action with the NMOCD.

We trust this field program will meet with your approval and that any comments by the City of Lovington will be forthcoming prior to the proposed field activities.

Sincerely,
R.T. Hicks Consultants, Ltd.

Randall T Hicks

Randall Hicks
Principal

Copy: Kristin Farris Pope

R. T. HICKS CONSULTANTS, LTD.
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

July 13, 2005

Roger Anderson
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Re: ABO 1G Release Site OCD Case #1R0415
Unit Letter G, Sec. 1, T17S, R36E
Lea County, NM

Dear Mr. Anderson:

This letter responds to the technical issues brought forth in the NMOCD letter to Rice Operating Company (ROC) dated July 8, 2005. Hicks Consultants collaborated with ROC staff to develop this response. The NMOCD technical comments or requirements are shown in italics and our response is presented below each comment or requirement.

1. *ROC indicated this is a modeling experiment (page 3 March 2005 report). OCD does not feel that it is appropriate to allow "experiments" in such a sensitive area that may impact thousands of people in the city of Lovington.*

In the report "experiment" is a term of science that means "a test made to demonstrate a known truth, to examine the validity of a hypothesis, or to determine the efficacy of something previously untried". The term refers to the simulation modeling, not the proposed remedy. We did not intend the word to mean anything that would suggest that ROC is not very serious regarding moving forward with an appropriate remedy that is fully supported by data and sound science. Nor did we mean to imply that the City of Lovington well field is not a "sensitive area". In our report, we refer to modeling, like monitoring or any scientific evaluation of a hypothesis, as an *experiment.* At this site, we used a simulation modeling experiment to test a null hypothesis: the residual chloride mass in the vadose zone would cause impairment of ground water quality.

2. *OCD did not have the accessibility to run the model and therefore cannot confirm the results.*

At a recent meeting of the New Mexico Oil and Gas Association, Mr. Daniel Sanchez stated that the State of New Mexico would not allow NMOCD to install the HYDRUS-1D software that ROC provided on June 26, 2003. Honestly, we were dumbfounded when NMOCD relayed this information to industry.

On June 26, 2003, Hicks Consultants and the author of the HYDRUS code, Dr. Jirka Simunek, provided NMOCD with a 1-day workshop on the use of HYDRUS. This workshop was a response to a request from NMOCD that the regulated community provide NMOCD with a copy of the HYRDRUS-1D software and instructions on how to use the code. The purposes of this workshop were outlined in the attached April 9, 2003 memorandum to Bill Olson of NMOCD and item 3 specifically states that the workshop would:

> Provide NMOCD instruction on the use of HYDRUS1D and the ground water mixing model. This will enable NMOCD to review and approve remedies that employ these tools.

This seminar, which cost more than $10,000, was funded by Rice Operating Company, Champion Technologies, Marathon Oil Company, and Hicks Consultants, all of whom had employed HYDRUS-1D in submittals submitted to the agency in 2003. Furthermore, the participants offered to fund the services of Dr. Jan Hendrickx of NM Tech for hands-on assistance after NMOCD had become familiar with the code.

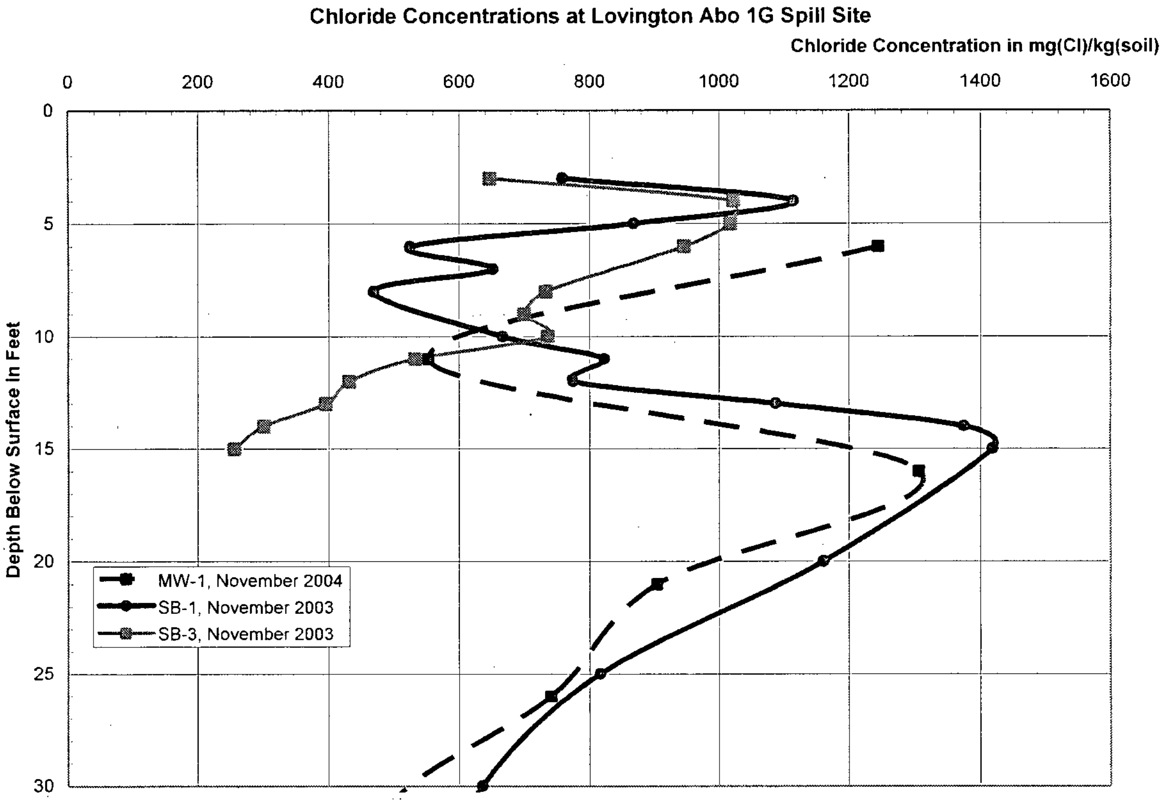
NMOCD comment #2 and the recent statement by Mr. Sanchez was especially disturbing because the agency has approved several work plans that specifically stated our intention to employ HYDRUS-1D in our evaluation of potential remedies. Therefore, we can only respond to this comment by asking NMOCD to identify a means to provide independent verification of our modeling if your agency is unable to do so internally.

If requested by NMOCD, ROC will provide the agency with a stand-alone modeling station for use on ROC or System Partner projects. This would not become property of the State of New Mexico and we trust that NMOCD would employ this tool for evaluation of submittals from ROC or specifically-identified System Partners. We would load this computer with all of the atmospheric and other data files necessary to evaluate any ROC or System Partner submittals that employ a particular code, such as HYDRUS-1D. The original offer of ROC to provide hands-on instruction of the use of the HYDRUS-1D code by Dr. Hendrickx remains on the table as well.

3. *The spill report showed a net release of 60 barrels. The actual investigation revealed this release amount actually caused the vadose zone to be contaminated down to a depth of approximately 46 feet in approximately one year.*

Our report is obviously not clear on the depth of penetration into the vadose zone from the October 2003 release. Chloride from the October 2003 release has not penetrated the upper vadose zone to a depth of 46 feet. As discussed below and in the various submittals, produced water released in October 2003 penetrated the upper vadose zone to a depth of about 4 feet by November 2003 at the site of SB-1. By November of 2004, chloride from the October 2003 release migrated to a depth of about 6 feet below land surface, as the data from MW-1 show.

The lithology of the site, the sudden and instantaneous nature of the spill, and the excellent soil chemistry data allow a solid understanding of the mechanics of fluid flow at this site. We believe the data demonstrate that chloride from the October 2003 spill immediately drained through the fractures in the surface caliche to a depth of about 3 feet, where the base of the fractured caliche horizon is in contact with underlying "sand and caliche" (see the attached MW-1 well log, which was previously submitted to NMOCD). The release created temporary saturated conditions in this underlying unit that caused relatively rapid migration of chloride into the sand plus caliche unit identified from 3 to 5 feet below ground surface. The center of chloride mass from the October 2003 release is shown in the report but is more clearly presented below. The sampling experiments show the center of mass of chloride at a depth of about 4 feet for both SB-1 and SB-3, about one month after the documented release. These data also demonstrate a second chloride mass 15 feet below ground surface at SB-1 and MW-1. This lower chloride mass is not present at SB-3 indicating that this mass is not part of the October 2003 release and dates from an earlier time.



The data simply do not support a hypothesis that chloride migrated to a depth 46 feet in one year. The chloride concentrations observed in SB-1 and MW-1, temporally separated by one year, could not agree in form if this were true. Rather, the data suggest that oil field activity over the past 50 years has caused an increase in chloride content in the upper vadose zone in this area, probably to a depth of about 46 feet. Perhaps produced water spills that occurred in this area decades earlier are the cause of this elevated chloride concentration. Perhaps the nature of the caliche itself contributes to the elevated chloride concentration in the uppermost vadose zone, as suggested in the report.

Our reports identified a June 2003 release of 10 barrels of produced water at this site, which may have impacted the area of SB-1 but did not impact the area characterized by SB-3. We hypothesize that the chloride released to the vadose zone in June 2003 may be the cause of the slightly higher chloride concentrations observed at the 4-foot depth at MW-1 and SB-1 relative to the concentrations observed at the same depth at SB-3.

If the area had not experienced oil field activity prior to the October 2003 release, then we would agree with NMOCD that the release caused an impact to a depth of 46 feet.

NMOCD's observation regarding the difference in chloride concentrations above 36 feet from the materially lower chloride concentrations below 46 feet is very interesting. Because the sampling data from SB-1 and MW-1 shows that chloride migration in this area is about 1-2 feet per year, one can use the depth of elevated chloride as a crude measure of when man's activities first affected the area. This observation allows us to conclude that oil field activity in the area began 23-46 years ago. NMOCD data show that wells within Section 1 (unit letters F, G, and H) were originally drilled in the early 1950s. Because oil production, and the impact of accidental produced water releases, would have started about 47 years prior to the 2003 release, we believe NMOCD's observation supports a long-term chloride vertical migration rate of about 1-foot per year.

Using this information concerning migration rates and the data collected from SB-1 and MW-1 demonstrating initial infiltration rates, we suggest that the chloride mass at 15 feet bgs dates from 10 to 15 years ago.

> *ROC's model uses a spill input parameter of 500 barrels- almost ten times the amount of the actual spill. In other words, the model assumes that it would take a much larger release to cause contamination to a depth of 46 feet in one year.*
>
> *It is apparent that in this particular case the model results do not accurately reflect the actual field conditions. OCD does not feel comfortable in accepting the results of the model when input parameters differ so greatly from the actual conditions.*

The model's use of a 500 barrel release is consistent with the mass of chloride observed in the soil profile (between ground surface and the 4- to 6-foot depth of penetration) rather than the visual observations of field personnel. However, the sampling points of ROC were considered "worst case" samples because field personnel observed pooled produced water at these locations. We believe the use of this value, which may actually over predict the impact to ground water, is fully appropriate. As pointed out in Hendrickx and others (2005), the HYDRUS-1D model does not rely upon chloride concentrations or chloride mass as input parameters. Chloride mass is used in the simple ground water mixing model and we can employ whatever mass of chloride NMOCD wishes to use without the need to recalibrate or re-run the HYDRUS-1D portion of the simulation experiment. We look forward to your input on this mater and are pleased to re-run the mixing model and present the result.

4. *ROC's June 07, 2004 report indicated that the background concentration in the caliche/upper vadose zone was 300-ppm chlorides.. OCD received a complaint from the City of Lovington concerning where the background sample was taken. OCD does not believe that naturally occurring background levels would be this high.*

We agree that naturally occurring background concentrations are not 300 ppm in sand. We believe the data from below 50 feet shown on the well log included in the report define the natural background (i.e. pre-Columbian conditions) as less than 100 ppm in sandy horizons. However, in order to differentiate between the impact of the October 2003 spill from previous releases or other anthropomorphic influences, we needed to establish a local background concentration (i.e. ambient concentration) in the same lithology as the spill itself. Therefore, ROC obtained samples from an area not effected by the recent release and the result was a finding that ambient chloride concentrations in the upper vadose zone were 300 ppm. Please remember, the purpose of the report was to examine the effect of the October 2003 spill on the environment. The purpose of the report was neither the evaluation of 50 years of man's activity in the area nor the natural variation between chloride in sandy horizons and chloride in caliche zones. We employed the ambient chloride concentration of 300 ppm only to assist us in the characterization of the release in the upper vadose zone.

> 5. *The chlorides contamination migrated down to a depth of 46 feet from October 2003 to November 2004. The groundwater depth was reported at approximately 77 feet. The March 2005 report indicated that chlorides contamination had moved an additional 30-60 cm. The June 07, 2004 report (see page 6) states that "Deeper in the Vadose zone, fractures become barriers to flow and deeply buried caliche behaves more like clay". The March 2005 report (see page 5) reiterates that the chloride migration is impeded at the depth of 35 to 36 feet by the one foot thick caliche layer. The report estimates that the migration is about 2 feet per year and the chloride peak would reach the groundwater in 35 to 42 years.*
>
> *NMOCD's experience in shallow vadose zone excavations (down to 50 feet) does not support the theory that fractured caliche acts as a clay barrier. ROC's plan did not support this theory with any field data. In fact, OCD notes that the chlorides contamination has migrated 46 feet in just one year. This is 10 feet deeper than the caliche zone that is purported to act as a barrier. Based on the limited information provided, OCD must reject the prediction that it will take another 30-40 years to reach groundwater.*

In vadose zone profiles with low water content, many scientists contend that fractures are barriers to unsaturated flow and the ability of a hydrostratigraphic unit to transmit water is depended upon the properties of the porous matrix. However, a growing body of knowledge from simulation, laboratory and field experiments suggests that the role of fractures is far more complex. At this site, our modeling experiment did not rely upon an assumption that fractures were or were not a barrier to flow. Instead, we relied upon actual field data to calibrate the HYDRUS-1D simulations. We used the field data to adjust the hydraulic input parameters of the model to permit more accurate predictions. At this site, the field data demanded that we employ hydraulic input parameters for the deep caliche horizons that were similar to clay. Conversely, we used hydraulic properties more similar to gravel to simulate movement through the highly fractured surface caliche.

We cannot comment on NMOCD's experience at other sites that may or may not have any similarity to this sudden and accidental surface release. We hope the discussion above adequately addresses the misunderstanding of the chloride migration rate at this site. We can state with a reasonable degree of scientific certainty that we have a solid understanding of the hydrogeology of this particular location.

> 6. *ROC's plan is to monitor groundwater for only two years and then request closure. This process does not correlate to the time that the model predicts salt will enter the groundwater, i.e., 30-40 years. OCD feels there will be no way to know if the model experiment is valid.*

If NMOCD does not have access to the HYDRUS-1D model, we are certain that NMOCD cannot validate the findings presented in the report using internal resources. We urge NMOCD to consider requesting assistance from other State of New Mexico employees, such as those employed at NM Tech, UNM, or NMED to evaluate the validity of our findings. To reiterate, if NMOCD requests a stand-alone modeling station and expert, independent assistance to further test the simulation experiments that are the basis of our submissions, ROC is willing to fund this endeavor.

We would like to remind NMOCD that very early in this matter, ROC offered to install vadose zone monitoring devices that would be capable of measuring the migration (and sequestration) of chloride in the vadose zone. This type of monitoring is exactly what is currently approved by NMOCD, NMED and EPA within the saturated zone: Monitored Natural Attenuation. However, NMOCD stated categorically that such monitoring would be unacceptable and required the installation of a monitoring well. If requested by NMOCD, ROC is willing to provide the agency with a program to monitor the migration of chloride in the vadose zone as originally proposed.

> 7. *OCD and the City of Lovington recently collected soil samples and discovered that high salt levels (i.e. chlorides up to 20,000 ppm) still remain in the spill area. These results were approximately 4-5 times higher than ROC's results submitted via E-mail on October 01, 2004.*
>
> *OCD understands that chloride mass is a very important input parameter to the model. The March 2005 submittal included a plate 3 "Calculation of Chloride Load" which showed the highest soil concentration to be 1161-ppm chlorides. As pointed out above, surface soils had concentrations 10 times the value shown on Plate 3. ROC did not justify why these values should not have been included in the calculations.*

The thin surface soil layer of high chloride concentration was not considered in our calculation of chloride load because this mass of chloride is inconsequential when compared to the overall chloride mass. Also, this thin zone of high chloride soil was not considered because ROC repeatedly offered to remove this soil layer (see August 31, 2004 work plan, for example). Although NMOCD initially approved the removal of the thin high chloride layer, this approval was then retracted (see November 4, 2004 email from NMOCD).

While selective sampling of the surface soil could demonstrate high or low chloride concentrations, we observed invasion of plants in 2004 and recent photographs show that the majority of the surface soil does not exhibit sufficient chloride concentration to inhibit growth. The invasion of vegetation in 2004, which is not well described in any submittals, provides evidence that the chloride mass in the thin soil horizon does not pose a material threat. Nevertheless, if requested by NMOCD, ROC will determine the mass of residual chloride in the thin soil horizon and we will re-run the model to account for increased chloride load.

> 8. *The site has not been adequately delineated.*

We maintain the characterization presented in the reports adequately defines site conditions, and provides the data necessary to select and design an effective remedy. The lateral extent of the surface impact can be measured to the inch. The vertical extent of impact is also defined to the inch in two areas of the spill, SB-1 and SB-3, where ROC observed pooled produced water. Sampling at locations such as SB-1 and SB-3 provide worst case conditions – maximum chloride penetration and the highest chloride concentrations (e.g. largest mass). Designing a remedy based upon these worst case conditions provides the maximum protection.

If requested by NMOCD, ROC is willing to expand temporal sampling to create a monitoring and reporting program that conforms to the criteria of Monitored Natural Attenuation. ROC discussed this strategy with NMOCD very early in the investigative process and our installation of permanent vadose zone monitoring at the site to more accurately measure the migration of chloride in the upper vadose zone remains on the table.

Below, we present our response to the corrective actions proposed by NMOCD.

1. *ROC shall remove a minimum of 10 feet of contaminated soil in the impacted areas. This project shall start no later than July 22, 2005. All contaminated soils removed from the site shall be disposed of at an OCD approved site.*

ROC and Hicks Consultants requests an opportunity to review the technical and regulatory justification for NMOCD's selection of the 10-foot minimum excavation.

2. *The site shall be delineated both horizontally and vertically. The delineation parameters will be as follows: TPH - 100 ppm; chlorides - 250 ppm; and, total BTEX - 100 ppm.*

As stated above, we believe the effect of the October 2003 release is characterized sufficiently to develop an appropriate remedy. Nevertheless, ROC will conduct any additional field testing requested by NMOCD.

3. *Samples for laboratory confirmation shall be collected from the bottom and side walls of the final excavated area. The samples shall be analyzed for BTEX (8021), TPH (418.1 or 8015 GRO & DRO) and chlorides all using EPA approved methods.*

Any NMOCD-directed investigation by ROC will follow appropriate scientific methods.

4. *ROC shall install a barrier over the site to impede infiltration and prevent any further migration of chlorides contamination. The barrier installation shall extend at least 10 feet horizontally past any remaining contamination. A suitable amount of clean top soil similar to the pre-existing spill conditions shall be placed over the compacted clean backfill material.*

ROC has not and will not advocate a "no action" strategy. ROC had always intended to install a vegetative cap over the site that would also direct runoff away from the underlying chloride mass. This type of barrier will materially reduce the infiltration of precipitation. Because the HYDRUS-1D experiments in the reports do not consider evapotranspiration, the predictions are very conservative as a result. As stated above, we will willing to conduct a simulation experiment showing the effect of this proposed barrier as compared to excavation.

5. *An interim report shall be submitted to the OCD within 10 days of the final excavation or no later than August 15, 2005. This report shall contain the results of the analysis requested in items 2 and 3 above. The report shall contain a log of events, waste disposal manifest, photos, barrier design and conclusions. The excavated area shall not be backfilled until ROC has requested OCD's approval.*

We would be pleased to keep NMOCD apprised of all ROC actions on a regular basis.

> 6. *ROC will notify the OCD Santa Fe office and the OCD District office at least 72 hours in advance of all scheduled activities so that the OCD has the opportunity to witness the events and/or split samples during OCD's normal business hours.*

We will inform NMOCD of any and all field activities.

We look forward to our meeting with you on Friday, July 15, 2005.

Sincerely,
R.T. Hicks Consultants, Ltd.

Randall T H

Randall Hicks
Principal

Copy:

William Carr
Carolyn Haynes

R. T. HICKS CONSULTANTS, LTD.
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

August 31, 2005

Wayne Price
NMOCD Environmental Bureau
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
Via E-mail and Federal Express

RE: Amended Corrective Action Plan
Abo 1G Pipeline Release NMOCD Case #1R0415
Section 1, 17S, 36E, Unit G

Dear Wayne:

On behalf of Rice Operating Company, R.T. Hicks Consultants, Ltd. is pleased to submit the attached Amended Corrective Action Plan for the above-referenced site.

If you have any questions or concerns about the enclosed report, please let us know. Thank you for your time.

Sincerely,
R.T. Hicks Consultants, Ltd.

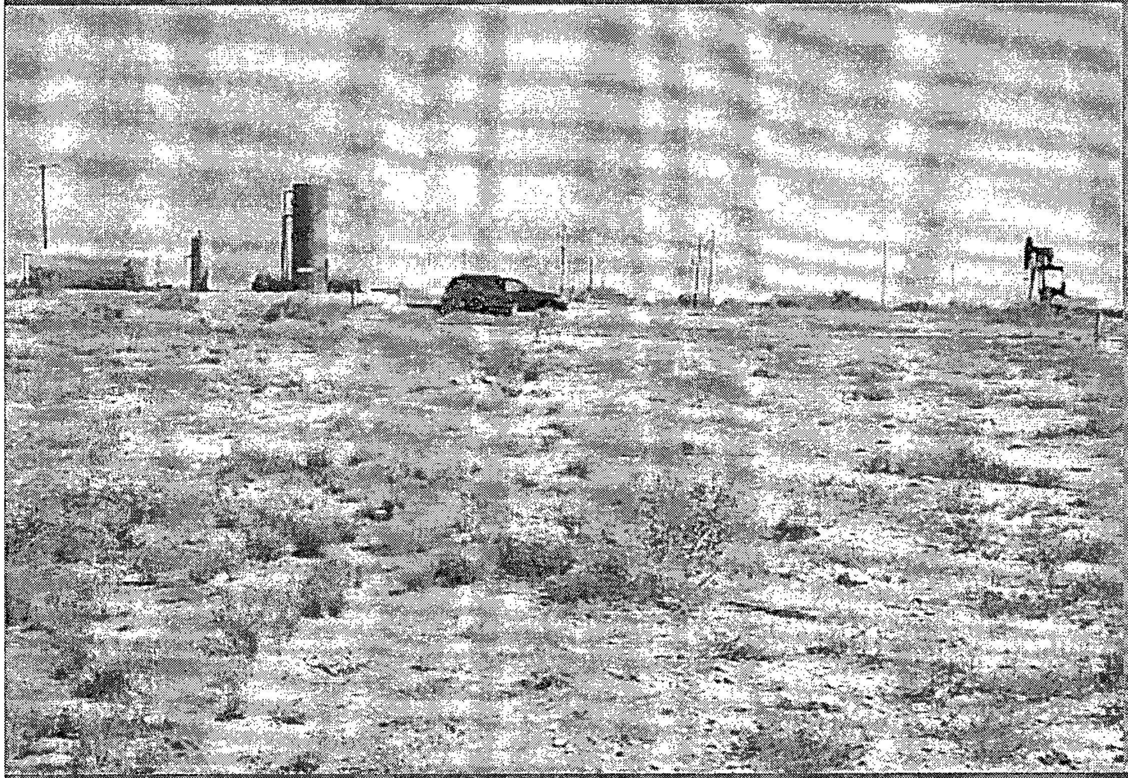
Katie Lee

Katie Lee
Staff Scientist

Copy: Rice Operating Company

August 2005

Amended Corrective Action Plan



Lovington Abo 1G Release Site

R.T. HICKS CONSULTANTS, LTD.

901 RIO GRANDE BLVD. NW, SUITE F-142, ALBUQUERQUE, NM 87104

August 31, 2005

Amended Corrective Action Plan

LOVINGTON ABO
1G RELEASE SITE

Prepared for:

Rice Operating Company
122 West Taylor
Hobbs, NM 88240

R.T. HICKS CONSULTANTS, LTD.
901 RIO GRANDE BLVD. NW, SUITE F-142, ALBUQUERQUE, NM 87104

1.0 SUMMARY

1. ROC mobilized to the Abo 1-G release site on November 10, 2003 and drilled three borings. The ROC field procedures were consistent with industry practice and with previously-submitted ROC characterization plans (e.g. junction box plan). Approximately 40 samples were collected.

2. In November 2005, Hicks Consultants completed a sampling boring and monitor well adjacent to SB-1 in accordance with an NMOCD-approved workplan. Approximately 15 samples were collected from the boring.

3. In July 2005, ROC implemented a deep soil sampling (about 130 samples) and surface soil sampling program (about 70 samples) to provide better characterization of the 1992 release and the 2003 release.

4. Chloride concentration data show a center of mass at depths of 3 to 6-feet below grade and a second mass at depths of 12- to 20-feet below grade. While the chloride from both spills is generally present at points near the source of the releases; at greater distances or release margins, the effects of only one of the releases may be present.

5. Samples from the bore holes, the deep soil sampling and the surface sampling yielded peak chloride concentrations of approximately 8,500 ppm, 1,500 ppm, and 1,400 ppm at respective depths of 0 feet, 4- to 6-feet below grade and 14- to 16-feet below grade. Area weighted average chloride concentrations were approximately 2,400 ppm, 850 ppm, and 475 ppm at these same respective depths.

6. Laboratory analyses confirm that regulated petroleum hydrocarbons are not present above screening levels employed by the PST Bureau of the New Mexico Environment Department.

7. Five potential remedies were evaluated using HYDRUS-1D and a simple mixing model to predict ground water chloride concentrations in an imaginary monitoring well with a 10-foot screened interval that is located at the edge of the release. Simulation experiments predict that only the simple vegetative cap remedy will cause ground water to exceed the 250 ppm chloride standard in the imaginary monitoring well.

8. A simple vegetative cap is sufficient to prevent impairment of ground water that would be produced from a windmill with a 40-foot screened interval located at the edge of the spill.

9. Ease of construction, long-term viability and other environmental considerations cause us to recommend the following remedy:
    a. Excavate and stockpile the areas of high-chloride surface soil that do not currently support vegetation.
    b. Excavate, characterize and segregate by chloride concentration the uppermost 2-feet of the vadose zone that overlies about 35% of the subsurface chloride load. This translates to removal of material where the average chloride concentration over the thickness of the impact is greater than about 1000 mg/kg.
    c. Blend clean soil (imported or excavated from the site) with higher chloride stockpiles to create a mixture that will support vegetation (i.e. about 1000 ppm chloride).
    d. Place a 1-foot thick clay barrier in the excavation in 6-inch lifts such that the saturated hydraulic conductivity of this clay barrier is less than 5×10^{-6} cm/sec.
    e. Place at least 2-feet of the blended stockpiled soil and any imported soil over the clay barrier and over the remaining unexcavated portion of the spill to create a small swale that will shed excess precipitation.
    f. Seed the site with native plants and fence the area to enhance re-vegetation

The selected remedy protects fresh water, human health and the environment. It complies with NMOCD rules and we believe it provides the greatest net environmental benefit.

2.0 BACKGROUND

The Abo 1G Discharge Site is located about 6 miles southeast of the center of Lovington, New Mexico. Plate 1 is a 1:24,000 topographic map showing the location of the site relative to Route 18, the Hobbs-Lovington Highway. Plate 2 is a 1:6,000 image (2004) of the site location and nearby features such as the Navajo Lovington Refinery and the Lovington-Hobbs highway.

In 2003, a line near the pick-up truck in Figure 1 ruptured and produced water flowed south. This 2003 release was the impetus for the investigations described herein. This final corrective action plan summarizes all of the data available for the site and recommends a remedy to protect fresh water, public health and the environment.

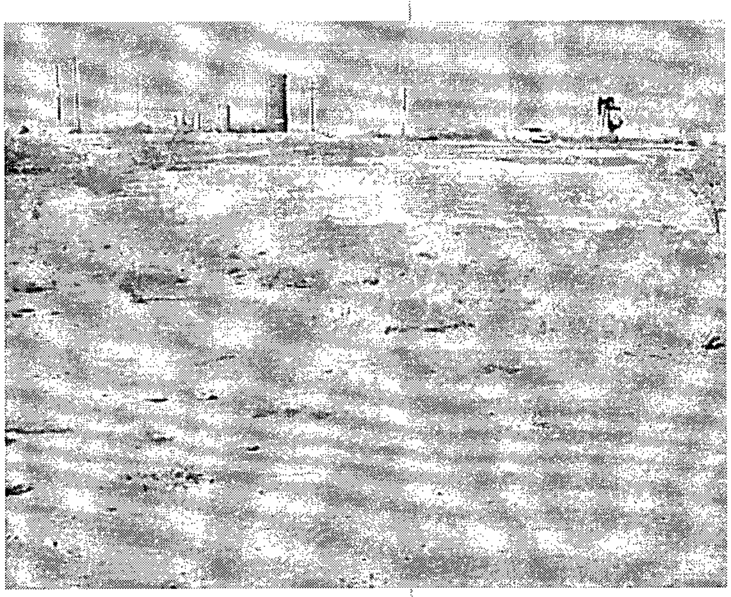


Figure 1. View of Abo 1G Leak site

On October 18, 2003, Rice Operating Company (ROC) prepared a Release Notification report that estimated a pipeline failure released 190 barrels of produced water and ROC recovered 130 barrels. The pipeline failure released produced water with little or no hydrocarbons. Plate 3a is the same image as Plate 2 at a 1:600 scale. This image shows the geometry of the 2003 release, which affected about 31,000 square feet of rangeland. ROC is also aware that a 10 barrel release near this same location occurred on June 3, 2003 and this earlier release impacted a 2,400 square foot area near SB-1. In August 2005, ROC conducted an internal records search and discovered a release report dated October 21, 1992. This report documents a release of produced water that covered about 17,000 square feet at this same location. Plate 3b is an aerial photograph taken between 1996-1999 at the same scale as Plate 3a showing our interpretation of the extent of the 1992 release. Plate 3a & 3b demonstrates that both spills occurred at essentially the same location. The 1992 report suggests that the release was principally water with little or no hydrocarbons and ROC recovered about 500 barrels of the release. This search of older records became feasible in mid 2005 due to the efforts of ROC to categorize and organize their older files in various storerooms.

ROC mobilized to the site on November 10, 2003 and drilled three borings. The field procedures employed by ROC were consistent with industry practice and with previously-submitted ROC characterization plans (e.g. junction box plan). In November 2004, Hicks Consultants completed a sampling boring and monitor well adjacent to SB-1 in accordance with an NMOCD-approved workplan. In July 2005, ROC implemented a deep soil sampling and surface soil sampling program to provide better characterization of the 1992 release and the 2003 release. Plate 4 is a sketch map that shows the outline of the 1992 and 2003 spills (based upon the imagery), 2003 borings, the 2004 monitor well and the 2005 trench samples. In 2005, ROC also collected surface soil samples on a 25-foot grid, which are not displayed on Plate 4.

Hicks Consultants used the data collected by ROC, the data from our 2004 field program and obtained additional data from public sources as input to the HYDRUS-1D vadose zone fate and transport model. Hicks Consultants employed the results of the modeling to develop a remedy to protect ground water quality and to restore the ground surface.

3.0 RESULTS OF FIELD PROGRAMS & INVESTIGATIONS

Next to the pipeline rupture, ROC drilled SB - 01 in 2003 to a depth of 45-feet. From field inspection, the site has several inches of sandy soil covering a highly-fractured caliche horizon. We examined borehole samples and the on-site cuttings log from SB-01 and concluded that the subsurface is composed of 24-feet of thin caliche layers within sands and silts. Interbedded with these caliche-rich sands and silts are silty clays. Below this uppermost 24-feet is 20-feet of sand and silt.

The lithologic log of MW-1 confirms the observations of 2003 for SB-1. Lithologic logs for both borings are included in Plates 5 & 6. Plate 5 also displays the calculated chloride load for the boring. The lithology of MW-1 is primarily a very fine-grained sand silt interbedded with a complex series of caliche beds. Layers featuring some caliche exist from 0.5- to 10-feet bgs, 33- to 44-feet bgs, and 53- to 60-feet bgs. In addition to these zones, three well indurated layers of caliche exist at 0.5- to 3-feet bgs, 15- to 17-feet bgs, 20- to 22-feet bgs, and 35- to 36-feet bgs. There also exists a well indurated layer of sandstone at 67- to 68-feet bgs.

We have no site specific or regional data on the moisture content of the vadose zone. Such data are generally rare. As described in a later section of this report, we used HYDRUS-1D to simulate an initial water content of the unsaturated zone.

We conclude that the vadose zone is about 90-feet thick and is composed of a caliche-rich upper horizon underlain by sand with minor amounts of silt.

Characteristics of Saturated Zone

In well L-1716 , about 1 mile west of the release site, the driller's log reports "water sand" from 45-feet to 70-feet underlain by 7-feet of "calcium sand" before penetrating water bearing units. At well L-5014, approximately 5 miles north of the site, the driller log identifies caliche from 2- to 28-feet below surface. Below this upper strata is sand and sandy clay to a depth of 190-feet. From 190- to 205-feet below surface, the driller reports a clay zone. This 15-feet of clay is underlain by 10-feet of clay and gravel. The driller penetrated the Dockum Group red beds at 215-feet below grade. For monitoring wells in the Lea Refinery, one mile to the northeast, driller's logs report a 4-foot caliche bed overlying more than 100-feet of very fine to fine grained sands. At the Lea Refinery, April 1996 water levels are 90-feet below grade (H+GCL, 1996). These well logs are included in Appendix A.

The saturated Ogallala Aquifer, which underlies the location, is dominantly sand. The saturated thickness of the aquifer is about 130-feet. The screened interval of wells in the area range from 20-feet to more than 100-feet. According to the USGS (http://water.usgs.gov/GIS/metadata/usgswrd/ofr98-548.html#Identification_Information), the hydraulic conductivity of the High Plains Aquifer ranges from less than 25-feet/day to greater than 300-feet per day with an average hydraulic conductivity of 60-feet/day. At this location, where saturated gravel units are restricted to the base of the Ogallala, we estimate the hydraulic conductivity is about 50-feet per day. Geologists who drilled monitoring wells at the Lea Refinery estimated the saturated hydraulic conductivity as ranging from 25- to 75-feet per day. At the Lea Refinery, the hydraulic gradient is 0.004 feet/foot to the southeast. The resultant ground water flux is probably about 10 cm per day.

Basin Environmental obtained samples from LA MW-1 on December 3, 2004, March 1, 2005 and June 16, 2005. The results of these samples are presented in Appendix B. The results show no evidence of ground water impact. Please note that the results of all analysis are in general agreement. The TDS result from the March 1, 2005 sampling was analyzed outside of the "hold time", but reproducibility of the results shows that all samples are representative of ground water quality.

Chloride Distribution in the Vadose Zone

Appendix C presents the analyses of field samples from the vadose zone during the 2005 field events. Earlier submissions present the analytical data for soils from previous sampling campaigns.

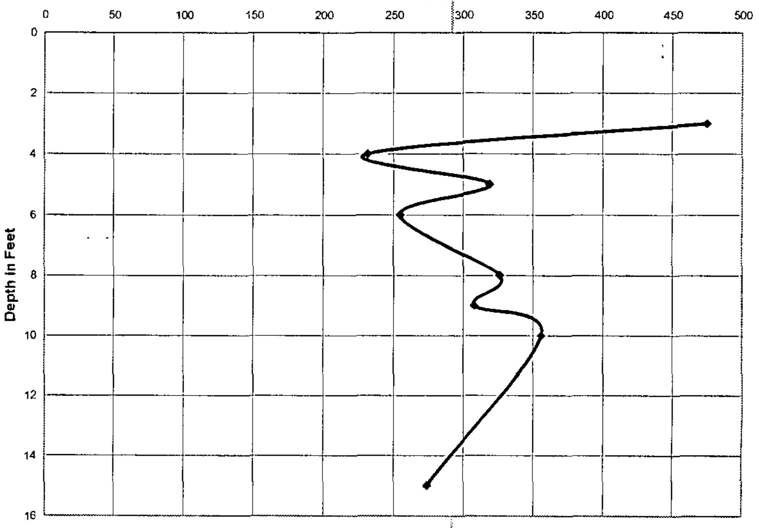


Figure 2. SB-2 Field Chloride concentrations

Soil boring SB-2 is uphill from the spill site and we considered this a "background" location, however the term "ambient" is more accurate. At this soil boring, the chloride near the ground surface is 475 ppm. From 4-feet below grade to the total depth of 15-feet, chloride in this caliche-rich horizon ranges between 230 and 356 ppm (Figure 2). Other scientists suggest that "background" chloride concentration in Lea County soil can be less than 100 ppm. At this site, caliche dominates the upper vadose zone and oil and gas activities may have released small amounts of chloride to the environment for decades in the form of small spills that are subsequently re-distributed by wind. At this release site, the ambient chloride concentration in the upper vadose zone is about 300 ppm. In the deep vadose zone, below about 45-feet, chloride concentrations are less than 100 ppm (See Plates 5 and 6). We believe these low chloride concentrations below 45-feet are due to the sand lithology combined with our hypothesis that anthropogenic chloride originating from decades of oil and gas production has penetrated only 41-feet of the vadose zone.

Plate 7 compares the chloride concentration versus depth for SB-1 and SB-3 (November 2003) with MW-1 (November 2004). These three borings, which provide the deepest vertical characterization for the site, show two distinct chloride masses - one from 3- to 6-feet below land surface and a second mass at 12- to 20-feet below land surface. These soil borings show a decline in chloride concentrations to ambient levels (i.e. 300 ppm) at 45-feet, 9-feet and about 40-feet below land surface respectively. Because the water table lies about 90-feet below land surface, this observed decrease of chloride concentrations to background suggests that the release did not create saturated conditions between ground surface and ground water.

As stated in earlier submissions to NMOCD, the patterns for SB-1 and MW-1 shown in Plate 7, which are closest to the pipeline rupture, confirm that the October 2003 release was not the first release at or near this site. An earlier release appears as chloride concentrations above 1,000 ppm between 12- and 20-feet below grade and the October release appears as the high chloride between 3- and 6-feet depth. We stated in our earlier reports that we did not believe that the chloride concentrations between 12- and 20-feet in SB-1 and MW-1 were caused by the 10-barrel release of June 2003. As suggested earlier in this report, the recent examination of ROC files identified the source of this deeper center of mass as a 1992 release.

Plate 8 shows the results of the deep soil sampling at the 12 sampling trenches, 3 soil borings and the monitor well. In general, chloride concentration profiles of points closest to the junction box (Points A, C, E, G and SB-1 and LA MW-1) demonstrate both the shallow and the deeper chloride masses. Points further away may demonstrate only the most recent spills (Points H, I, J and SB-3). Other points (B and K) have a chloride profile showing relatively low concentrations near the surface and higher concentrations at intermediate depths (8- to 14-feet bgs). The site has little relief and is located in an active oil field with considerable human activity. We believe that over the course of the last 15 years, small topographic changes due to rainfall events, human activities, and the variation in source location and flows of the different releases explains the variation in chloride distribution at the site.

4.0 SIMULATION MODELING EXPERIMENTS

4.1 HYDRUS-1D CALIBRATION INPUT DATA

Because the chloride center of mass at SB-1/LA MW-1 (from the 1992 release) resides at a depth of about 15-feet below land surface, chloride movement is not temporarily perturbed by upward wicking due to evapotranspiration or individual rainfall events. This mass resides above and within the well indurated caliche at 15- to 17-feet bgs. We compared the observed chloride transport rates at these depths and within these known lithologies with the predictions of the model, then adjusted the input characteristics to calibrate the HYDRUS-1D simulation.

The density of chloride measurements from the ROC November 2003 field program is quite good and clearly defines the location of the chloride center of mass at the SB-1 location. The data from the November 2004 event at MW-1 does not allow us to identify the center of chloride mass with the same degree of precision, but for the purposes of our modeling experiment, the data are more than sufficient.

Plate 9 is similar to Plate 7 but more clearly shows that peak measured chloride concentration of the upper chloride center of mass has migrated approximately two feet downward during the 12-month period (November 2003 to November 2004) that separates these two deep sampling programs. We believe that the recent rain events may have temporarily created saturated flow in the upper soil profile moving the chloride into the sand and caliche layer below the upper fractured caliche.

The minimum chloride concentration between the two masses was at a depth of approximately 8-feet bgs in November 2003 and was located at approximately 11-feet bgs in November 2004. The chloride at these depths is within a very fine-grained sand silt featuring little caliche. Considering sampling depth approximations, this suggests a chloride migration rate of two to three feet per year.

The recent precipitation did not affect the downward migration of the peak chloride concentration at 15-feet in the same manner. As Plate 9 implies, the peak chloride concentration is at a depth of 16-feet in 2004, suggesting a migration rate of approximately one foot per year. At 35- to 36-feet bgs we note virtually identical chloride concentrations from both drilling events. At this depth, a hard caliche layer exists and the downward migration of chloride is less than 1-foot per year.

At the 35- to 36-foot depth the low moisture content of the caliche creates extremely low vertical hydraulic conductivities, thus these units act as barriers to vertical flow. Below this caliche layer, chloride concentrations decline to ambient levels.

We conclude that the recent precipitation events have resulted in movement of the upper chloride mass downwards about 2-feet. The minimum chloride concentration has migrated downwards two to three feet. The lower mass of chloride has migrated downwards about one foot through the caliche at this horizon. A lower rate of chloride migration is present at the 35- to 36-foot caliche layer. The rates of chloride migration, when weighted by thickness of soil material, suggest a rate of chloride migration of about one to two feet per year.

The data for the calibration included our acquisition and installation of weather data for Hobbs, New Mexico from October 1, 2003 to November 6, 2004. This data is collected approximately 12 miles south of the spill site because the data from the Lovington Airport is not complete for these dates and this is the closest available weather data to the site. We then began our simulations using weather data for October 2003, when the release actually occurred. We then added the 46 year weather record from the Pearl, New Mexico weather station to create a representative atmospheric file for the HYDRUS-1D simulations.

Our 2004 monitor well boring program allowed us to collect a very detailed description of the vadose zone for the MW-1 boring (See Plate 6). This improved vadose zone profile data was used in all simulations.

Table 1 summarizes the data employed in the final calibration simulation, attached. Appendix D is a CD with the data in a format that will allow the reader to verify the results of the simulations using HYDRUS-1D or a similar code.

4.2 HYDRUS-1D MODEL CALIBRATION

To calibrate the model, we installed the chloride concentration data obtained by ROC at SB-1 in their November 2003 field event as the initial condition. We then ran the model for one year with the November to November Hobbs weather data discussed above. We made slight adjustments to the hydraulic properties in order to calibrate the model predictions to the chloride migration observed in the 2004 MW-1 field data.

Plate 10 adds the predicted chloride concentrations of the calibrated simulation, (line marked with diamonds) to the observed field data shown in Plate 9.

To obtain the match shown in Plate 10 (i.e. to calibrate our HYDRUS-1D simulation) we adjusted the hydraulic properties of the caliche and sand zones such that the center of the upper chloride mass migrated about 1.5 feet downwards from November 2003 to November 2004. In the calibration simulation, the minimum chloride concentration observed at about 8-feet bgs in SB-1 migrated slightly over one foot downwards. The center of the lower chloride mass (15 feet bgs in SB-1) migrated 1.1-feet in the same time interval, about 10 percent more than observed.

We used extremely conservative dispersion coefficients for our calibration, which would tend to over-estimate the resultant chloride concentration in ground water. As stated earlier, we believe that the rate of movement of chloride in the upper ten feet of the soil profile is affected by the weather, such as large rainfall events, rather than the long-term climate of the site. Compounding the effects of day-long rainfall events is the difficulty of accounting for the hydraulic properties of the uppermost fractured caliche bed. These fractures act as aids to flow in saturated conditions and as a hindrance to flow during the unsaturated conditions between severe precipitation events. After infiltrated water (and entrained chloride) passes beyond this uppermost vadose zone, unsaturated flow is the dominant type of transport. Climate, not weather, is the principal influence of this rate of flow.

Because we see a match between the 2004 field chloride concentrations and the predicted chloride concentration of calibrated simulation, we believe that HYDRUS-1D is a reasonable representation of the flow regime. Vertical migration rates and preservation of the two separate chloride concentrations are a good match to field data. In our calibrated HYDRUS-1D simulation, the center of the upper chloride mass migrated about 1.5-feet downwards from November 2003 to November 2004. The minimum chloride concentration has migrated slightly over one foot downwards. The center of the lower chloride mass migrated 1.1-feet in the same time interval, about 10 percent more than observed. We believe that the rate of movement of the lower chloride mass demonstrates a good agreement of the model with the field data because these short-term influences are not active at this depth.

4.3 SIMULATION AND DESIGN OF CORRECTIVE ACTION

Before design of a final corrective action for the site, we evaluated the following possible remedies:

1. Vegetation Cap without any excavation and chloride exportation.
2. Excavation and placement of chloride impacted surface soil beneath a synthetic liner which covers 100% of the site, then covering the liner with imported topsoil and vegetation cap.

3. Excavation and exportation of 35% of the chloride load, which translates to removal of material where the average chloride concentration over the thickness of the impact is greater than about 1,000 mg/kg.

4. Excavation and placement of chloride impacted surface soil beneath synthetic liner strips that would cover 35% of the total spill area, then covering the lined and unlined portions of the spill site with imported topsoil and vegetation cap.

5. The selected remedy:
   a) Excavate and stockpile the areas of high-chloride surface soil that do not currently support vegetation.
   b) Excavate, characterize and segregate by chloride concentration the uppermost 2-feet of the vadose zone that overlies about 35% of the subsurface chloride load. This translates to removal of material where the average chloride concentration over the thickness of the impact is greater than about 1,000 mg/kg (see Plate 6).
   c) Blend clean soil (imported or excavated from the site) with higher chloride stockpiles to create a mixture that will support vegetation (i.e. about 1,000 ppm chloride).
   d) Place a 1-foot thick clay barrier in the excavation in 6-inch lifts such that the saturated hydraulic conductivity of this clay barrier is less than 5×10^{-6} cm/sec.
   e) Place at least 1.5 feet of the blended stockpiled soil and any imported soil over the clay barrier and over the remaining unexcavated portion of the spill to create a small swale that will shed excess precipitation.
   f) Seed the site with native plants and fence the area to enhance re-vegetation.

For the preliminary design of all remedies we employed field-calibrated HYDRUS-1D simulations. We followed the following protocol to calculate and install an average chloride load from the releases. We compiled all of the chloride concentration data from the trench samples, the bore hole samples, and the surface samples. As this data is from different depths at the various locations, we linearly interpolated depth discrete samples for each of the trench sites and each of the bore holes to create complete chloride profiles at each site. We gave these profiles an area weighting allowing for the calculation of an averaged chloride concentration profile representative of the entire spill area. This profile was used in the HYDRUS-1D modeling.

We calibrated the mixing model to the observed conditions in ground water. To do this, we assumed that the pore water in the capillary fringe (from 0- to 8-feet above the water table) equaled the ambient water quality documented by the existing monitoring well, which is about 100 ppm and compared the model output for the first 10 years of the simulation with the observed ground water data. We selected the period 0-10 years for the calibration because we are confident that only true "background" chloride in soil water (from 50- to 90- feet below land surface) is entering the aquifer during this time. In other words, we are confident that chloride from the 1992 release does not enter ground water from years 0-10 in our simulation experiment.

To determine the area of the spill that overlies 35% of the chloride load, we employed the same area-weighting protocol discussed above to map the area planned for the clay barrier. Using this method, we identified a clay barrier strategy that covers 35% of the chloride load by creating a barrier over two areas. The largest area is defined by trenches A, B, and D and MW-1 (see Plate 11). A smaller area defined by SB-3 and trench I completes this cover strategy.

Table 2 summarizes the output of the simulation experiments. HYDRUS-1D predicts that only the vegetative cap remedy allows chloride concentrations above the state standard of 250 mg/L for the imaginary well with a 10-foot screen located at the edge of the spill site. Because of the simulation methodology will exaggerate the chloride concentration in ground water, we are confident that the predicted maximum chloride in the imaginary well is what we say: a maximum concen-

Table 2. Simulation experiment outputs

Remedy	Maximum Chloride Concentration (mg/l)			Duration of ground water chloride conentration above 250 mg/l (yrs.)	Time from present to Max. Concentration (yrs.)
	10 ft screen	*40 ft screen*	*100 ft screen*	*10 ft screen*	
Vegetative Cap only	405	188	137	19	29
Synthetic Barrier over 100% of the spill area, cover with topsoil and vegetative cap	100	100	100	0	Not Applicable
Excavtion and Exportation of 35% of the chloride load	243	140	116	0	29
Excavation of surface chloride and placement of synthetic barriers over 35% of the spill area and	243	140	116	0	29
Excavation of upper 3-feet. Replace with 1-foot of clay underlying 1.5 foot of loam and	243	140	116	0	29

tration. At other sites, we have found that chloride is distributed throughout the underlying aquifer provided that geologic barriers to flow, such as silt-clay horizons, do not exist. At this site, MW-1 did not detect such barriers within the uppermost 30-feet of the saturated zone and the screened interval of nearby supply wells is 20- to 100-feet. Table 2 includes an evaluation of different mixing zones.

For the selected remedy, the simulated response of an imaginary monitoring well located at the edge of the spill that draws from an aquifer with a 10-foot thick mixing zone is shown below in Figure 3. After year 10, the chloride from the 1992 begins to enter ground water. After year 50, the released chloride from below the vegegative cap has effectively moved through the vadose zone. Released chloride that lies below the clay barrier is effectively sequestered in the vadose zone for more than a century. The maximum predicted chloride concentration in ground water caused by the slow release from beneath the clay barrier is less than 105 ppm, which is observed more than 410 years from now.

Although installation of a synthetic liner over 100% of the spill area permanently sequesters the chloride in the upper vadose zone and results in a better simulation result, we did not select this option. This remedy demands that the liner maintain integrity for hundreds of years. We favored the clay liner remedy which allows a very slow release of chloride to ground water that remains compliant with NMOCD Rules.

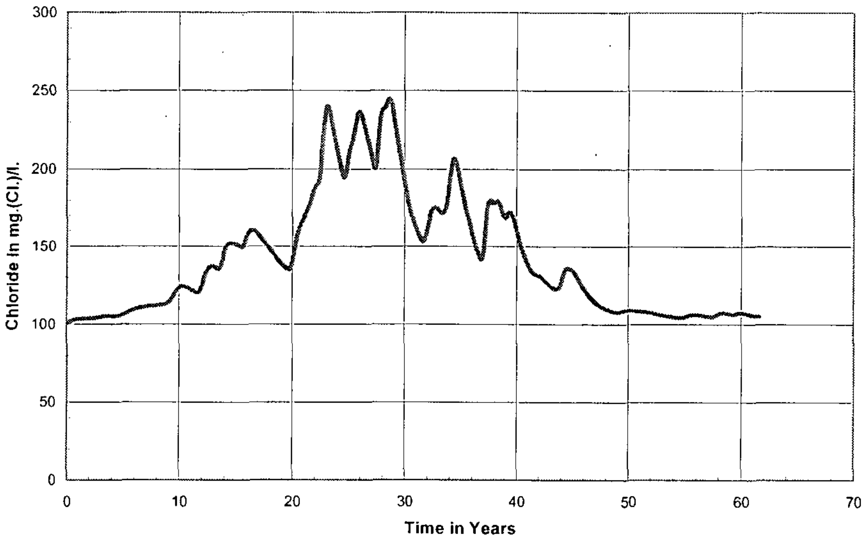


Figure 3. Chloride concentration in the aquifer for the Abo 1G Release Site, averaged chloride load from entire site, vegetation, 35% clay cap

4.4 SCHEDULE

Sixty days after NMOCD approval of this remedy, we will submit detailed plans and specifications for this remedy. The plans will include hydraulic conductivity testing of the material selected for the clay barrier, a plot plan showing the area to be capped with clay, a detailed description of the proposed field methods, a quality assurance plan for the remedy, and a post-remedy monitoring plan. Thirty days after NMOCD approval of the detailed plans, ROC will begin field activities to implement the remedy, with completion of the remedy 60 days after NMOCD approval of the detailed plans.

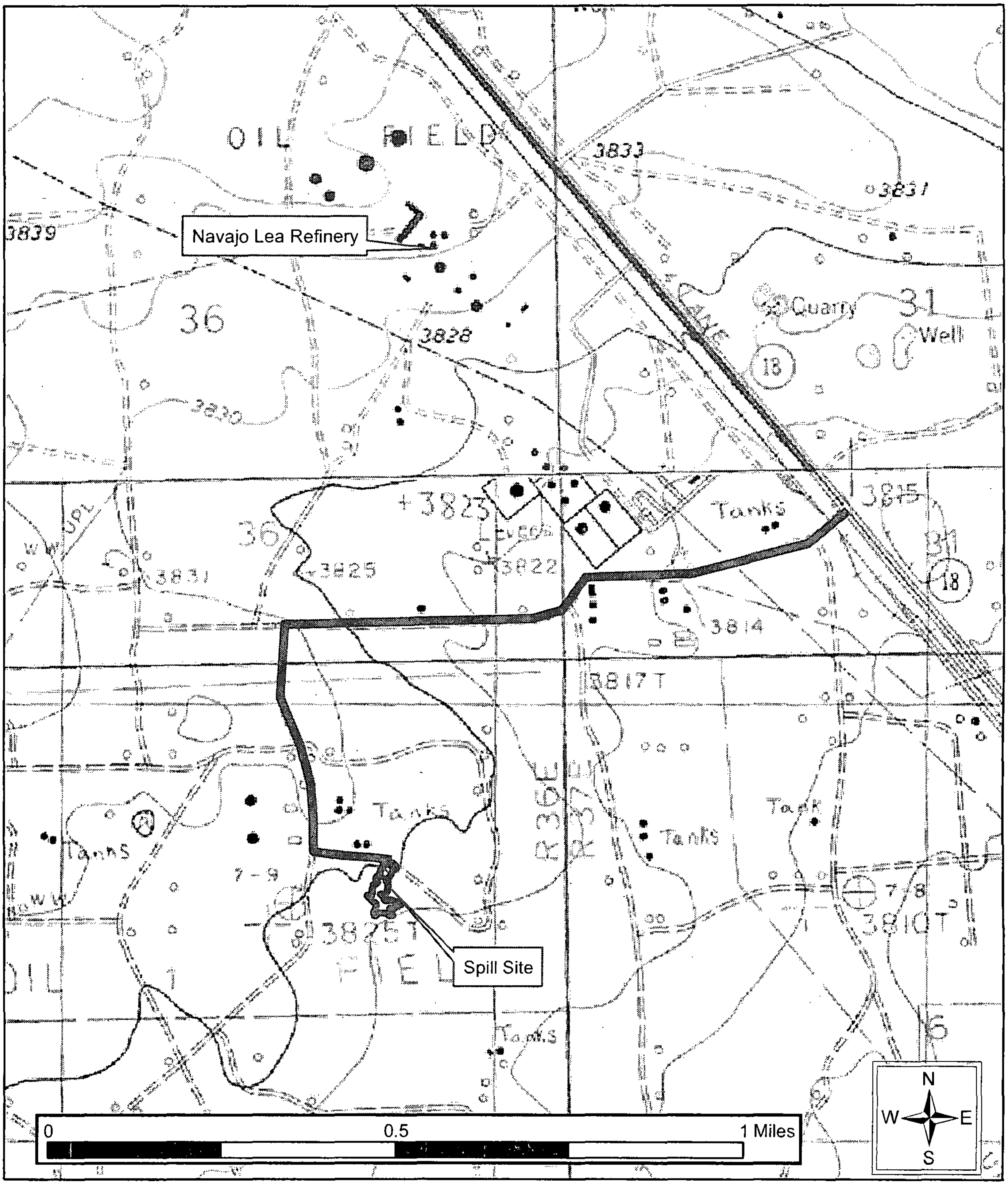
TABLES

Table 1: Input Parameters for Simulation Modeling

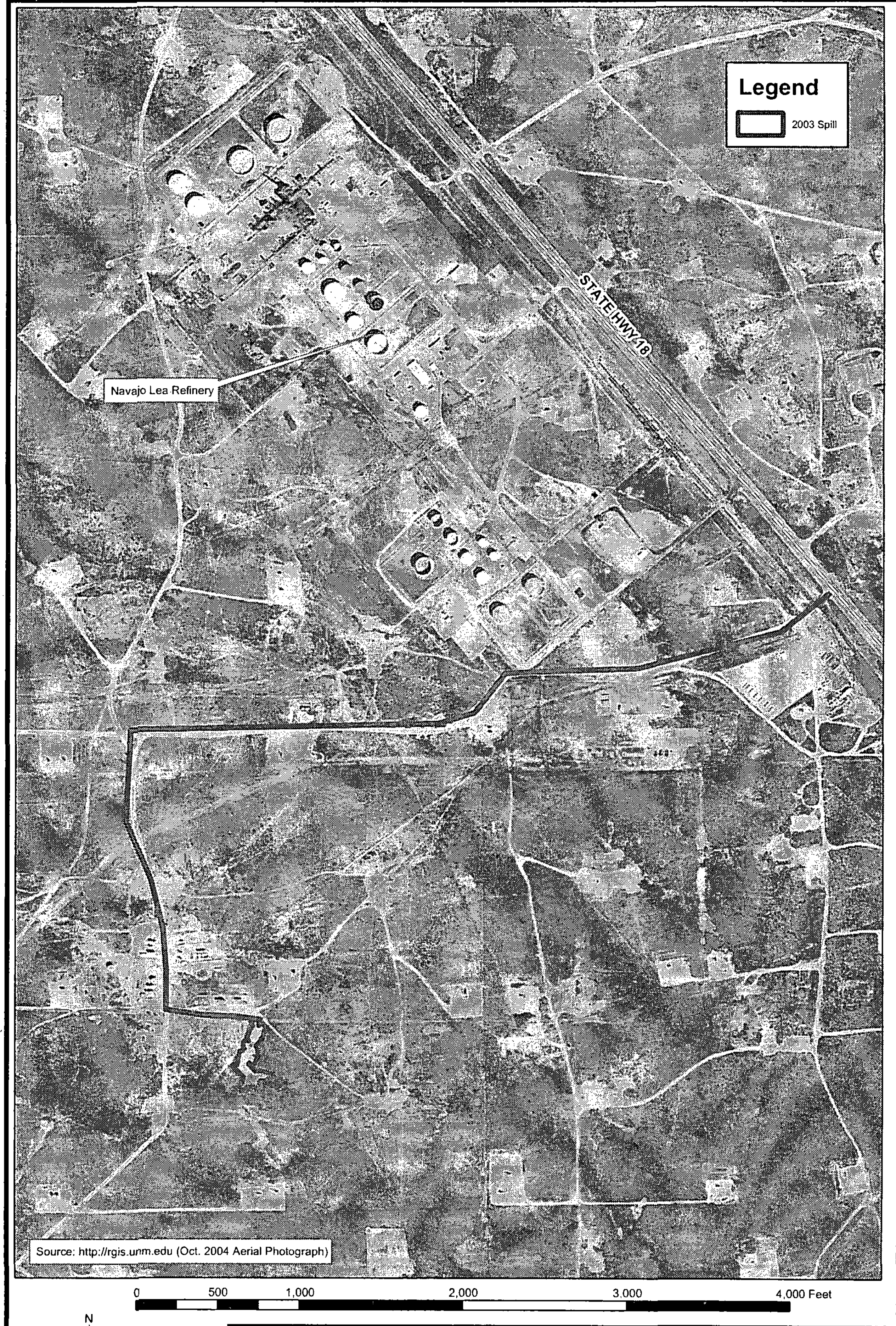
Input Parameter	**Source**
1. Vadose Zone Thickness – 91 feet	Appendix A well logs
2. Vadose Zone Texture – Plate 6	Samples and attached well logs
3. Dispersion Length - < 10%	Professional judgment
4. Soil Moisture	HYDRUS-1D initial condition simulation
5. Chloride in release – 19,994 ppm	Samples of produced water
6. Height of spill on land surface –1.0 inches	Calculated from chloride load at sampling location SB-3 and chloride in released water
7. Length of release parallel to ground water flow – 477 ft	Field Measurements
8. Climate – Arid	Pearl Weather Station near Hobbs Airport
9. Background Chloride in Ground Water – 100 ppm	Professional judgment
10. Ground Water Flux – 10 cm/day	Calculated from published data and the Lea Refinery Report
11. Aquifer Thickness – 10 feet	NMOCD suggestion

PLATES

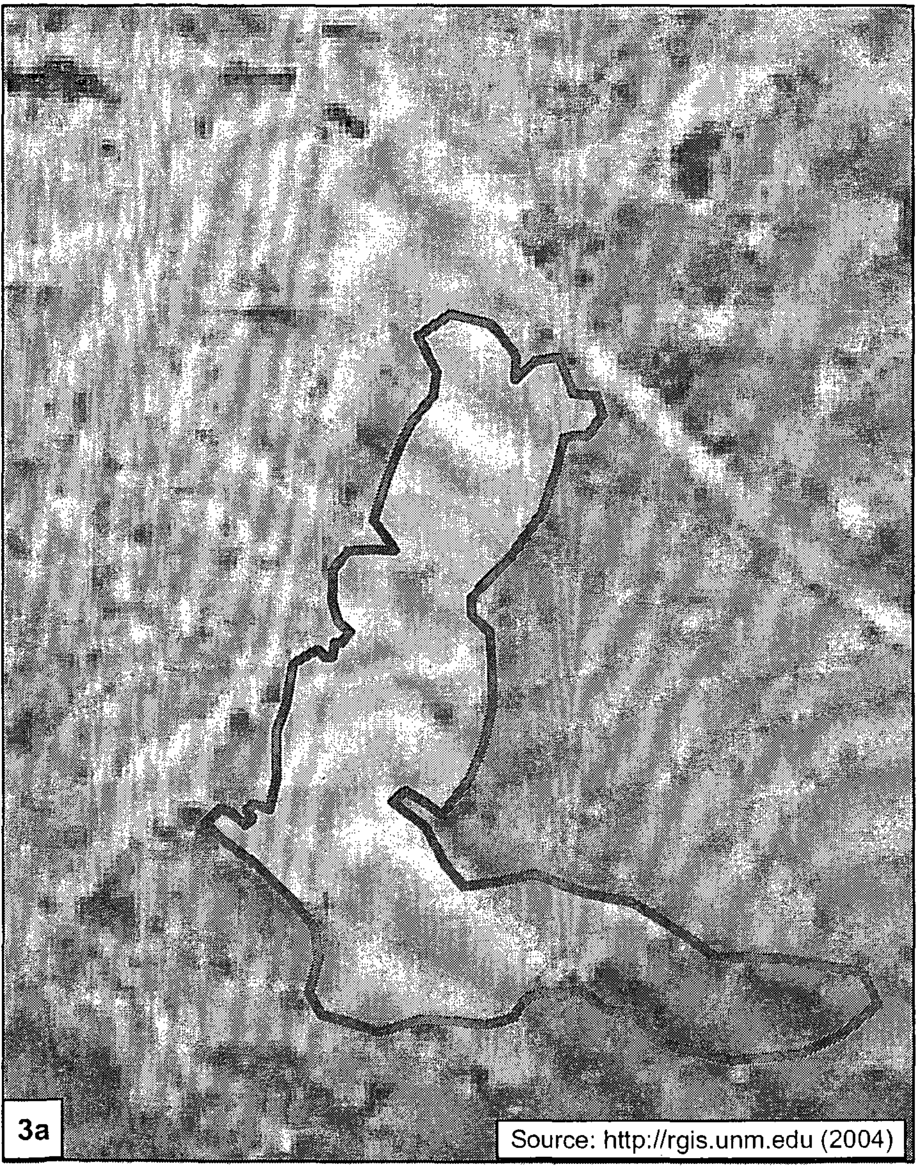
Directions: From Lovington, NM, proceed on Highway 18 for approximatly 5.3 miles. Head southwest on an unnamed dirt road (0.5 miles southeast of the Navajo Lea Refinery. Proceed on the dirt road for approximately 0.8 miles. Head south on an unamed dirt road for approximately 0.3 miles. Head east on an unnamed dirt road immediatley south of a tank battery. Proceed east for approximately 550 feet. The spill site is on the south side of the road.



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Site Location Map (USGS Lovington SE 7.5' Quad)	Plate 1
	ABO 1G Realease Site, OCD Case #1R0415	August 2005



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Location of Realese and Sourrounds	Plate 2
	ABO 1G Realease Site, OCD Case #1R0415	August 2005


3a

Source: http://rgis.unm.edu (2004)


3b

Source: http://rgis.unm.edu (1996-1998)

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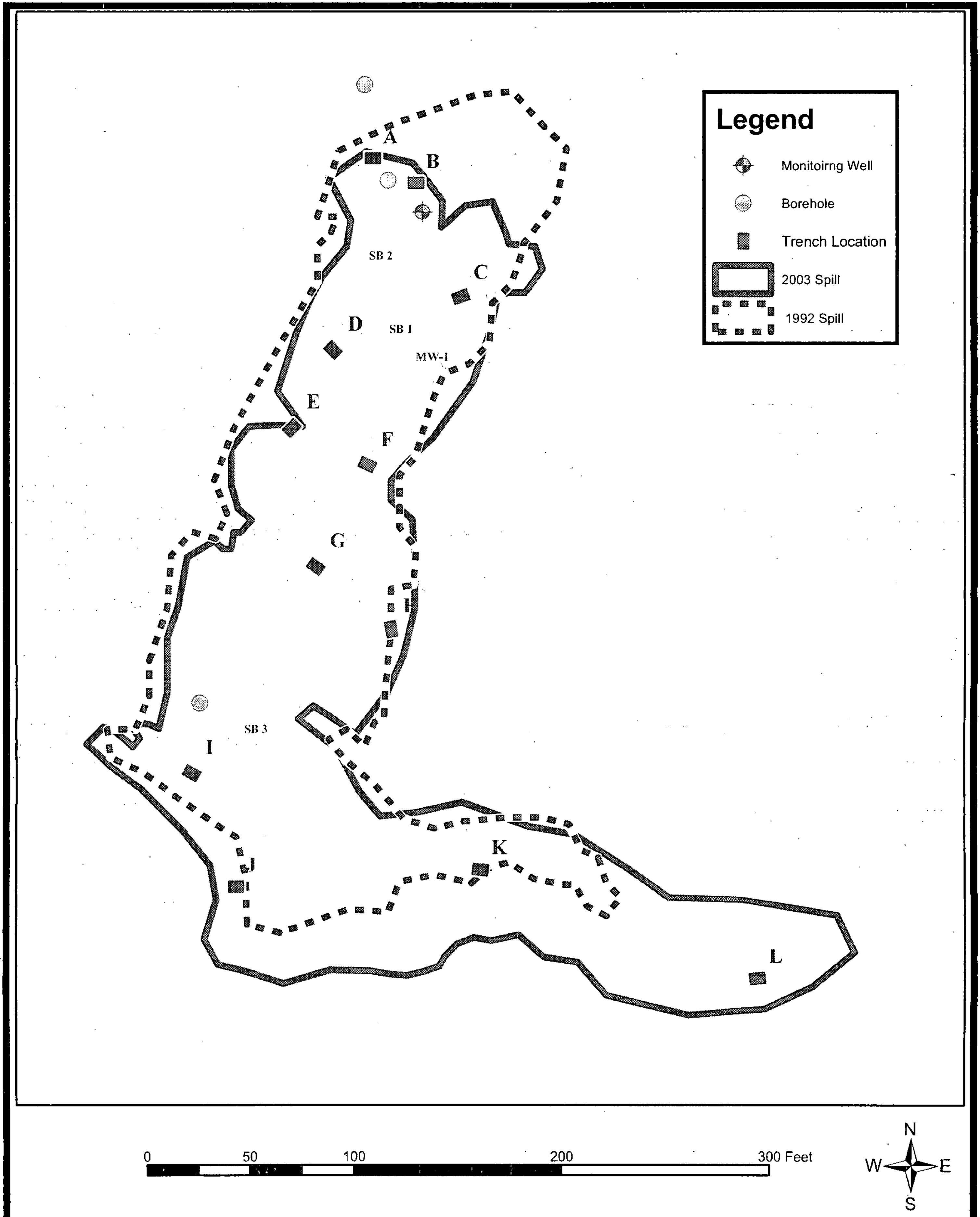
Albuquerque, NM 87104
Ph: 505.266.5004

Geometry of 2003 and 1992 Releases

ABO 1G Realease Site, OCD Case #1R0415

Plates 3a & 3b

August 2005



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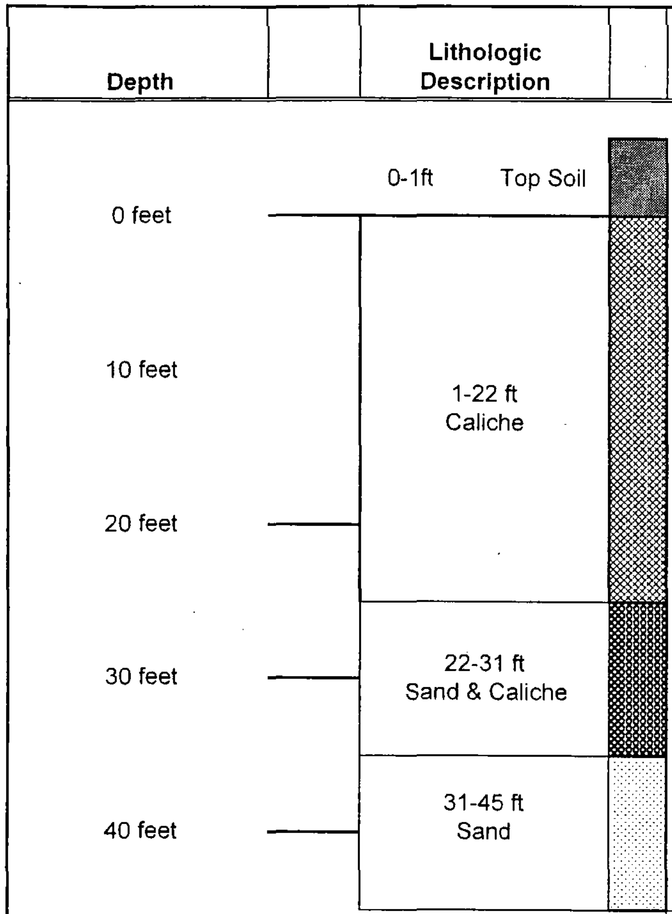
Albuquerque, NM 87104
Ph: 505.266.5004

Geometry of 1992 & 2003 Releases with Trenches, Soil Borings & Monitoring Well

Plate 4

ABO 1G Realease Site, OCD Case #1R0415

August 2005



Measured Soil Chloride Concentration mg/kg	Bulk Density of Sample kg/m3	Thickness of Column (ft)	Calculated Chloride Mass in Column (kg/m2)
525	1858	10	3.23
1088	1858	11	7.37
1161	1858	5	3.57
636	1858	4	1.57
573	1858	7	2.47
236	1858	7	1.02
Calculated Chloride Load			19.22

R.T. Hicks Consultants
901 Rio Grande NW
Albuquerque, NM

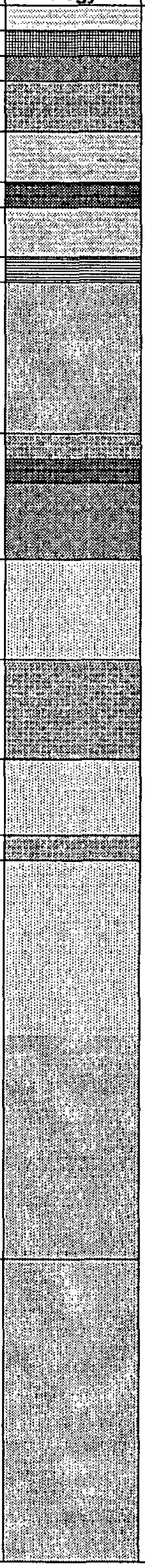
RICE *Operating Company*

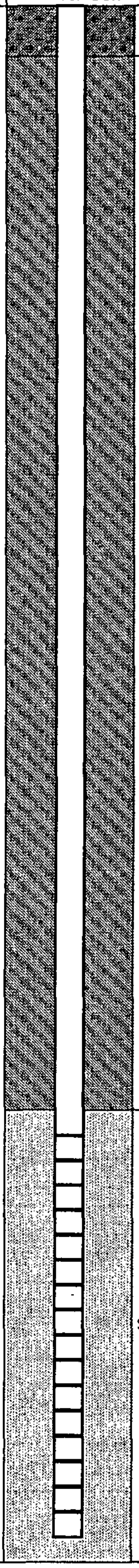
Soil Bore #1 - Calculation of Chloride Load, Abo Leak, Lea County, New Mexico

Plate 5

Aug-05

Logger:	David Hamilton	**Client:**	**Well ID:**
Driller:	Eades Drilling	ROC	LA MW-1
Drilling Method:	Air Rotary	**Project Name:**	
Start Date:	11/5/2004	Abo Apache LA 1-G Release Site	
End Date:	11/6/2004	**Location:**	
		Section 1, 17S, 36E, Unit 1G	





Depth (feet)	Description	Comments	Well Construction
0.0	Surface, 0 - .5 feet	Hard drilling	Cement, 0-3 feet
2.0	Frac. caliche, sand, clay, .5 - 3 feet, tan		
4.0	Sand and caliche, 3 - 5 feet, tan		Hydrated bentonite, 3-87 feet
6.0	Very fine grained sand, silt, some caliche, 5 - 10 feet, tan		
8.0			
10.0	Very fine grained sand, silt, little caliche, 10 - 15 feet, tan		
12.0			
14.0	Indurated caliche, 15 - 17 feet		
16.0	Very fine grained sand, silt, little caliche, 17 - 20 feet		
18.0			
20.0	Thin caliche layers in sand, 20 - 22 feet		
22.0	Very fine grained sand, silt, 22 - 33 feet, tan with reddish tinge		
24.0			
26.0			
28.0		Samples fell out of spoon, collected with shovel	
30.0			
32.0			
34.0	Very fine grained sand, silt, caliche , 33 -44 feet, light tan. Well indurated caliche layer from 35 to 36 feet.		
36.0			
38.0			
40.0			
42.0			
44.0	Very fine grained sand, silt, 44 - 53 feet, tan		
46.0			
48.0			
50.0			
52.0	Very fine grained sand, silt, some caliche, 53 - 60 feet, tan		
54.0			
56.0			
58.0			
60.0	Very fine grained sand, silt, 60 - 67 feet, tan		
62.0			
64.0			
66.0	Indurated sand, silt, 67 - 68 feet	Hard drilling	
68.0	Very fine grained sand, silt, 68 - 100 feet tan. Slightly redder below 83 feet.		
70.0			
72.0			
74.0			
76.0			
78.0			
80.0			
82.0			
84.0			
86.0			
88.0			Sand, 87-122 feet
90.0			
92.0			
94.0			
96.0		Soil moist at 100 feet	
98.0			
100.0	Very fine grained sand, silt, 100 - 122 feet		
102.0			
104.0			
106.0			
108.0		Hole was drilled with water below 100 feet due to borehole collapse	
110.0			
112.0			
114.0			
116.0			
118.0			
120.0			
122.0			

Field data		
Depth	Chloride mg/kg	PID
6.0	1245	6.3
11.0	553	7.3
16.0	1307	5.2
21.0	905	8.2
26.0	741	1.1
31.0	493	0.8
36.0	566	0.8
41.0	126	3.3
46.0	83	2.0
51.0	49	1.0
61.0	59	2.4
71.0	50	2.9
81.0	59	3.7
91.0	55	2.7

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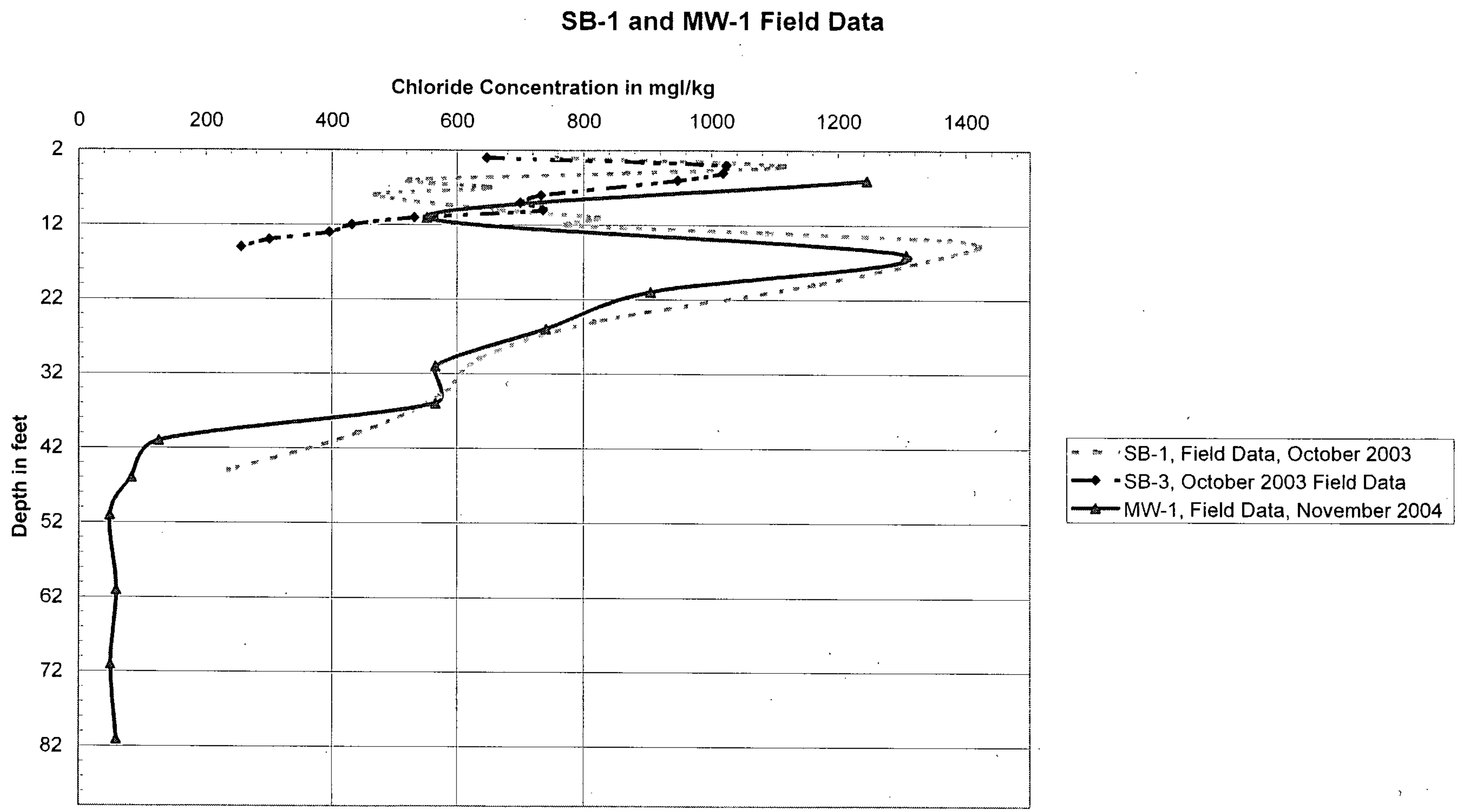
505-266-5004

ROC Lovington Abo 1-G Site

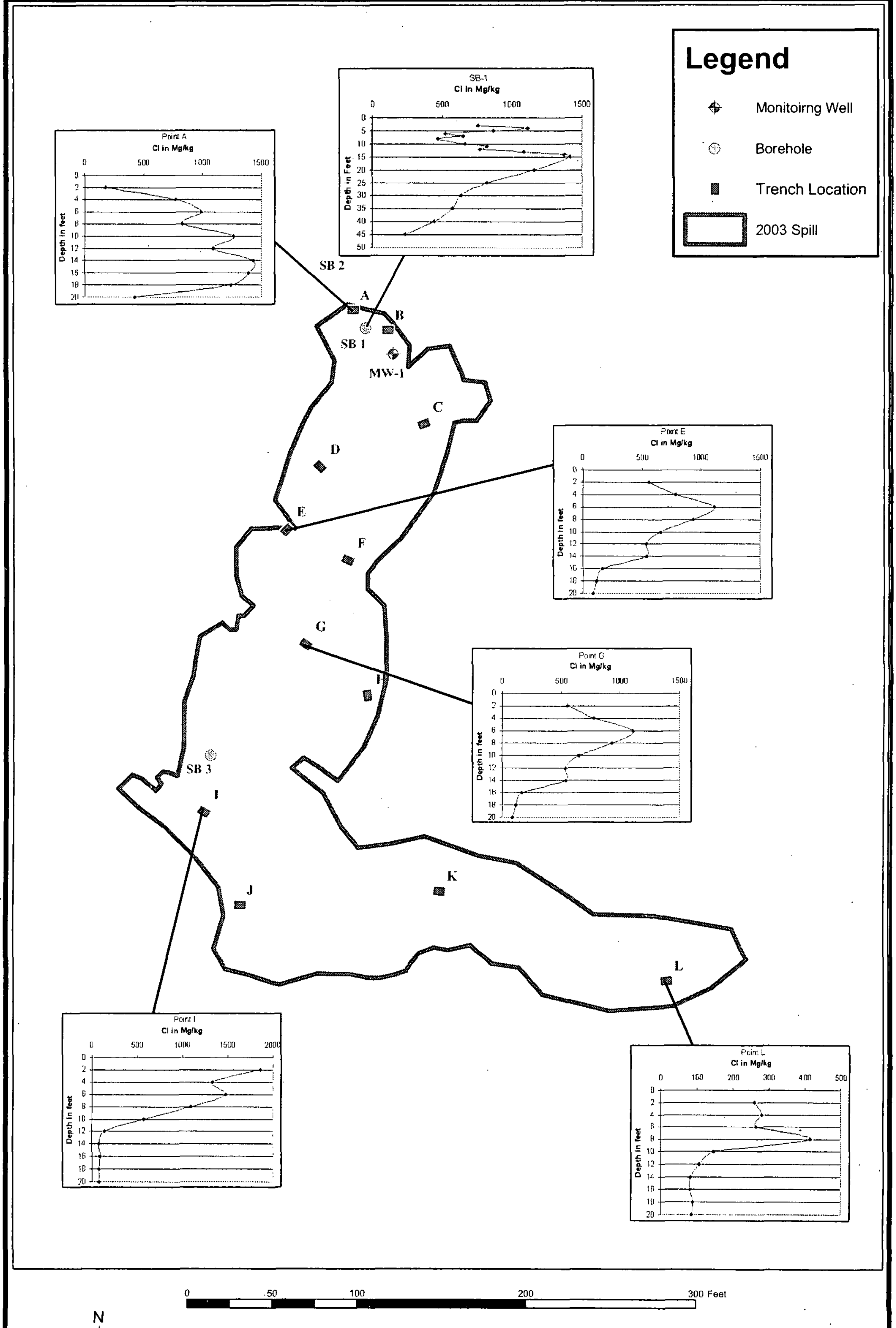
Monitoring Well Boring

Plate 6

August 2005



R.T. Hicks Consultants, Ltd. 901 Rio Grande Blvd. NW, Suite F-142 Albuquerque, New Mexico 87104	**Chloride Loading in SB-1 and MW-1 Field Data**	**Plate 7**
	Abo 1G Release Site, NMOCD Case #1RO415	**Aug-05**



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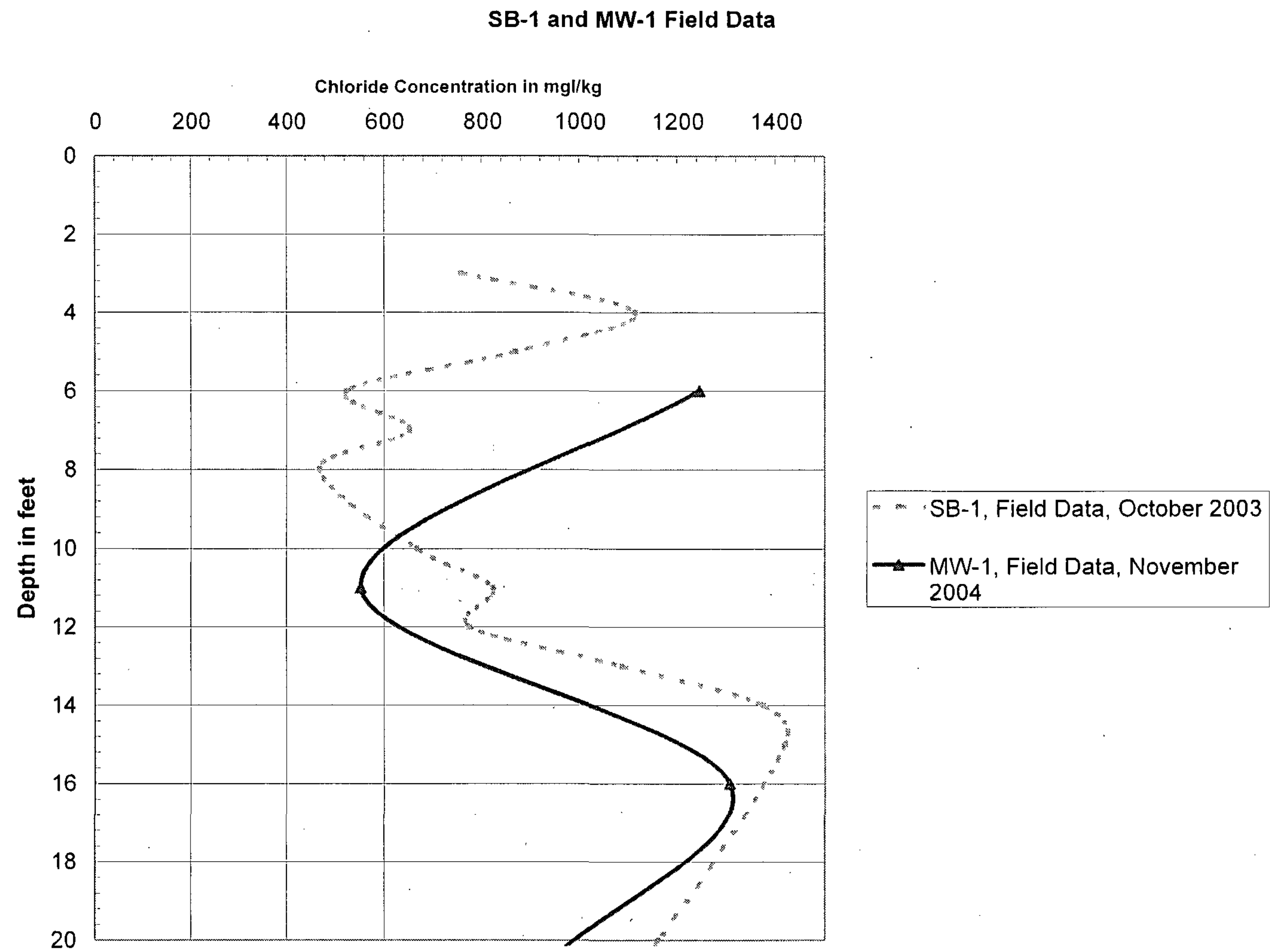
Albuquerque, NM 87104
Ph: 505.266.5004

Geometry of 2003 Release with Trenches, Soil Borings & Monitoring Well and selected graphs

Plate 8

ABO 1G Realease Site, OCD Case #1R0415

August 2005



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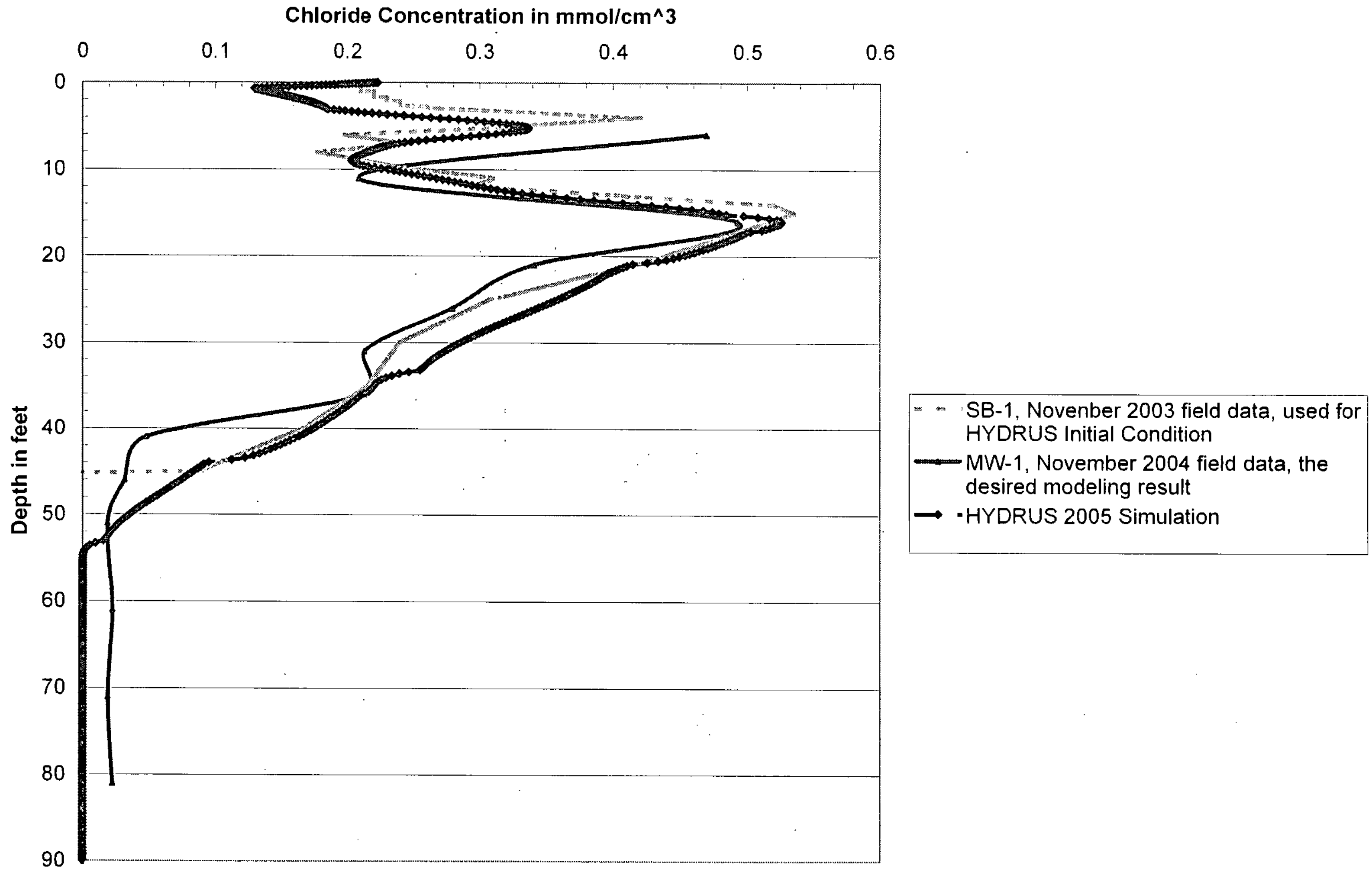
Albuquerque, New Mexico 87104

Detail of Chloride Loading in SB-1 and MW-1 Field Data

Abo 1G Release Site, NMOCD Case #1RO415

Plate 9

Aug-05



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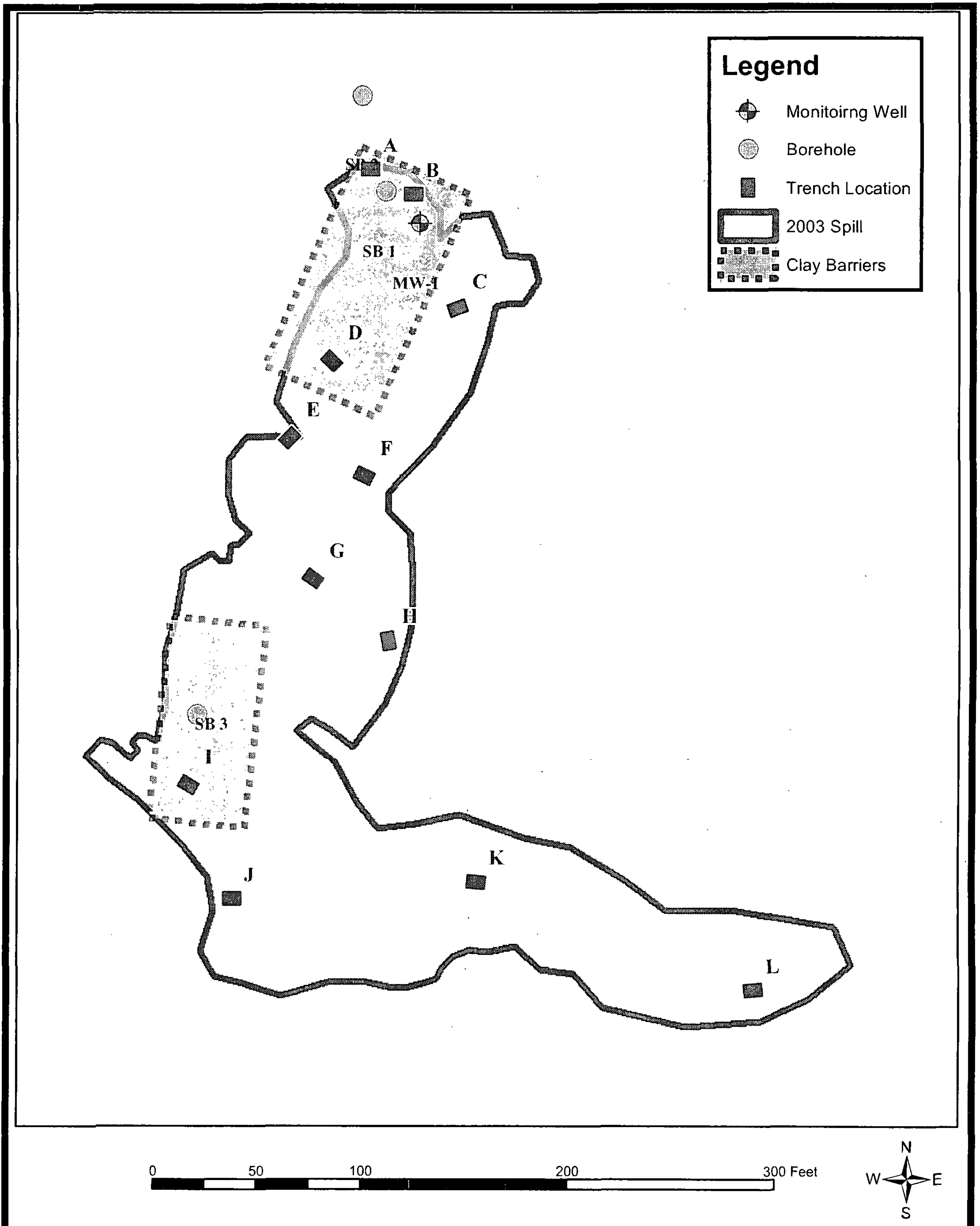
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, New Mexico 87104

Comparison of HYDRUS 1D Modeling with Field Data

Abo 1G Release Site, NMOCD Case #1RO415

Plate 10

Aug-05



R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

Areas Proposed for Clay Barriers

Plate 11

ABO 1G Realease Site, OCD Case #1R0415

August 2005

APPENDIX A

Form WR-23

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

# 5	m 730	-20-	13
OPN	25-	1350	

(Plat of 640 acres)

(A) Owner of well Jack Gayton

Street and Number Box 1021

City Lovington State New Mexico

Well was drilled under Permit No. L-2490-1716 and is located in the NW ¼ NW ¼ SE SE ¼ of Section 2 Twp. 17 S Rge. 36 E

(B) Drilling Contractor Gayton & Porter License No. WD-163

Street and Number Box 1021

City Lovington State New Mexico

Drilling was commenced Sept. 1 19 55

Drilling was completed Sept. 2 19 55

Elevation at top of casing in feet above sea level ________ Total depth of well 145

State whether well is shallow or artesian Shallow Depth to water upon completion 59

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation
	From	To		
1	77	92	15	Water Sand
2				
3				
4				
5				

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth		Feet	Type Shoe	Perforations	
			Top	Bottom			From	To

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet		Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
From	To				

Section 5 PLUGGING RECORD

Name of Plugging Contractor ________ License No. ________

Street and Number ________ City ________ State ________

Tons of Clay used ________ Tons of Roughage used ________ Type of roughage ________

Plugging method used ________ Date Plugged ________ 19____

Plugging approved by:

____
Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug		No. of Sacks Used
	From	To	

FOR USE OF STATE ENGINEER ONLY

Date Received SEP 15 1955

OFFICE

[illegible]

File No. L-2490 1716 Use Irrig Location No. 12362

Section 6

LOG OF WELL

Depth in Feet		Thickness in Feet	Color	Type of Material Encountered
From	To			
0	1	1		Soil
1	7	6		Rock
7	16	9		Caliche
16	20	4		Boulder
20	26	6		Sand Rock
26	45	19		Sand
45	70	25		Water Sand
70	77	7		Calcium Sand
77	92	15		Quick Sand
92	106	14		Sandy Clay
106	108	2		Sand
108	112	4		Rock
112	134	22		Sandy Clay
134	143	9		Sand
143	145	2		Sandy Clay

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Well Driller

LOG FILED

(This form to be executed in triplicate)

WELL RECORD

Renumbered L-4058
Feb 2
1959

Date of Receipt .... Permit No. L-455A

Name of permittee, Lovington Municipal Utilities

Street or P.O., ..., City and State Lovington, New Mexico

1. Well location and description: The shallow (shallow or artesian) well is located in .... ¼, [illegible] ¼,

Lot 9 .... ¼ of Section 4, Township 16, Range 36; Elevation of top of casing above sea level, 3979 feet; diameter of hole, 16 inches; total depth, 127 feet; depth to water upon completion, 58 feet; drilling was commenced June 2, 19 52, and completed June 4, 19 52; name of drilling contractor Aqua Drilling Co.

Box 1004; Address, Lovington, N.M.; Driller's License No. WD 35

2. Principal Water-bearing Strata:

	Depth in Feet From	To	Thickness	Description of Water-bearing Formation
No. 1	58	59	1	Water Sand
No. 2	69	71	2	Water Sand
No. 3	82	86	4	Quick Sand & Water
No. 4	112	116	4	Water Sand & Shale
No. 5				

3. Casing Record:

Diameter in inches	Pounds per ft.	Threads per inch	Depth of Casing or Liner Top	Bottom	Feet of Casing	Type of Shoe	Perforations From	To

RECEIVED
OCT 27 1952
STATE ENGINEER

4. If above construction replaces old well to be abandoned, give location: .... ¼, ... ¼, ... ¼ of Section ...., Township ...., Range ....; name and address of plugging contractor, ...

date of plugging .... 19 .... describe how well was plugged: ....

FILED
OCT [illegible] 1952
OFFICE
ARTESIAN WELL SUPERVISOR
ROSWELL, NEW MEXICO

FILED
[illegible]
OFFICE
[illegible]
ROSWELL, NEW MEXICO

5. Log of Well:

Depth in feet		Thickness in feet	Description of Formation
From	To		
0	2	2	Soil
2	26	24	Caliche & Lime Shale
26	58	32	Sandy Shale
58	59	1	Water Sand
59	69	10	Sand & Shale
69	71	2	Water Sand & Shale
71	82	11	Sand Shale with Streaks of Clay
82	86	4	Quick Sand & Water
86	112	26	Sand & Shale
112	116	4	Tight Water Sand & Clay Shale
116	127	11	Sandy Shale

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Licensed Well Driller

Instructions

This form shall be executed, preferably typewritten, in triplicate and filed with the State Engineer's Office at Roswell, New Mexico, within 10 days after drilling has been completed. Data on water-bearing strata and on all formations encountered should be as complete and accurate as possible.

(This form to be executed in triplicate)

WELL RECORD

Date of Receipt ______________ Permit No. L-265

Name of permittee, Ernest Mahan

Street or P.O., Box 32, City and State Lovington, N. M.

1. Well location and description: The shallow (shallow or artesian) well is located in NW ¼, NW ¼,

SW ¼ of Section 11, Township 16 S, Range 36 E; Elevation of top of

casing above sea level, ______ feet; diameter of hole, 16 inches; total depth, 120 feet;

depth to water upon completion, 45 feet; drilling was commenced Jan. 8 19 48,

and completed Jan. 9, 1948; name of drilling contractor Abbott Bros.

______; Address, Box 637, Hobbs, N. M.; Driller's License No. WD-46

2. Principal Water-bearing Strata:

	Depth in Feet From	To	Thickness	Description of Water-bearing Formation
No. 1	45	120	75	Water sand
No. 2				
No. 3				
No. 4				
No. 5				

3. Casing Record:

Diameter in inches	Pounds per ft.	Threads per inch	Depth of Casing or Liner Top	Bottom	Feet of Casing	Type of Shoe	Perforations From	To
NONE								

4. If above construction replaces old well to be abandoned, give location: ______ ¼, ______ ¼, ______ ¼

of Section ______, Township ______, Range ______; name and address of plugging contractor,

______

______

date of plugging ______, 19____; describe how well was plugged: ______

FILED
JAN 11 1952
OFFICE
ARTESIAN WELL SUPERVISOR
ROSWELL, NEW MEXICO

5. Log of Well:

Depth in feet		Thickness in feet	Description of Formation
From	To		
0	4	4	Soil
4	35	31	Caliche
35	45	10	Hard shell
45	120	75	Water sand

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Clyde [illegible]
Licensed Well Driller

Instructions

This form shall be executed, preferably typewritten, in triplicate and filed with the State Engineer's Office at Roswell, New Mexico, within 10 days after drilling has been completed. Data on water-bearing strata and on all formations encountered should be as complete and accurate as possible.

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Hulda Heidel Owner's Well No.
Street or Post Office Address 1018 West Avenue K
City and State Lovington, New Nexico 88260

Well was drilled under Permit No. L-135 enlarged L-135S and is located in the:

a. ___ ¼ ___ ¼ ___ ¼ NW ¼ of Section 11 Township 16S Range 36E N.M.P.M.

b. Tract No. ___ of Map No. ___ of the ___

c. Lot No. ___ of Block No. ___ of the ___
Subdivision, recorded in Lea County.

d. X= ___ feet, Y= ___ feet, N.M. Coordinate System ___ Zone in the ___ Grant.

(B) Drilling Contractor Abbott Bros. License No. WD-46

Address P.O. Box 637, Hobbs, New Mexico 88240

Drilling Began 3/17/77 Completed 3/22/77 Type tools Cable Size of hole 16 in.

Elevation of land surface or ___ at well is ___ ft. Total depth of well 146 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 58 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
58	146	88	Sand	

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
12 3/4"	43	Welded	0	146	146	None	66	146

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 5. PLUGGING RECORD

Plugging Contractor ___
Address ___
Plugging Method ___
Date Well Plugged ___
Plugging approved by:

___
State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received June 14, 1977

Quad ___ FWL ___ FSL ___

Supplemental

✓ File No. L-135 & L-135-Enlgd-S Use Irr Location No. 16.36.11. [illegible]

Section 6. LOG OF HOLE

Depth in Feet		Thickness in Feet	Color and Type of Material Encountered
From	To		
0	2	2	Surface soil
2	26	24	Caliche
26	58	32	Sand-tight
58	112	54	Sand-water
112	128	16	Sand-tight
128	146	18	Sand-water

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Murrell Abbott
Driller H.B.

Form WR-23

STATE ENGINEER OFFICE

FIELD ENGR. LOG

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

(Plat of 640 acres)

(A) Owner of well J.W. Taylor Jr.
Street and Number P.O.
City Hope State New Mex.
Well was drilled under Permit No. Comer Ludgens Enlgd. L-135 and is located in the
N.W.1/4 S.W.1/4 N.W.1/4 of Section II Twp. 16So Rge. 36 E.
(B) Drilling Contractor C.O. Aldredge License No. W.D.79
Street and Number Box ~~52~~ 379
City LOvington State New Mex.
Drilling was commenced Mar. I4 19 64
Drilling was completed Mar.I6 19 64

Elevation at top of casing in feet above sea level ______ Total depth of well II0 Ft
State whether well is shallow or artesian Shallow Depth to water upon completion 75

Section 2

PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation
	From	To		
1	95	II0	I5	Small crystlized sand rock & quick sand
2				
3				
4				
5				

Section 3

RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth		Feet	Type Shoe	Perforations	
			Top	Bottom			From	To
			Not	cased				

Section 4

RECORD OF MUDDING AND CEMENTING

Depth in Feet		Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
From	To				
		I6			2 sacks of drilling mud used to
					hold quick sand back
					while cleaning out well

Section 5

PLUGGING RECORD

Name of Plugging Contractor ______ License No. ______
Street and Number ______ City ______ State ______
Tons of Clay used ______ Tons of Roughage used ______ Type of roughage ______
Plugging method used ______ Date Plugged ______ 19 ______
Plugging approved by:

______
Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug		No. of Sacks Used
	From	To	

FOR USE OF STATE ENGINEER ONLY

Date Received ✓

File No. L-135-Enlgd. Use Irr Location No. 16.36.11.131

Section 6

LOG OF WELL

Depth in Feet		Thickness in Feet	Color	Type of Material Encountered
From	To			
95	IIO	15	red	small crystalized sand rock

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

C. O. Aldredge
Well Driller

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well City of Lovington Owner's Well No. L-9517
Street or Post Office Address P.O. Box 1268
City and State Lovington, N.M. 88260

Well was drilled under Permit No. L 9517 and is located in the:

a. SESE ¼ NE ¼ ~~SE~~SW ¼ SW ¼ of Section 3 Township 16S Range 36E N.M.P.M.

b. Tract No. ______ of Map No. ______ of the ______

c. Lot No. ______ of Block No. ______ of the ______
Subdivision, recorded in ______ County.

d. X= ______ feet, Y= ______ feet, N.M. Coordinate System ______ Zone in the ______ Grant.

(B) Drilling Contractor Gene Eades License No. WD982

Address Rt. 4 Tahoka, Tx. 79373

Drilling Began 11-27-84 Completed 11-27-84 Type tools Rotary Size of hole 8 in.

Elevation of land surface or ______ at well is ______ ft. Total depth of well 138 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 66 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
66	138	72	Brown water sand w/ sandstone stringers	30

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
5 3/4	160 psi,				134		118	138
5 3/4	Sch. 40 steel for pitless adapter				4			

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 5. PLUGGING RECORD

Plugging Contractor ______
Address ______
Plugging Method ______
Date Well Plugged ______
Plugging approved by:

______
State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received December 10, 1984

Quad ______ FWL ______ FSL ______

File No. L-9517

Use Drinking/Sanitary Location No. 16.36.3.33244

Section 6. LOG OF HOLE

Depth in Feet		Thickness in Feet	Color and Type of Material Encountered
From	To		
0	3	3	Top soil
3	15	12	Caliche
15	21	6	Sandy clay
21	40	19	Sandy clay & sandstone
40	65	25	Sand & sandstone
65	66	1	Hard sandstone
66	138	72	Brown water sand

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Driller

Form WR-23

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

(Plat of 640 acres)

(A) Owner of well City of Lovington
Street and Number Box 1168
City Lovington State New Mexico
Well was drilled under Permit No. L - 5356 and is located in the
[illegible] ¼ [illegible] ¼ ¼ of Section 3 Twp. 16 S Rge. 36 E
(B) Drilling Contractor Grady Backus License No. W. D. 322
Street and Number Box 791
City Lovington State New Mexico
Drilling was commenced April 8 19 64
Drilling was completed April 12 19 64

Elevation at top of casing in feet above sea level -- Total depth of well 164 ft.
State whether well is shallow or artesian Shallow Depth to water upon completion 70 ft.

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation
	From	To		
1	70	84	14 ft.	Sand
2	112	122	10 ft.	Sand
3	138	146	8 ft.	Water Sand
4	153	158	5 ft.	Water Sand
5				

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth		Feet	Type Shoe	Perforations	
			Top	Bottom			From	To
12 in.	30		0	164	164 ft		[illegible]	164

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet		Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
From	To				

Section 5 PLUGGING RECORD

Name of Plugging Contractor License No.
Street and Number City State
Tons of Clay used Tons of Roughage used Type of roughage
Plugging method used Date Plugged 19
Plugging approved by:

Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug		No. of Sacks Used
	From	To	

FOR USE OF STATE ENGINEER ONLY

Date Received 1964 APR 28 AM 8:37

File No. L-5356 Use Expl. Location No. 16.36.3.400

Section 6

LOG OF WELL

Depth in Feet		Thickness in Feet	Color	Type of Material Encountered
From	To			
0	1	1 ft.		Soil
1	4	3 ft.		Rock
4	18	14 ft.		Caliche
18	62	44 ft.		Sand
62	70	8 ft.		Sand Stone
70	84	14 ft.		Sand
84	98	14 ft.		Sand & Calcum
98	112	14 ft.		Sandy Clay
112	120	8 ft.		Sand
120	138	18 ft.		Sandy Clay
138	146	8 ft.		Water Sand
146	153	7 ft.		Sandy Clay
153	158	5 ft.		Sand
158	164	6 ft.		Sandy Clay

The undersigned hereby certifies that; to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Well Driller

Form WR-23 Orig-in S.F.

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

(Plat of 640 acres)

(A) Owner of well City of Lovington

Street and Number

City Lovington State New Mexico

Well was drilled under Permit No. L-3901 and is located in the S W ¼ N W ¼ S E ¼ ¼ of Section 10 Twp. 16 S Rge. 36 E

(B) Drilling Contractor Clayton Drlg. Co. License No. WD-183

Street and Number Box 1121

City Lovington State New Mexico

Drilling was commenced June 25 1958

Drilling was completed June 28 1958

Elevation at top of casing in feet above sea level Total depth of well 104 ft.

State whether well is shallow or artesian Shallow Depth to water upon completion 66 ft.

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation
	From	To		
1	66	74	8	Water Sand
2	82	90	8	Quick Sand
3				
4				
5				

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth		Feet	Type Shoe	Perforations	
			Top	Bottom			From	To
7 in. O.D.	26	8	0-0	104	105	None	65	100

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet		Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
From	To				
20	104	8 in.	200 lbs.		Dry Mix

Section 5 PLUGGING RECORD

Name of Plugging Contractor License No.

Street and Number City State

Tons of Clay used Tons of Roughage used Type of roughage

Plugging method used Date Plugged 19

Plugging approved by:

Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug		No. of Sacks Used
	From	To	

FOR USE OF STATE ENGINEER ONLY

Date Received JUL 9 1958

File No. L-3901 Use Dom. Location No. 16.36.10.413

Section 6

LOG OF WELL

Depth in Feet		Thickness in Feet	Color	Type of Material Encountered
From	To			
0	2	2		Soil
2	20	18		Caliche
20	28	8		Boulder
28	66	38		Sand
66	74	8		Water Sand
74	82	8		Sandy Clay
82	90	8		Quick Sand
90	104	14		Sand

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

CAYTON WATER WELL DRILLING COMPANY
Well Driller

Form WR-23

STATE ENGINEER OFFICE

WELL RECORD

FIELD ENGR LOG

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1

(Plat of 640 acres)

City of Lovington
(A) Owner of well P. O. Box 1268
Street and Number Lovington New Mex.
City L- 5014 State
Well was drilled under Permit No. 10 1 and is located in the
¼ ¼ ¼ of Section Twp. Rge. 322
(B) Drilling Contractor Box 721 License No.
Street and Number Lovington New Mex.
City Nov. 27, State 62
Drilling was commenced Dec. 9, 19 62
Drilling was completed 19
1960 216 Ft.
Elevation at top of casing in feet above sea level Shallow Total depth of well 66 Ft.
State whether well is shallow or artesian Depth to water upon completion

Section 2

PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation
	From	To		
	70	76	6	Sand
1	82	94	12	Quick Sand
2	112	116	4	Sand
3	132	137	5	Sand
4	164	168	4	Sand ?
5	178	190	12	Sand

Section 3

RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth		Feet	Type Shoe	Perforations	
			Top	Bottom			From	To
12	3/16 Wall						9	21

Section 4

RECORD OF MUDDING AND CEMENTING

Depth in Feet		Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
From	To				

Section 5

PLUGGING RECORD

Name of Plugging Contractor License No.
Street and Number City State
Tons of Clay used Tons of Roughage used Type of roughage
Plugging method used Date Plugged 19
Plugging approved by:

Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug		No. of Sacks Used
	From	To	

FOR USE OF STATE ENGINEER ONLY

STATE ENGINEER OFFICE
DISTRICT II
ROSWELL, N. MEX.

Date Received 1962 DEC 13 AM 8:11 ✓

File No. L-5014 Use Expl. Location No. 16.36.10.240

Section 6

LOG OF WELL

Depth in Feet		Thickness in Feet	Color	Type of Material Encountered
From	To			
0	2	2		Soil
2	8	6		Clachie
8	12	4		Bolder
12	28	16		Clichie
28	70	42		Sandy Clay
70	76	6		Water Sand
76	82	6		Sandy Clay
82	94	12		Quick Sand
94	112	18		Sandy Clay
112	116	4		Sand
116	132	16		Sandy Clay
132	137	5		Sand
137	164	27		Sandy Clay
164	168	4		Sand
168	178	10		Sandy Clay
178	190	12		Sand
190	205	15		Clay
205	215	10		Clay & Gravel
215	216	1		Red Bed

L S Elev ________

Depth to K________Trc________

Elev of K________Trc________

Loc. No.________

Hydro. Survey Field Check

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Grady Booker
Well Driller

SOURCE OF ALTITUDE GIVEN

Interpolated from Topo. Sheet________

Determined by Inst. Leveling________

Other________

L-5014

16.36.10.240

APPENDIX B

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:
Kristin Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak Site
Project Number: None Given
Location: Lovington

Lab Order Number: 5H11001

Report Date: 08/23/05

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO-Apache LA Leak Site Project Number: None Given Project Manager: Kristin Pope	Fax: (505) 397-1471 **Reported:** 08/23/05 10:09

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well #1	5H11001-01	Water	08/10/05 09:30	08/11/05 07:45

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Pope	08/23/05 10:09

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (5H11001-01) Water									
Benzene	ND	0.00100	mg/L	1	EH51609	08/16/05	08/16/05	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*105 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*95.0 %*	*80-120*		"	"	"	"	

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Pope	08/23/05 10:09

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (5H11001-01) Water									
Total Alkalinity	**159**	2.00	mg/L	1	EH51208	08/11/05	08/11/05	EPA 310.2M	
Chloride	**91.1**	2.50	"	5	EH51906	08/15/05	08/15/05	EPA 300.0	
Total Dissolved Solids	**603**	5.00	"	1	EH51210	08/16/05	08/17/05	EPA 160.1	
Sulfate	**66.3**	2.50	"	5	EH51906	08/15/05	08/15/05	EPA 300.0	

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Pope	08/23/05 10:09

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (5H11001-01) Water									
Calcium	**99.1**	0.100	mg/L	10	EH51103	08/11/05	08/11/05	EPA 6010B	
Magnesium	**15.3**	0.0100	"	"	"	"	"	"	
Potassium	**4.87**	0.0500	"	1	"	"	"	"	
Sodium	**56.5**	0.100	"	10	"	"	"	"	

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH51609 - EPA 5030C (GC)										
Blank (EH51609-BLK1)				Prepared & Analyzed: 08/16/05						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*97.9*		*ug/l*	*100*		*97.9*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*81.4*		*"*	*100*		*81.4*	*80-120*			
LCS (EH51609-BS1)				Prepared & Analyzed: 08/16/05						
Benzene	98.4		ug/l	100		98.4	80-120			
Toluene	97.0		"	100		97.0	80-120			
Ethylbenzene	106		"	100		106	80-120			
Xylene (p/m)	204		"	200		102	80-120			
Xylene (o)	104		"	100		104	80-120			
Surrogate: a,a,a-Trifluorotoluene	*104*		*"*	*100*		*104*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*95.4*		*"*	*100*		*95.4*	*80-120*			
Calibration Check (EH51609-CCV1)				Prepared: 08/16/05		Analyzed: 08/17/05				
Benzene	94.2		ug/l	100		94.2	80-120			
Toluene	94.5		"	100		94.5	80-120			
Ethylbenzene	106		"	100		106	80-120			
Xylene (p/m)	203		"	200		102	80-120			
Xylene (o)	109		"	100		109	80-120			
Surrogate: a,a,a-Trifluorotoluene	*94.9*		*"*	*100*		*94.9*	*0-200*			
Surrogate: 4-Bromofluorobenzene	*102*		*"*	*100*		*102*	*0-200*			
Matrix Spike (EH51609-MS1)	**Source: 5H11006-01**			Prepared: 08/16/05		Analyzed: 08/17/05				
Benzene	91.6		ug/l	100	ND	91.6	80-120			
Toluene	90.2		"	100	ND	90.2	80-120			
Ethylbenzene	101		"	100	ND	101	80-120			
Xylene (p/m)	191		"	200	ND	95.5	80-120			
Xylene (o)	102		"	100	ND	102	80-120			
Surrogate: a,a,a-Trifluorotoluene	*91.5*		*"*	*100*		*91.5*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*97.9*		*"*	*100*		*97.9*	*80-120*			

Organics by GC - Quality Control

Environmental Lab of Texas

Batch EH51609 - EPA 5030C (GC)

Matrix Spike Dup (EH51609-MSD1) **Source: 5H11006-01** Prepared: 08/16/05 Analyzed: 08/17/05

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Benzene	95.5		ug/l	100	ND	95.5	80-120	4.17	20	
Toluene	94.5		"	100	ND	94.5	80-120	4.66	20	
Ethylbenzene	106		"	100	ND	106	80-120	4.83	20	
Xylene (p/m)	201		"	200	ND	100	80-120	4.60	20	
Xylene (o)	108		"	100	ND	108	80-120	5.71	20	
Surrogate: a,a,a-Trifluorotoluene	*82.3*		"	*100*		*82.3*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*92.9*		"	*100*		*92.9*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH51208 - General Preparation (WetChem)										
Blank (EH51208-BLK1)				Prepared & Analyzed: 08/11/05						
Total Alkalinity	ND	2.00	mg/L							
Duplicate (EH51208-DUP1)	**Source: 5H11001-01**			Prepared & Analyzed: 08/11/05						
Total Alkalinity	0.00	2.00	mg/L		159				20	
Reference (EH51208-SRM1)				Prepared & Analyzed: 08/11/05						
Bicarbonate Alkalinity	230		mg/L	200		115	80-120			
Batch EH51210 - General Preparation (WetChem)										
Blank (EH51210-BLK1)				Prepared: 08/16/05 Analyzed: 08/17/05						
Total Dissolved Solids	ND	5.00	mg/L							
Duplicate (EH51210-DUP1)	**Source: 5H11001-01**			Prepared: 08/16/05 Analyzed: 08/17/05						
Total Dissolved Solids	628	5.00	mg/L		603			4.06	5	
Batch EH51906 - General Preparation (WetChem)										
Blank (EH51906-BLK1)				Prepared & Analyzed: 08/15/05						
Chloride	ND	0.500	mg/L							
Sulfate	ND	0.500	"							
LCS (EH51906-BS1)				Prepared & Analyzed: 08/15/05						
Chloride	8.36		mg/L	10.0		83.6	80-120			
Sulfate	9.43		"	10.0		94.3	80-120			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH51906 - General Preparation (WetChem)										
Calibration Check (EH51906-CCV1)				Prepared & Analyzed: 08/15/05						
Chloride	9.85		mg/L	10.0		98.5	80-120			
Sulfate	11.4		"	10.0		114	80-120			
Duplicate (EH51906-DUP1)	**Source: 5H09007-02**			Prepared & Analyzed: 08/15/05						
Sulfate	122	5.00	mg/L		122			0.00	20	
Chloride	202	5.00	"		203			0.494	20	

Rice Operating Co.
122 W. Taylor
Hobbs NM, 88240

Project: ABO-Apache LA Leak Site
Project Number: None Given
Project Manager: Kristin Pope

Fax: (505) 397-1471
Reported:
08/23/05 10:09

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH51103 - 6010B/No Digestion										
Blank (EH51103-BLK1)				Prepared & Analyzed: 08/11/05						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Calibration Check (EH51103-CCV1)				Prepared & Analyzed: 08/11/05						
Calcium	1.95		mg/L	2.00		97.5	85-115			
Magnesium	2.17		"	2.00		108	85-115			
Potassium	1.90		"	2.00		95.0	85-115			
Sodium	1.84		"	2.00		92.0	85-115			
Duplicate (EH51103-DUP1)	**Source: 5H09005-01**			Prepared & Analyzed: 08/11/05						
Calcium	148	0.500	mg/L		153			3.32	20	
Magnesium	24.3	0.0100	"		24.7			1.63	20	
Potassium	5.97	0.0500	"		5.92			0.841	20	
Sodium	80.0	0.100	"		81.4			1.73	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 8/23/2005

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope

Company Name: Rice Operating

Company Address: 122 W. Taylor St.

City/State/Zip: Hobbs, NM 88240

Telephone No: (505) 393-9174 631-5075

Fax No: (505) 397-1471

Sampler Signature:

Project Name: ABO Apache LA Leak

Project #:

Project Loc: LOVINGTON

PO #:

LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative: Ice	HNO_3	HCl (2) 40ml glass	NaOH	H_2SO_4	None (1) L HDPE	Other (Specify)	Matrix: Water	Sludge	Soil	Other (specify):	Analyze For: TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	T.D.S.				RUSH TAT (Pre-Schedule)	Standard TAT
TCLP:																															
TOTAL:																							X								
5H11001 -01	Monitor Well #1	8-10-05	09:30	3	X		X			X		X					X	X					X			X					X

Special Instructions:
Please email analysis to Kristin: Kpriceswd@valornet.com

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt: 2.0°c
Laboratory Comments:
Labels + seals on containers
Seal on cooler

Relinquished by:	Date	Time	Received by:	Date	Time
	8-10-05	12:25	K Pope	8-10-05	1230

Relinquished by:	Date	Time	Received by ELOT:	Date	Time
	8/11	7:45	Jeanne McMurrey	8-11-05	0745

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Operating

Date/Time: 08-11-05 @ 0745

Order #: 5H11001

Initials: JMM

Sample Receipt Checklist

Temperature of [✓ container]/cooler?	[✓ Yes]	No	2.0 C
Shipping container/[✓ cooler] in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	- -
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations: H11001-01 Neutral pH. 8/11/05

Variance Documentation:

Contact Person: - ______ Date/Time: ______ Contacted by: ______

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak
Project Number: None Given
Location: None Given

Lab Order Number: 5F16009

Report Date: 06/28/05

Rice Operating Co.	Project: ABO-Apache LA Leak	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Pope	06/28/05 14:04

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	5F16009-01	Water	06/16/05 09:42	06/16/05 15:20

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5F16009-01) Water									
Benzene	ND	0.00100	mg/L	1	EF51701	06/17/05	06/17/05	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*119 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*95.0 %*	*80-120*		"	"	"	"	

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5F16009-01) Water									
Total Alkalinity	**153**	2.00	mg/L	1	EF52213	06/22/05	06/22/05	EPA 310.2M	
Chloride	**71.8**	2.50	"	5	EF52001	06/17/05	06/17/05	EPA 300.0	
Total Dissolved Solids	**389**	5.00	"	1	EF52212	06/22/05	06/23/05	EPA 160.1	
Sulfate	**84.0**	2.50	"	5	EF52001	06/17/05	06/17/05	EPA 300.0	

Total Metals by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5F16009-01) Water									
Calcium	**69.2**	0.100	mg/L	10	EF52114	06/21/05	06/21/05	EPA 6010B	
Magnesium	**10.9**	0.0100	"	"	"	"	"	"	
Potassium	**4.70**	0.0500	"	1	"	"	"	"	
Sodium	**49.7**	0.100	"	10	"	"	"	"	

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EF51701 - EPA 5030C (GC)										
Blank (EF51701-BLK1)				Prepared & Analyzed: 06/17/05						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*21.5*		*ug/l*	*20.0*		*108*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*16.4*		*"*	*20.0*		*82.0*	*80-120*			
LCS (EF51701-BS1)				Prepared & Analyzed: 06/17/05						
Benzene	98.2		ug/l	100		98.2	80-120			
Toluene	99.0		"	100		99.0	80-120			
Ethylbenzene	89.8		"	100		89.8	80-120			
Xylene (p/m)	177		"	200		88.5	80-120			
Xylene (o)	82.1		"	100		82.1	80-120			
Surrogate: a,a,a-Trifluorotoluene	*18.2*		*"*	*20.0*		*91.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*19.0*		*"*	*20.0*		*95.0*	*80-120*			
LCS Dup (EF51701-BSD1)				Prepared & Analyzed: 06/17/05						
Benzene	112		ug/l	100		112	80-120	13.1	20	
Toluene	113		"	100		113	80-120	13.2	20	
Ethylbenzene	103		"	100		103	80-120	13.7	20	
Xylene (p/m)	199		"	200		99.5	80-120	11.7	20	
Xylene (o)	94.3		"	100		94.3	80-120	13.8	20	
Surrogate: a,a,a-Trifluorotoluene	*20.1*		*"*	*20.0*		*100*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*17.2*		*"*	*20.0*		*86.0*	*80-120*			
Calibration Check (EF51701-CCV1)				Prepared & Analyzed: 06/17/05						
Benzene	112		ug/l	100		112	80-120			
Toluene	112		"	100		112	80-120			
Ethylbenzene	108		"	100		108	80-120			
Xylene (p/m)	201		"	200		100	80-120			
Xylene (o)	93.6		"	100		93.6	80-120			
Surrogate: a,a,a-Trifluorotoluene	*20.7*		*"*	*20.0*		*104*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*21.1*		*"*	*20.0*		*106*	*80-120*			

Organics by GC - Quality Control
Environmental Lab of Texas

Batch EF51701 - EPA 5030C (GC)

Matrix Spike (EF51701-MS1) **Source: 5F17006-01** Prepared & Analyzed: 06/17/05

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Benzene	103		ug/l	100	ND	103	80-120			
Toluene	114		"	100	ND	114	80-120			
Ethylbenzene	105		"	100	ND	105	80-120			
Xylene (p/m)	203		"	200	ND	102	80-120			
Xylene (o)	91.9		"	100	ND	91.9	80-120			
Surrogate: a,a,a-Trifluorotoluene	*20.6*		"	*20.0*		*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*20.0*		"	*20.0*		*100*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EF52001 - General Preparation (WetChem)										
Blank (EF52001-BLK1)				Prepared & Analyzed: 06/17/05						
Chloride	ND	0.500	mg/L							
Sulfate	ND	0.500	"							
LCS (EF52001-BS1)				Prepared & Analyzed: 06/17/05						
Chloride	11.5		mg/L	10.0		115	80-120			
Sulfate	11.1		"	10.0		111	80-120			
Calibration Check (EF52001-CCV1)				Prepared & Analyzed: 06/17/05						
Chloride	11.1		mg/L	10.0		111	80-120			
Sulfate	10.4		"	10.0		104	80-120			
Duplicate (EF52001-DUP1)		**Source: 5F16004-02**		Prepared & Analyzed: 06/17/05						
Chloride	90.7	2.50	mg/L		96.5			6.20	20	
Sulfate	70.2	2.50	"		76.0			7.93	20	
Batch EF52212 - Filtration Preparation										
Blank (EF52212-BLK1)				Prepared: 06/22/05 Analyzed: 06/23/05						
Total Dissolved Solids	ND	5.00	mg/L							
Duplicate (EF52212-DUP1)		**Source: 5F16004-04**		Prepared: 06/22/05 Analyzed: 06/23/05						
Total Dissolved Solids	277	5.00	mg/L		276			0.362	20	
Batch EF52213 - General Preparation (WetChem)										
Blank (EF52213-BLK1)				Prepared & Analyzed: 06/22/05						
Total Alkalinity	ND	2.00	mg/L							

Rice Operating Co.
122 W. Taylor
Hobbs NM, 88240

Project: ABO-Apache LA Leak
Project Number: None Given
Project Manager: Kristin Pope

Fax: (505) 397-1471
Reported:
06/28/05 14:04

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EF52213 - General Preparation (WetChem)										
Duplicate (EF52213-DUP1)	**Source: 5F16009-01**			Prepared & Analyzed: 06/22/05						
Total Alkalinity	153	2.00	mg/L		153			0.00	20	
Reference (EF52213-SRM1)				Prepared & Analyzed: 06/22/05						
Bicarbonate Alkalinity	230		mg/L	200		115	80-120			

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EF52114 - 6010B/No Digestion										
Blank (EF52114-BLK1)				Prepared & Analyzed: 06/21/05						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Calibration Check (EF52114-CCV1)				Prepared & Analyzed: 06/21/05						
Calcium	1.94		mg/L	2.00		97.0	85-115			
Magnesium	2.14		"	2.00		107	85-115			
Potassium	1.75		"	2.00		87.5	85-115			
Sodium	1.73		"	2.00		86.5	85-115			
Duplicate (EF52114-DUP1)		**Source: 5F16004-01**		Prepared & Analyzed: 06/21/05						
Calcium	20.4	0.100	mg/L		21.8			6.64	20	
Magnesium	19.6	0.0100	"		21.9			11.1	20	
Potassium	10.1	0.500	"		10.5			3.88	20	
Sodium	64.0	0.100	"		65.2			1.86	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 6/28/2005

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

This material is intended only for the use of the individual (s) or entity to whom it is addressed, and may contain information that is privileged and confidential.

If you have received this material in error, please notify us immediately at 432-563-1800.

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope
Company Name: Rice Operating
Company Address: 122 W. Taylor
City/State/Zip: Hobbs NM 88240
Telephone No: (505) 393-9174
Fax No: (505) 397-1471
Sampler Signature:

Project Name: Abo Apache CA Leak
Project #:
Project Loc:
PO #:

LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative							Matrix				Analyze For: (TCLP: / TOTAL:)														RUSH TAT (Pre-Schedule)	Standard TAT
5F16007		2005			Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	TDS / CL / SAR / EC	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	Cations	Anions						
-01	MW-1	June 16	9:42am	3	X		X					X											X	X	X						X

Special Instructions:
Please E-mail analysis to Kristin enviro@leaco.net

Relinquished by:	Date	Time	Received by:	Date	Time
Roy R. Rascon	6-16-05	11:54	Norma Brady	6.16.05	11:54

Relinquished by:	Date	Time	Received by ELOT:	Date	Time
Norma Brady	6-16-05	15:20		6/16/05	15:20

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt:
Laboratory Comments: 4.0
2-VOA-HCl
1-L

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice

Date/Time: 6/16/05 15:20

Order #: 5F16009

Initials: CK

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	1.0 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak
Project Number: None Given
Location: Hobbs

Lab Order Number: 5E24015

Report Date: 06/07/05

Rice Operating Co.	Project: ABO-Apache LA Leak	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Pope	06/07/05 14:09

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	5E24015-01	Water	05/23/05 09:23	05/24/05 15:40

Organics by GC
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5E24015-01) Water									
Benzene	ND	0.00100	mg/L	1	EE52604	05/26/05	05/26/05	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*98.0 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*97.0 %*	*80-120*		"	"	"	"	

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5E24015-01) Water									
Total Alkalinity	**170**	2.00	mg/L	1	EE52509	05/24/05	05/24/05	EPA 310.2M	
Chloride	**98.4**	2.50	"	5	EE52703	05/27/05	05/27/05	EPA 300.0	
Total Dissolved Solids	**573**	5.00	"	1	EF50109	05/27/05	05/27/05	EPA 160.1	
Sulfate	**82.2**	2.50	"	5	EE52703	05/27/05	05/27/05	EPA 300.0	

Total Metals by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5E24015-01) Water									
Calcium	**78.3**	0.100	mg/L	10	EE52518	05/25/05	05/25/05	EPA 6010B	
Magnesium	**13.3**	0.0100	"	"	"	"	"	"	
Potassium	**4.83**	0.0500	"	1	"	"	"	"	
Sodium	**56.4**	0.100	"	10	"	"	"	"	

Organics by GC - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE52604 - EPA 5030C (GC)										
Blank (EE52604-BLK1)				Prepared & Analyzed: 05/26/05						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*20.2*		*ug/l*	*20.0*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*17.1*		*"*	*20.0*		*85.5*	*80-120*			
LCS (EE52604-BS1)				Prepared & Analyzed: 05/26/05						
Benzene	93.7		ug/l	100		93.7	80-120			
Toluene	100		"	100		100	80-120			
Ethylbenzene	102		"	100		102	80-120			
Xylene (p/m)	205		"	200		102	80-120			
Xylene (o)	101		"	100		101	80-120			
Surrogate: a,a,a-Trifluorotoluene	*21.3*		*"*	*20.0*		*106*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*22.6*		*"*	*20.0*		*113*	*80-120*			
Calibration Check (EE52604-CCV1)				Prepared: 05/26/05	Analyzed: 05/27/05					
Benzene	87.9		ug/l	100		87.9	80-120			
Toluene	96.3		"	100		96.3	80-120			
Ethylbenzene	98.2		"	100		98.2	80-120			
Xylene (p/m)	197		"	200		98.5	80-120			
Xylene (o)	96.2		"	100		96.2	80-120			
Surrogate: a,a,a-Trifluorotoluene	*19.4*		*"*	*20.0*		*97.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*23.3*		*"*	*20.0*		*116*	*80-120*			
Matrix Spike (EE52604-MS1)	**Source: 5E23014-01**			Prepared & Analyzed: 05/26/05						
Benzene	95.4		ug/l	100	ND	95.4	80-120			
Toluene	101		"	100	ND	101	80-120			
Ethylbenzene	100		"	100	ND	100	80-120			
Xylene (p/m)	203		"	200	ND	102	80-120			
Xylene (o)	98.2		"	100	ND	98.2	80-120			
Surrogate: a,a,a-Trifluorotoluene	*19.8*		*"*	*20.0*		*99.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*20.3*		*"*	*20.0*		*102*	*80-120*			

Organics by GC - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE52604 - EPA 5030C (GC)										
Matrix Spike Dup (EE52604-MSD1)	**Source: 5E23014-01**			Prepared & Analyzed: 05/26/05						
Benzene	92.8		ug/l	100	ND	92.8	80-120	2.76	20	
Toluene	97.3		"	100	ND	97.3	80-120	3.73	20	
Ethylbenzene	98.9		"	100	ND	98.9	80-120	1.11	20	
Xylene (p/m)	202		"	200	ND	101	80-120	0.985	20	
Xylene (o)	99.1		"	100	ND	99.1	80-120	0.912	20	
Surrogate: a,a,a-Trifluorotoluene	*19.8*		"	*20.0*		*99.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*21.8*		"	*20.0*		*109*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE52509 - General Preparation (WetChem)										
Blank (EE52509-BLK1)				Prepared & Analyzed: 05/24/05						
Total Alkalinity	ND	2.00	mg/L							
Duplicate (EE52509-DUP1)	**Source: 5E19001-01**			Prepared & Analyzed: 05/24/05						
Total Alkalinity	215	2.00	mg/L		214			0.466	20	
Reference (EE52509-SRM1)				Prepared & Analyzed: 05/24/05						
Bicarbonate Alkalinity	230		mg/L	200		115	80-120			
Batch EE52703 - General Preparation (WetChem)										
Blank (EE52703-BLK1)				Prepared & Analyzed: 05/27/05						
Chloride	ND	0.500	mg/L							
Sulfate	ND	0.500	"							
LCS (EE52703-BS1)				Prepared & Analyzed: 05/27/05						
Chloride	10.9		mg/L	10.0		109	80-120			
Sulfate	9.99		"	10.0		99.9	80-120			
Calibration Check (EE52703-CCV1)				Prepared & Analyzed: 05/27/05						
Chloride	10.6		mg/L	10.0		106	80-120			
Sulfate	9.87		"	10.0		98.7	80-120			
Duplicate (EE52703-DUP1)	**Source: 5E24015-01**			Prepared & Analyzed: 05/27/05						
Chloride	100	2.50	mg/L		98.4			1.61	20	
Sulfate	82.3	2.50	"		82.2			0.122	20	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EF50109 - Filtration Preparation										
Blank (EF50109-BLK1)				Prepared & Analyzed: 05/27/05						
Total Dissolved Solids	ND	5.00	mg/L							
Duplicate (EF50109-DUP1)	**Source: 5E24015-01**			Prepared & Analyzed: 05/27/05						
Total Dissolved Solids	567	5.00	mg/L		573			1.05	20	

Total Metals by EPA / Standard Methods - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE52518 - 6010B/No Digestion										
Blank (EE52518-BLK1)				Prepared & Analyzed: 05/25/05						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Blank (EE52518-BLK2)				Prepared & Analyzed: 05/25/05						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Calibration Check (EE52518-CCV1)				Prepared & Analyzed: 05/25/05						
Calcium	1.86		mg/L	2.00		93.0	85-115			
Magnesium	2.10		"	2.00		105	85-115			
Potassium	1.93		"	2.00		96.5	85-115			
Sodium	2.18		"	2.00		109	85-115			
Duplicate (EE52518-DUP1)	**Source: 5E19001-01**			Prepared & Analyzed: 05/25/05						
Calcium	51.6	0.500	mg/L		56.0			8.18	20	
Magnesium	26.4	0.0100	"		27.2			2.99	20	
Potassium	5.70	0.0500	"		5.69			0.176	20	
Sodium	109	0.100	"		110			0.913	20	
Duplicate (EE52518-DUP2)	**Source: 5E24016-01**			Prepared & Analyzed: 05/25/05						
Calcium	90.2	0.100	mg/L		89.5			0.779	20	
Magnesium	50.6	0.0100	"		50.5			0.198	20	
Potassium	10.7	0.500	"		11.0			2.76	20	
Sodium	244	0.500	"		248			1.63	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 6/7/2005

Raland K. Tuttle, Lab Manager	Jeanne Mc Murrey, Inorg. Tech Director
Celey D. Keene, Lab Director, Org. Tech Director	James L. Hawkins, Chemist/Geologist
Peggy Allen, QA Officer	Sandra Sanchez, Lab Tech.

This material is intended only for the use of the individual (s) or entity to whom it is addressed, and may contain information that is privileged and confidential.

If you have received this material in error, please notify us immediately at 432-563-1800.

Environmental Lab of Texas I, Ltd.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope

Company Name: Rice Operating

Company Address: 122 W Taylor St.

City/State/Zip: Hobbs, nm 88240

Telephone No: (505) 393-9174

Fax No: (505) 397-1471

Sampler Signature:

Project Name: Abo Apache LA Leak

Project #:

Project Loc: Hobbs

PO #:

					Preservative							Matrix				Analyze For:															
5E24015 LAB # (lab use only)	FIELD CODE	2005 Date Sampled	Time Sampled	No. of Containers	Ice	HNO$_3$	HCl	NaOH	H$_2$SO$_4$	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	RCI	N.O.R.M.	Total Gamma	Total Dissolved Solids			RUSH TAT (Pre-Schedule)	Standard TAT
-01	MW-1	May 23	9:23	3	X		X					X					X	X					X				X				X

TOLP:
TOTAL:

Special Instructions: Please email analysis to Kristin enviro@leaco.net

Relinquished by:	Date	Time	Received by:	Date	Time
	5-23-05	13:23	K. Pope	5-23-05	13:23
Relinquished by:	**Date**	**Time**	**Received by ELOT:**	**Date**	**Time**
Kristin Pope	5-24-05	15:40	Cecie Keeley	5/24/05	15:40

Sample Containers Intact? [✓ Y] N

Temperature Upon Receipt: -2.0

Laboratory Comments:
2-VOA
1-1L

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Operating

Date/Time: 5/24/05 3:55

Order #: 5E24015

Initials: Ck

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	-2.0 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak
Project Number: None Given
Location: Lovington

Lab Order Number: 5C02003

Report Date: 03/15/05

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO-Apache LA Leak Project Number: None Given Project Manager: Kristin Pope	Fax: (505) 397-1471 **Reported:** 03/15/05 12:19

ANALYTICAL REPORTFOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	5C02003-01	Water	03/01/05 14:10	03/01/05 18:45

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5C02003-01) Water									
Total Alkalinity	**148**	2.00	mg/L	1	EC50405	03/03/05	03/03/05	EPA 310.2M	
Chloride	**120**	2.50	"	5	EC50903	03/03/05	03/03/05	EPA 300.0	
Sulfate	**91.8**	2.50	"	"	"	"	"	"	
MW-1 (5C02003-01RE1) Water									
Total Dissolved Solids	**532**	5.00	mg/L	1	EC50311	03/11/05	03/11/05	EPA 160.1	O-04, QC-08

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO-Apache LA Leak Project Number: None Given Project Manager: Kristin Pope	Fax: (505) 397-1471 **Reported:** 03/15/05 12:19

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5C02003-01) Water									
Calcium	**85.2**	0.100	mg/L	10	EC50412	03/03/05	03/04/05	EPA 6010B	
Magnesium	**13.5**	0.0100	"	"	"	"	"	"	
Potassium	**5.10**	0.100	"	2	"	"	"	"	
Sodium	**48.3**	0.100	"	10	"	"	"	"	

Volatile Organic Compounds by EPA Method 8260B

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (5C02003-01) Water									
Benzene	ND	1.00	ug/l	1	EC50703	03/04/05	03/04/05	EPA 8260B	
Toluene	ND	1.00	"	"	"	"	"	"	
Ethylbenzene	ND	1.00	"	"	"	"	"	"	
Xylene (p/m)	ND	1.00	"	"	"	"	"	"	
Xylene (o)	ND	1.00	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*112 %*	*68-129*		"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4		*90.2 %*	*72-132*		"	"	"	"	
Surrogate: Toluene-d8		*104 %*	*74-118*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*101 %*	*65-140*		"	"	"	"	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EC50311 - 410.4										
Blank (EC50311-BLK1)				Prepared: 03/02/05 Analyzed: 03/03/05						
Total Dissolved Solids	ND	5.00	mg/L							
Duplicate (EC50311-DUP1)	**Source: 5C02003-01**			Prepared: 03/02/05 Analyzed: 03/03/05						
Total Dissolved Solids	1150	5.00	mg/L		1080			6.28	20	
Duplicate (EC50311-DUP2)	**Source: 5C02003-01RE1**			Prepared & Analyzed: 03/11/05						
Total Dissolved Solids	556	5.00	mg/L		532			4.41	20	
Batch EC50405 - General Preparation (WetChem)										
Blank (EC50405-BLK1)				Prepared & Analyzed: 03/03/05						
Total Alkalinity	ND	2.00	mg/L							
Calibration Check (EC50405-CCV1)				Prepared & Analyzed: 03/03/05						
Carbonate Alkalinity	0.0500		mg/L	0.0500		100	80-120			
Duplicate (EC50405-DUP1)	**Source: 5C02003-01**			Prepared & Analyzed: 03/03/05						
Total Alkalinity	149	2.00	mg/L		148			0.673	20	
Batch EC50903 - General Preparation (WetChem)										
Blank (EC50903-BLK1)				Prepared & Analyzed: 03/03/05						
Chloride	ND	0.500	mg/L							
Sulfate	ND	0.500	"							
LCS (EC50903-BS1)				Prepared & Analyzed: 03/03/05						
Chloride	10.2		mg/L	10.0		102	80-120			
Sulfate	10.5		"	10.0		105	80-120			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EC50903 - General Preparation (WetChem)										
Calibration Check (EC50903-CCV1)				Prepared & Analyzed: 03/03/05						
Chloride	10.5		mg/L	10.0		105	80-120			
Sulfate	10.8		"	10.0		108	80-120			
Duplicate (EC50903-DUP1)	**Source: 5C02010-01**			Prepared & Analyzed: 03/03/05						
Sulfate	87.5	2.50	mg/L		87.9			0.456	20	
Chloride	529	10.0	"		577			8.68	20	

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EC50412 - 6010B/No Digestion										
Blank (EC50412-BLK1)				Prepared: 03/03/05		Analyzed: 03/04/05				
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Calibration Check (EC50412-CCV1)				Prepared: 03/03/05		Analyzed: 03/04/05				
Calcium	2.25		mg/L	2.00		112	85-115			
Magnesium	2.30		"	2.00		115	85-115			
Potassium	1.85		"	2.00		92.5	85-115			
Sodium	1.82		"	2.00		91.0	85-115			
Duplicate (EC50412-DUP1)	**Source: 5B25005-01**			Prepared: 03/03/05		Analyzed: 03/04/05				
Calcium	104	0.100	mg/L		99.2			4.72	20	
Magnesium	38.9	0.0100	"		41.0			5.26	20	
Potassium	10.8	0.500	"		11.1			2.74	20	
Sodium	267	1.00	"		252			5.78	20	

Volatile Organic Compounds by EPA Method 8260B - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EC50703 - EPA 5030C (GCMS)										
Blank (EC50703-BLK1)				Prepared & Analyzed: 03/04/05						
Benzene	ND	1.00	ug/l							
Toluene	ND	1.00	"							
Ethylbenzene	ND	1.00	"							
Xylene (p/m)	ND	1.00	"							
Xylene (o)	ND	1.00	"							
Surrogate: Dibromofluoromethane	*50.5*		"	*50.0*		*101*	*68-129*			
Surrogate: 1,2-Dichloroethane-d4	*42.6*		"	*50.0*		*85.2*	*72-132*			
Surrogate: Toluene-d8	*48.6*		"	*50.0*		*97.2*	*74-118*			
Surrogate: 4-Bromofluorobenzene	*48.1*		"	*50.0*		*96.2*	*65-140*			
LCS (EC50703-BS1)				Prepared & Analyzed: 03/04/05						
Benzene	55.7		ug/l	50.0		111	70-130			
Toluene	56.6		"	50.0		113	70-130			
Ethylbenzene	54.5		"	50.0		109	70-130			
Xylene (p/m)	95.6		"	100		95.6	70-130			
Xylene (o)	56.0		"	50.0		112	70-130			
Surrogate: Dibromofluoromethane	*51.0*		"	*50.0*		*102*	*68-129*			
Surrogate: 1,2-Dichloroethane-d4	*47.6*		"	*50.0*		*95.2*	*72-132*			
Surrogate: Toluene-d8	*50.1*		"	*50.0*		*100*	*74-118*			
Surrogate: 4-Bromofluorobenzene	*50.2*		"	*50.0*		*100*	*65-140*			
Calibration Check (EC50703-CCV1)				Prepared & Analyzed: 03/04/05						
Toluene	54.0		ug/l	50.0		108	70-130			
Ethylbenzene	50.7		"	50.0		101	70-130			
Surrogate: Dibromofluoromethane	*51.1*		"	*50.0*		*102*	*68-129*			
Surrogate: 1,2-Dichloroethane-d4	*44.2*		"	*50.0*		*88.4*	*72-132*			
Surrogate: Toluene-d8	*50.4*		"	*50.0*		*101*	*74-118*			
Surrogate: 4-Bromofluorobenzene	*48.6*		"	*50.0*		*97.2*	*65-140*			

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EC50703 - EPA 5030C (GCMS)										
Matrix Spike (EC50703-MS1)	**Source: 5C02003-01**			Prepared & Analyzed: 03/04/05						
Benzene	56.9		ug/l	50.0	ND	114	80-120			
Toluene	58.8		"	50.0	ND	118	80-120			
Ethylbenzene	58.3		"	50.0	ND	117	80-120			
Xylene (p/m)	104		"	100	ND	104	80-120			
Xylene (o)	58.7		"	50.0	ND	117	80-120			
Surrogate: Dibromofluoromethane	*51.3*		"	*50.0*		*103*	*68-129*			
Surrogate: 1,2-Dichloroethane-d4	*48.4*		"	*50.0*		*96.8*	*72-132*			
Surrogate: Toluene-d8	*50.3*		"	*50.0*		*101*	*74-118*			
Surrogate: 4-Bromofluorobenzene	*49.7*		"	*50.0*		*99.4*	*65-140*			
Matrix Spike Dup (EC50703-MSD1)	**Source: 5C02003-01**			Prepared & Analyzed: 03/04/05						
Benzene	56.2		ug/l	50.0	ND	112	80-120	1.24	20	
Toluene	58.1		"	50.0	ND	116	80-120	1.20	20	
Ethylbenzene	57.1		"	50.0	ND	114	80-120	2.08	20	
Xylene (p/m)	100		"	100	ND	100	80-120	3.92	20	
Xylene (o)	58.4		"	50.0	ND	117	80-120	0.512	20	
Surrogate: Dibromofluoromethane	*49.2*		"	*50.0*		*98.4*	*68-129*			
Surrogate: 1,2-Dichloroethane-d4	*47.0*		"	*50.0*		*94.0*	*72-132*			
Surrogate: Toluene-d8	*49.2*		"	*50.0*		*98.4*	*74-118*			
Surrogate: 4-Bromofluorobenzene	*48.5*		"	*50.0*		*97.0*	*65-140*			

Notes and Definitions

QC-08	Sample was originally analyzed within holding time. However, it was determined that positive interferences contributed to the sample results. The sample was rerun with lower volume of sample.
O-04	This sample was analyzed outside the EPA recommended holding time.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 3/15/05

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
James L. Hawkins, Chemist/Geologist
Sandra Sanchez, Lab Tech.

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Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope

Company Name: Rice Operating

Company Address: 122 W Taylor

City/State/Zip: Hobbs, NM 88240

Telephone No: (505) 393-9174

Fax No: (505) 397-1471

Sampler Signature: Jake Vance

Project Name: ABO-APACHE LA LEAK

Project #:

Project Loc: LOVINGTON

PO #:

5C02003		2005			Preservative							Matrix				Analyze For: TCLP: TOTAL:															
LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	TDS				RUSH TAT (Pre-Schedule)	Standard TAT
-01	MW-1	3/1/2005	14:10	3	X		X					X					X	X					X			X					

Special Instructions: Please email analysis to Kristin enviro@leaco.net

Relinquished by:	Date	Time	Received by:	Date	Time
Jake Vance	3-1-05	14:34	Kristin Pope	3-1-05	1435
Relinquished by:	**Date**	**Time**	**Received by ELOT:**	**Date**	**Time**
Kristin Pope	3-1-05	4:30pm MST		3-1-05	18:45

Sample Containers Intact? Y N

Temperature Upon Receipt:

Laboratory Comments:

Rec 3.0°C

2 VOA

1 L HPPE

Rcl. c/c/f 3-1-05 1845.

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rife Operating

Date/Time: 3/2/05 8:20

Order #: 5C02003

Initials: Mk

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	3.0 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	~~Not present~~ Mk 3-02-05
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: - ______ Date/Time: ______ Contacted by: ______

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:
Kristin Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak
Project Number: None Given
Location: Lovington

Lab Order Number: 4L06004

Report Date: 12/16/04

Rice Operating Co.	Project: ABO-Apache LA Leak	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Pope	12/16/04 09:21

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	4L06004-01	Water	12/03/04 08:30	12/06/04 10:35

Rice Operating Co.	Project: ABO-Apache LA Leak	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Pope	12/16/04 09:21

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (4L06004-01) Water									
Benzene	ND	0.00100	mg/L	1	EL40913	12/08/04	12/08/04	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*101 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*96.0 %*	*80-120*		"	"	"	"	

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (4L06004-01) Water									
Total Alkalinity	**142**	2.00	mg/L	1	EL41406	12/10/04	12/10/04	EPA 310.2M	
Chloride	**80.5**	5.00	"	10	EL40916	12/08/04	12/08/04	EPA 300.0	
Total Dissolved Solids	**329**	5.00	"	1	EL40702	12/06/04	12/07/04	EPA 160.1	
Sulfate	**85.7**	5.00	"	10	EL40916	12/08/04	12/08/04	EPA 300.0	

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (4L06004-01) Water									
Calcium	**60.0**	0.100	mg/L	10	EL41408	12/14/04	12/14/04	EPA 6010B	
Magnesium	**12.9**	0.0100	"	"	"	"	"	"	
Potassium	**2.67**	0.500	"	"	"	"	"	"	
Sodium	**42.4**	0.100	"	"	"	"	"	"	

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EL40913 - EPA 5030C (GC)										
Blank (EL40913-BLK1)				Prepared & Analyzed: 12/08/04						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*19.8*		*ug/l*	*20.0*		*99.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*17.4*		*"*	*20.0*		*87.0*	*80-120*			
LCS (EL40913-BS1)				Prepared & Analyzed: 12/08/04						
Benzene	94.3		ug/l	100		94.3	80-120			
Toluene	97.6		"	100		97.6	80-120			
Ethylbenzene	96.2		"	100		96.2	80-120			
Xylene (p/m)	194		"	200		97.0	80-120			
Xylene (o)	99.5		"	100		99.5	80-120			
Surrogate: a,a,a-Trifluorotoluene	*17.8*		*"*	*20.0*		*89.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*22.1*		*"*	*20.0*		*110*	*80-120*			
LCS Dup (EL40913-BSD1)				Prepared & Analyzed: 12/08/04						
Benzene	97.4		ug/l	100		97.4	80-120	3.23	20	
Toluene	100		"	100		100	80-120	2.43	20	
Ethylbenzene	102		"	100		102	80-120	5.85	20	
Xylene (p/m)	202		"	200		101	80-120	4.04	20	
Xylene (o)	103		"	100		103	80-120	3.46	20	
Surrogate: a,a,a-Trifluorotoluene	*18.7*		*"*	*20.0*		*93.5*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*22.2*		*"*	*20.0*		*111*	*80-120*			
Calibration Check (EL40913-CCV1)				Prepared & Analyzed: 12/08/04						
Benzene	97.0		ug/l	100		97.0	80-120			
Toluene	99.1		"	100		99.1	80-120			
Ethylbenzene	101		"	100		101	80-120			
Xylene (p/m)	199		"	200		99.5	80-120			
Xylene (o)	101		"	100		101	80-120			
Surrogate: a,a,a-Trifluorotoluene	*19.4*		*"*	*20.0*		*97.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*21.5*		*"*	*20.0*		*108*	*80-120*			

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EL40913 - EPA 5030C (GC)										
Matrix Spike (EL40913-MS1)	**Source: 4L06002-01**			Prepared & Analyzed: 12/08/04						
Benzene	102		ug/l	100	ND	102	80-120			
Toluene	102		"	100	ND	102	80-120			
Ethylbenzene	101		"	100	ND	101	80-120			
Xylene (p/m)	203		"	200	ND	102	80-120			
Xylene (o)	111		"	100	ND	111	80-120			
Surrogate: a,a,a-Trifluorotoluene	*18.4*		*"*	*20.0*		*92.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*19.5*		*"*	*20.0*		*97.5*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EL40702 - General Preparation (WetChem)										
Blank (EL40702-BLK1)				Prepared: 12/06/04	Analyzed: 12/07/04					
Total Dissolved Solids	ND	5.00	mg/L							
Duplicate (EL40702-DUP1)	**Source: 4L03001-01**			Prepared: 12/06/04	Analyzed: 12/07/04					
Total Dissolved Solids	4120	5.00	mg/L		4030			2.21	20	
Batch EL40916 - General Preparation (WetChem)										
Blank (EL40916-BLK1)				Prepared & Analyzed: 12/08/04						
Chloride	0.00	0.500	mg/L							
Sulfate	0.00	0.500	"							
Blank (EL40916-BLK2)				Prepared & Analyzed: 12/08/04						
Sulfate	0.00	0.500	mg/L							
Chloride	0.00	0.500	"							
LCS (EL40916-BS1)				Prepared & Analyzed: 12/08/04						
Chloride	9.75	0.500	mg/L	10.0		97.5	80-120			
Sulfate	11.7	0.500	"	10.0		117	80-120			
LCS (EL40916-BS2)				Prepared & Analyzed: 12/08/04						
Chloride	9.77	0.500	mg/L	10.0		97.7	80-120			
Sulfate	11.8	0.500	"	10.0		118	80-120			
LCS Dup (EL40916-BSD1)				Prepared & Analyzed: 12/08/04						
Sulfate	11.8	0.500	mg/L	10.0		118	80-120	0.851	20	
Chloride	9.83	0.500	"	10.0		98.3	80-120	0.817	20	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EL40916 - General Preparation (WetChem)										
LCS Dup (EL40916-BSD2)				Prepared & Analyzed: 12/08/04						
Chloride	9.74	0.500	mg/L	10.0		97.4	80-120	0.308	20	
Sulfate	11.7	0.500	"	10.0		117	80-120	0.851	20	
Calibration Check (EL40916-CCV1)				Prepared & Analyzed: 12/08/04						
Chloride	9.79		mg/L	10.0		97.9	80-120			
Sulfate	11.7		"	10.0		117	80-120			
Calibration Check (EL40916-CCV2)				Prepared & Analyzed: 12/08/04						
Chloride	9.80		mg/L	10.0		98.0	80-120			
Sulfate	11.7		"	10.0		117	80-120			
Duplicate (EL40916-DUP1)	**Source: 4L03001-01**			Prepared & Analyzed: 12/08/04						
Chloride	1570	20.0	mg/L		1330			16.6	20	
Sulfate	809	20.0	"		682			17.0	20	
Duplicate (EL40916-DUP2)	**Source: 4L06003-02**			Prepared & Analyzed: 12/08/04						
Chloride	731	20.0	mg/L		725			0.824	20	
Sulfate	1210	20.0	"		1200			0.830	20	
Batch EL41406 - General Preparation (WetChem)										
Blank (EL41406-BLK1)				Prepared & Analyzed: 12/10/04						
Total Alkalinity	ND	2.00	mg/L							
Duplicate (EL41406-DUP1)	**Source: 4L06003-01**			Prepared & Analyzed: 12/10/04						
Total Alkalinity	161	2.00	mg/L		160			0.623	20	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EL41406 - General Preparation (WetChem)										
Reference (EL41406-SRM1)				Prepared & Analyzed: 12/10/04						
Carbonate Alkalinity	0.0501		mg/L	0.0500		100	80-120			

Total Metals by EPA / Standard Methods - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EL41408 - 6010B/No Digestion										
Blank (EL41408-BLK1)				Prepared & Analyzed: 12/14/04						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Calibration Check (EL41408-CCV1)				Prepared & Analyzed: 12/14/04						
Calcium	1.95		mg/L	2.00		97.5	85-115			
Magnesium	2.06		"	2.00		103	85-115			
Potassium	2.18		"	2.00		109	85-115			
Sodium	1.77		"	2.00		88.5	85-115			
Duplicate (EL41408-DUP1)	**Source: 4L03004-01**			Prepared & Analyzed: 12/14/04						
Calcium	120	1.00	mg/L		127			5.67	20	
Magnesium	73.9	0.100	"		75.1			1.61	20	
Potassium	5.29	0.500	"		5.37			1.50	20	
Sodium	102	1.00	"		97.9			4.10	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Celey D. Keene Date: 12/16/2004

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer
Jeanne Mc Murrey, Inorg. Tech Director
James L. Hawkins, Chemist/Geologist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope
Company Name: Rice Operating
Company Address: 122 W. Taylor St.
City/State/Zip: Hobbs, NM 88240
Telephone No: (505) 393-9174
Fax No: (505) 397-1471
Sampler Signature:

Project Name: ABO-APACHE LA Leak
Project #:
Project Loc: Lovington
PO #:

4L06004

					Preservative							Matrix				Analyze For: TCLP: / TOTAL:															
LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	TDS				RUSH TAT (Pre-Schedule)	Standard TAT
-01	MW-1	12-3-04	8:30	3	X		X					X					X	X					X			X					X

Special Instructions:
Please email analysis to Kristin enviro@leaco.net

Relinquished by:	Date	Time	Received by:	Date	Time
James Johnson	12-6-04	9:35			

Relinquished by:	Date	Time	Received by ELOT:	Date	Time
				12-06-04	10:35

Sample Containers Intact? Y N
Temperature Upon Receipt:
Laboratory Comments:
Ice -3°C

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Operation

Date/Time: 12/6/04 11:58

Order #: 4L06004

Initials: JLH

Sample Receipt Checklist

Temperature of container/cooler?	[✓ Yes]	No	~3 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	Yes	No	[✓ Not present]
Custody Seals intact on sample bottles?	Yes	No	[✓ Not present]
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	Yes	[✓ No]	No label on 1L Poly
Sample Matrix and properties same as on chain of custody?	Yes	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

APPENDIX C & D

On attached CD

March 3, 2006

Closure Report

Abo 1G Pipeline Release
Section 1, Township 17S, Range 36E
Lea County, New Mexico

R.T. HICKS CONSULTANTS, LTD.
901 RIO GRANDE BLVD. NW, SUITE F-142, ALBUQUERQUE, NM 87104

R. T. HICKS CONSULTANTS, LTD.
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

March 3, 2006

Wayne Price
NMOCD Environmental Bureau
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
Via E-mail and Federal Express

RE: Closure Report
Abo 1G Pipeline Release NMOCD Case #1R0415
Section 1, 17S, 36E, Unit G

Dear Wayne:

Attached are photographs that document the completion of all construction (soil excavation, exportation and importation of clay). Because electronic files of the final analytical results are quite large, please expect them with the paper copy of this letter, which will be sent on Monday.

Our progress report of January 31, 2006 provided the following post-closure monitoring plant:

> We propose plugging and abandonment of the monitoring well and sampling the vadose zone monitoring devices two times per year for three years.

We will submit annual reports to NMOCD. After your approval of this closure report; we will notify NMOCD of the date for plugging the well.

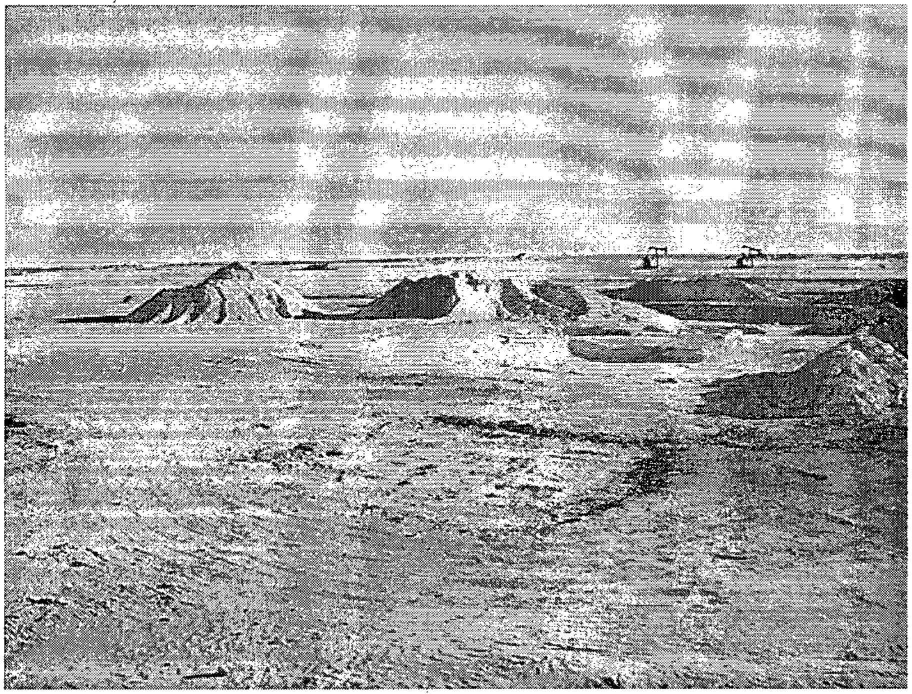
Sincerely,
R.T. Hicks Consultants, Ltd.

Randall T H

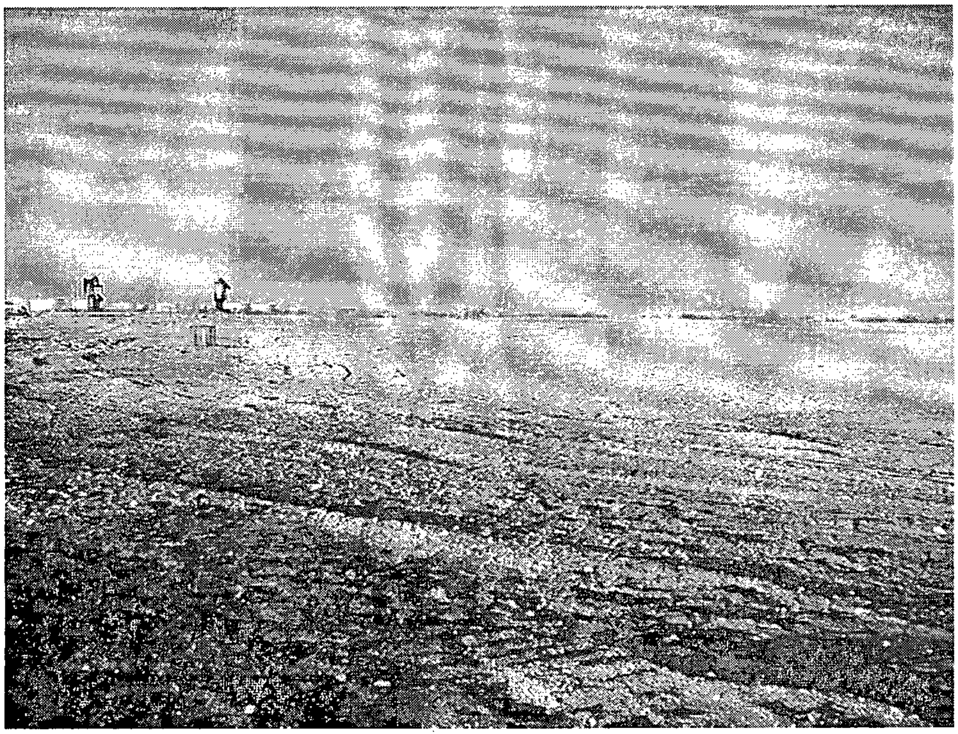
Randall Hicks
Principal

Copy: Rice Operating Company

Construction photographs showing clay placement excavation



Photographs showing final cover



ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Roy Rascon
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak Site
Project Number: None Given
Location: None Given

Lab Order Number: 6A11001

Report Date: 01/17/06

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	01/17/06 07:56

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
#45@ 1'bgs	6A11001-01	Soil	01/05/06 12:12	01/11/06 08:00
#54@ 1'bgs	6A11001-02	Soil	01/05/06 12:30	01/11/06 08:00
#27@ 1'bgs	6A11001-03	Soil	01/06/06 15:05	01/11/06 08:00
#13@ 1'bgs	6A11001-04	Soil	01/06/06 08:30	01/11/06 08:00
#62@ 1'bgs	6A11001-05	Soil	01/05/06 13:00	01/11/06 08:00
#39@ 1'bgs	6A11001-06	Soil	01/04/06 11:05	01/11/06 08:00
#57@ 1'bgs	6A11001-07	Soil	01/04/06 11:20	01/11/06 08:00
#14@ 1'bgs	6A11001-08	Soil	01/06/06 08:32	01/11/06 08:00
#44@ 1'bgs	6A11001-09	Soil	01/05/06 12:15	01/11/06 08:00
#60@ 3'bgs	6A11001-10	Soil	01/06/06 14:30	01/11/06 08:00
#58@ 5'bgs	6A11001-11	Soil	01/04/06 11:10	01/11/06 08:00
#10@ 1'bgs	6A11001-12	Soil	01/06/06 08:40	01/11/06 08:00
#55@ 4'bgs	6A11001-13	Soil	01/09/06 08:56	01/11/06 08:00
#28@ 1'bgs	6A11001-14	Soil	01/06/06 14:52	01/11/06 08:00
#52@ 1'bgs	6A11001-15	Soil	01/05/06 12:45	01/11/06 08:00
#22@ 1'bgs	6A11001-16	Soil	01/06/06 15:10	01/11/06 08:00
#63@ 1'bgs	6A11001-17	Soil	01/05/06 12:25	01/11/06 08:00
#38@ 5'bgs	6A11001-18	Soil	01/04/06 13:40	01/11/06 08:00
#33@ 1'bgs	6A11001-19	Soil	01/06/06 14:57	01/11/06 08:00
#53@ 1'bgs	6A11001-20	Soil	01/05/06 12:20	01/11/06 08:00
#56@ 1'bgs	6A11001-21	Soil	01/05/06 14:45	01/11/06 08:00
#61@ 3'bgs	6A11001-22	Soil	01/06/06 14:45	01/11/06 08:00
#26@ 1'bgs	6A11001-23	Soil	01/06/06 14:54	01/11/06 08:00
#32@ 1'bgs	6A11001-24	Soil	01/06/06 15:00	01/11/06 08:00
#74@ 5'bgs	6A11001-25	Soil	01/04/06 10:55	01/11/06 08:00
#75@ 5'bgs	6A11001-26	Soil	01/04/06 11:00	01/11/06 08:00
#59@ 5'bgs	6A11001-27	Soil	01/04/06 13:47	01/11/06 08:00
#9@ 1'bgs	6A11001-28	Soil	01/06/06 08:35	01/11/06 08:00

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
#62@ 1'bgs (6A11001-05) Soil									
Gasoline Range Organics C6-C12	ND	25.0	mg/kg dry	1	EA61214	01/12/06	01/13/06	TX 1005	
Diesel Range Organics >C12-C35	ND	25.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	25.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*77.8 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*77.4 %*	*70-130*		"	"	"	"	
#14@ 1'bgs (6A11001-08) Soil									
Gasoline Range Organics C6-C12	ND	25.0	mg/kg dry	1	EA61214	01/12/06	01/13/06	TX 1005	
Diesel Range Organics >C12-C35	ND	25.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	25.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*82.8 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*82.4 %*	*70-130*		"	"	"	"	
#55@ 4'bgs (6A11001-13) Soil									
Gasoline Range Organics C6-C12	ND	25.0	mg/kg dry	1	EA61214	01/12/06	01/13/06	TX 1005	
Diesel Range Organics >C12-C35	ND	25.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	25.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*79.4 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*78.8 %*	*70-130*		"	"	"	"	
#38@ 5'bgs (6A11001-18) Soil									
Gasoline Range Organics C6-C12	ND	25.0	mg/kg dry	1	EA61214	01/12/06	01/13/06	TX 1005	
Diesel Range Organics >C12-C35	ND	25.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	25.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*77.6 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*76.8 %*	*70-130*		"	"	"	"	
#61@ 3'bgs (6A11001-22) Soil									
Gasoline Range Organics C6-C12	ND	25.0	mg/kg dry	1	EA61214	01/12/06	01/13/06	TX 1005	
Diesel Range Organics >C12-C35	ND	25.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	25.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*87.0 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*86.2 %*	*70-130*		"	"	"	"	

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
#75@ 5'bgs (6A11001-26) Soil									
Gasoline Range Organics C6-C12	ND	25.0	mg/kg dry	1	EA61214	01/12/06	01/13/06	TX 1005	
Diesel Range Organics >C12-C35	ND	25.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	25.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*88.6 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*88.2 %*	*70-130*		"	"	"	"	

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
#45@ 1'bgs (6A11001-01) Soil									
Chloride	**267**	10.0	mg/kg	20	EA61303	01/11/06	01/13/06	EPA 300.0	
#54@ 1'bgs (6A11001-02) Soil									
Chloride	**1960**	50.0	mg/kg	100	EA61303	01/11/06	01/13/06	EPA 300.0	
#27@ 1'bgs (6A11001-03) Soil									
Chloride	**756**	20.0	mg/kg	40	EA61303	01/11/06	01/13/06	EPA 300.0	
#13@ 1'bgs (6A11001-04) Soil									
Chloride	**604**	20.0	mg/kg	40	EA61303	01/11/06	01/13/06	EPA 300.0	
#62@ 1'bgs (6A11001-05) Soil									
Chloride	**785**	20.0	mg/kg	40	EA61303	01/11/06	01/13/06	EPA 300.0	
% Moisture	**7.6**	0.1	%	1	EA61202	01/11/06	01/12/06	% calculation	
#39@ 1'bgs (6A11001-06) Soil									
Chloride	**1360**	20.0	mg/kg	40	EA61303	01/11/06	01/13/06	EPA 300.0	
#57@ 1'bgs (6A11001-07) Soil									
Chloride	**1560**	25.0	mg/kg	50	EA61303	01/11/06	01/13/06	EPA 300.0	
#14@ 1'bgs (6A11001-08) Soil									
Chloride	**706**	10.0	mg/kg	20	EA61303	01/11/06	01/13/06	EPA 300.0	
% Moisture	**5.9**	0.1	%	1	EA61202	01/11/06	01/12/06	% calculation	
#44@ 1'bgs (6A11001-09) Soil									
Chloride	**290**	10.0	mg/kg	20	EA61303	01/11/06	01/13/06	EPA 300.0	
#60@ 3'bgs (6A11001-10) Soil									
Chloride	**1130**	20.0	mg/kg	40	EA61303	01/11/06	01/13/06	EPA 300.0	

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
#58@ 5'bgs (6A11001-11) Soil									
Chloride	**1720**	25.0	mg/kg	50	EA61303	01/11/06	01/13/06	EPA 300.0	
#10@ 1'bgs (6A11001-12) Soil									
Chloride	**1240**	25.0	mg/kg	50	EA61303	01/11/06	01/13/06	EPA 300.0	
#55@ 4'bgs (6A11001-13) Soil									
Chloride	**1220**	20.0	mg/kg	40	EA61303	01/11/06	01/13/06	EPA 300.0	
% Moisture	**7.5**	0.1	%	1	EA61202	01/11/06	01/12/06	% calculation	
#28@ 1'bgs (6A11001-14) Soil									
Chloride	**908**	20.0	mg/kg	40	EA61303	01/11/06	01/13/06	EPA 300.0	
#52@ 1'bgs (6A11001-15) Soil									
Chloride	**625**	20.0	mg/kg	40	EA61304	01/12/06	01/13/06	EPA 300.0	
#22@ 1'bgs (6A11001-16) Soil									
Chloride	**948**	20.0	mg/kg	40	EA61304	01/12/06	01/13/06	EPA 300.0	
#63@ 1'bgs (6A11001-17) Soil									
Chloride	**1260**	20.0	mg/kg	40	EA61304	01/12/06	01/13/06	EPA 300.0	
#38@ 5'bgs (6A11001-18) Soil									
Chloride	**1330**	20.0	mg/kg	40	EA61304	01/12/06	01/13/06	EPA 300.0	
% Moisture	**9.0**	0.1	%	1	EA61202	01/11/06	01/12/06	% calculation	
#33@ 1'bgs (6A11001-19) Soil									
Chloride	**1020**	20.0	mg/kg	40	EA61304	01/12/06	01/13/06	EPA 300.0	
#53@ 1'bgs (6A11001-20) Soil									
Chloride	**734**	20.0	mg/kg	40	EA61304	01/12/06	01/13/06	EPA 300.0	

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
#56@ 1'bgs (6A11001-21) Soil									
Chloride	**2750**	50.0	mg/kg	100	EA61304	01/12/06	01/13/06	EPA 300.0	
#61@ 3'bgs (6A11001-22) Soil									
Chloride	**1320**	20.0	mg/kg	40	EA61304	01/12/06	01/13/06	EPA 300.0	
% Moisture	7.7	0.1	%	1	EA61202	01/11/06	01/12/06	% calculation	
#26@ 1'bgs (6A11001-23) Soil									
Chloride	**754**	20.0	mg/kg	40	EA61304	01/12/06	01/13/06	EPA 300.0	
#32@ 1'bgs (6A11001-24) Soil									
Chloride	**1960**	25.0	mg/kg	50	EA61304	01/12/06	01/13/06	EPA 300.0	
#74@ 5'bgs (6A11001-25) Soil									
Chloride	**424**	10.0	mg/kg	20	EA61304	01/12/06	01/13/06	EPA 300.0	
#75@ 5'bgs (6A11001-26) Soil									
Chloride	**712**	10.0	mg/kg	20	EA61304	01/12/06	01/13/06	EPA 300.0	
% Moisture	5.9	0.1	%	1	EA61202	01/11/06	01/12/06	% calculation	
#59@ 5'bgs (6A11001-27) Soil									
Chloride	**1100**	20.0	mg/kg	40	EA61304	01/12/06	01/13/06	EPA 300.0	
#9@ 1'bgs (6A11001-28) Soil									
Chloride	**2010**	20.0	mg/kg	40	EA61304	01/12/06	01/13/06	EPA 300.0	

Organics by GC - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA61214 - Solvent Extraction (GC)										
Blank (EA61214-BLK1)				Prepared & Analyzed: 01/12/06						
Gasoline Range Organics C6-C12	ND	25.0	mg/kg wet							
Diesel Range Organics >C12-C35	ND	25.0	"							
Total Hydrocarbon C6-C35	ND	25.0	"							
Surrogate: 1-Chlorooctane	*41.8*		*mg/kg*	*50.0*		*83.6*	*70-130*			
Surrogate: 1-Chlorooctadecane	*42.2*		*"*	*50.0*		*84.4*	*70-130*			
LCS (EA61214-BS1)				Prepared: 01/12/06		Analyzed: 01/13/06				
Gasoline Range Organics C6-C12	435	25.0	mg/kg wet	500		87.0	75-125			
Diesel Range Organics >C12-C35	526	25.0	"	500		105	75-125			
Total Hydrocarbon C6-C35	961	25.0	"	1000		96.1	75-125			
Surrogate: 1-Chlorooctane	*59.8*		*mg/kg*	*50.0*		*120*	*70-130*			
Surrogate: 1-Chlorooctadecane	*52.3*		*"*	*50.0*		*105*	*70-130*			
Calibration Check (EA61214-CCV1)				Prepared: 01/12/06		Analyzed: 01/13/06				
Gasoline Range Organics C6-C12	447		mg/kg	500		89.4	80-120			
Diesel Range Organics >C12-C35	518		"	500		104	80-120			
Total Hydrocarbon C6-C35	965		"	1000		96.5	80-120			
Surrogate: 1-Chlorooctane	*55.8*		*"*	*50.0*		*112*	*70-130*			
Surrogate: 1-Chlorooctadecane	*52.0*		*"*	*50.0*		*104*	*70-130*			
Matrix Spike (EA61214-MS1)	**Source: 6A11001-26**			Prepared & Analyzed: 01/12/06						
Gasoline Range Organics C6-C12	478	25.0	mg/kg dry	531	ND	90.0	75-125			
Diesel Range Organics >C12-C35	531	25.0	"	531	ND	100	75-125			
Total Hydrocarbon C6-C35	1010	25.0	"	1060	ND	95.3	75-125			
Surrogate: 1-Chlorooctane	*58.3*		*mg/kg*	*50.0*		*117*	*70-130*			
Surrogate: 1-Chlorooctadecane	*47.8*		*"*	*50.0*		*95.6*	*70-130*			
Matrix Spike Dup (EA61214-MSD1)	**Source: 6A11001-26**			Prepared: 01/12/06		Analyzed: 01/13/06				
Gasoline Range Organics C6-C12	469	25.0	mg/kg dry	531	ND	88.3	75-125	1.90	20	
Diesel Range Organics >C12-C35	504	25.0	"	531	ND	94.9	75-125	5.22	20	
Total Hydrocarbon C6-C35	973	25.0	"	1060	ND	91.8	75-125	3.73	20	
Surrogate: 1-Chlorooctane	*57.8*		*mg/kg*	*50.0*		*116*	*70-130*			
Surrogate: 1-Chlorooctadecane	*46.7*		*"*	*50.0*		*93.4*	*70-130*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA61202 - General Preparation (Prep)										
Blank (EA61202-BLK1)				Prepared:	01/11/06	Analyzed:	01/12/06			
% Solids	100		%							
Duplicate (EA61202-DUP1)		**Source: 6A10012-01**		Prepared:	01/11/06	Analyzed:	01/12/06			
% Solids	88.6		%		90.4			2.01	20	
Duplicate (EA61202-DUP2)		**Source: 6A10016-04**		Prepared:	01/11/06	Analyzed:	01/12/06			
% Solids	93.3		%		93.6			0.321	20	
Duplicate (EA61202-DUP3)		**Source: 6A11007-01**		Prepared:	01/11/06	Analyzed:	01/12/06			
% Solids	96.6		%		97.0			0.413	20	
Batch EA61303 - Water Extraction										
Blank (EA61303-BLK1)				Prepared:	01/11/06	Analyzed:	01/13/06			
Chloride	ND	0.500	mg/kg							
LCS (EA61303-BS1)				Prepared:	01/11/06	Analyzed:	01/13/06			
Chloride	8.58		mg/L	10.0		85.8	80-120			
Calibration Check (EA61303-CCV1)				Prepared:	01/11/06	Analyzed:	01/13/06			
Chloride	8.75		mg/L	10.0		87.5	80-120			
Duplicate (EA61303-DUP1)		**Source: 6A10017-01**		Prepared:	01/11/06	Analyzed:	01/13/06			
Chloride	3850	100	mg/kg		3790			1.57	20	
Batch EA61304 - Water Extraction										
Blank (EA61304-BLK1)				Prepared:	01/12/06	Analyzed:	01/13/06			
Chloride	ND	0.500	mg/kg							

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA61304 - Water Extraction										
LCS (EA61304-BS1)				Prepared: 01/12/06		Analyzed: 01/13/06				
Chloride	8.60		mg/L	10.0		86.0	80-120			
Calibration Check (EA61304-CCV1)				Prepared: 01/12/06		Analyzed: 01/13/06				
Chloride	9.66		mg/L	10.0		96.6	80-120			
Duplicate (EA61304-DUP1)	**Source: 6A11001-15**			Prepared: 01/12/06		Analyzed: 01/13/06				
Chloride	639	20.0	mg/kg		625			2.22	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 1/17/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: Rice Operating
Company Address: 122 W Taylor
City/State/Zip: Hobbs NM 88240
Telephone No: (505) 393-9174 631-1278
Fax No:
Sampler Signature: Jennifer A Johnson

Project Name: ABO APACHE LALCAE
Project #:
Project Loc:
PO #:

6A11001

LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative: Ice	Preservative: HNO_3	Preservative: HCl	Preservative: NaOH	Preservative: H_2SO_4	Preservative: None	Preservative: Other (Specify)	Matrix: Water	Matrix: Sludge	Matrix: Soil	Matrix: Other (specify)	Analyze For: TDS / CL / SAR / EC	Analyze For: TPH 418.1	Analyze For: TPH TX 1005/1006	Analyze For: TPH 8015M GRO/DRO	Analyze For: Metals: As Ag Ba Cd Cr Pb Hg Se	Analyze For: Volatiles	Analyze For: Semivolatiles	Analyze For: BTEX 8021B/5030							RUSH TAT (Pre-Schedule)
-01	#45 @ 1' bgs	1/5/06	12:12	1	X									X		X			X											
-02	#54 @ 1' bgs	1/5/06	12:30	1	X									X		X			X											
-03	#27 @ 1' bgs	1/6/06	3:05	1	X									X		X			X											
-04	#13 @ 1' bgs	1/6/06	8:30	1	X									X		X			X											
-05	#62 @ 1' bgs	1/5/06	1:00	1	X									X		X			X											
-06	#39 @ 1' bgs	1/4/06	11:05	1	X									X		X			X											
-07	#57 @ 1' bgs	1/4/06	11:20	1	X									X		X			X											
-08	#14 @ 1' bgs	1/6/06	8:32	1	X									X		X			X											
-09	#44 @ 1' bgs	1/5/06	12:15	1	X									X		X			X											
-10	#60 @ 3' bgs	1/6/06	2:30	1	X									X		X			X											

Special Instructions: TPH - please do the circled first: if non-detect, call before continuing

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt:
Laboratory Comments: 1.5 4oz [illegible]

Relinquished by:	Date	Time	Received by:	Date	Time
Jennifer A Johnson	1/10/06	5:00	C D Haynes	1/10	17:00
C D Haynes	1/11	7:30	Received by ELOT: [illegible]	1/11/06	8:30

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: Rice Operating
Company Address: 122 W Taylor
City/State/Zip: Hobbs NM 88240
Telephone No: 505 393 9174
Fax No:
Sampler Signature: Jennifer A Johnson

Project Name: ABD Apache Lalick
Project #:
Project Loc:
PO #:

C4#001

LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative							Matrix				Analyze For: TCLP: TOTAL:														RUSH TAT (Pre-Schedule)
					Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify)	TDS/(CL)/SAR / EC	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030							
-11	#58 @ 5' bgs	1/4/06	11:10	1	X									X		X			X											
-12	#10 @ 1' bgs	1/6/06	8:40	1	X									X		X			X											
-13	#55 @ 4' bgs	1/9/06	8:56	1	X									X		X			X											
-14	#28 @ 1' bgs	1/6/06	2:52	1	X									X		X			X											
-15	#52 @ 1' bgs	1/5/06	12:45	1	X									X		X			X											
-16	#22 @ 1' bgs	1/6/06	3:10	1	X									X		X			X											
-17	#63 @ 1' bgs	1/5/05	12:25	1	X									X		X			X											
-18	#38 @ 5' bgs	1/4/05	1:40	1	X									X		X			X											
-19	#33 @ 1' bgs	1/6/05	2:57	1	X									X		X			X											
-20	#53 @ 1' bgs	1/5/06	12:20	1	X									X		X			X											

Special Instructions:
TPH Please do circled first; if non detect, call before continuing CDH

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt:
Laboratory Comments:

Relinquished by:	Date	Time	Received by:	Date	Time
Jennifer A Johnson	1/10/06	5:00pm	C Hayne	1/10	17:00

Relinquished by:	Date	Time	Received by ELOT:	Date	Time
C Hayne	1/11	7:30	Drop Box / Chris Keel	1/11/06	8:00

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: Rice Operating
Company Address: 122 W Taylor
City/State/Zip: Hobbs NM 88240
Telephone No: (505) 593-9174
Fax No:
Sampler Signature: Jennifer A Johnson

Project Name: ABD APACHE CA Leak
Project #:
Project Loc:
PO #:

					Preservative							Matrix				Analyze For: TCLP: / TOTAL:														
6A11061 LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify)	TDS/Cl/SAR / EC	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030							RUSH TAT (Pre-Schedule)
-21	#56' bgs	1/5/06	2:45	1	X									X		X			X											
-22	#61 @ 3' bgs	1/6/06	2:45	1	X									X		X			X											
-23	#26 @ 1' bgs	1/6/05	2:54	1	X									X		X			X											
-24	# 32 @ 1' bgs	1/6/06	3:00	1	X									X		X			X											
-25	# 74 @ 5' bgs	1/4/06	10:55	1	X									X		X			X											
-26	# 75 @ 5' bgs	1/4/06	11:00	1	X									X		X			X											
-27	# 59 @ 5' bgs	1/4/06	1:47	1	X									X		X			X											
-28	# 9 @ 1' bgs	1/6/06	8:35	1	X									X		X			X											

Special Instructions:
TPH - please do circled first; if non detect, call before continuing Cont

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt:
Laboratory Comments:

Relinquished by:	Date	Time	Received by:	Date	Time
Jennifer A Johnson	1/10/06	5:00pm		1/10	1700
Relinquished by:	**Date**	**Time**	**Received by ELOT:**	**Date**	**Time**
	1/11	7:30	Drop Box/[illegible]	1/11/06	8:00

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Op.

Date/Time: 1/11/06 8:00

Order #: 6A1100

Initials: CK

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	1.5 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL LAB OF TEXAS

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:
Roy Rascon
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak Site
Project Number: None Given
Location: None Given

Lab Order Number: 6A17001

Report Date: 01/18/06

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	01/18/06 11:31

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
#26 @ 2' bgs	6A17001-01	Soil	01/11/06 13:05	01/17/06 08:00
#25 @ 2' bgs	6A17001-02	Soil	01/11/06 13:00	01/17/06 08:00
#35 @ 1' bgs	6A17001-03	Soil	01/11/06 14:10	01/17/06 08:00
#37 @ 5' bgs	6A17001-04	Soil	01/10/06 14:00	01/17/06 08:00
#30 @ 3' bgs	6A17001-05	Soil	01/12/06 09:15	01/17/06 08:00
#29 @ 3' bgs	6A17001-06	Soil	01/12/06 09:11	01/17/06 08:00
#40 @ 5' bgs	6A17001-07	Soil	01/12/06 11:30	01/17/06 08:00
#31 @ 3' bgs	6A17001-08	Soil	01/12/06 10:30	01/17/06 08:00
#1 @ 1' bgs	6A17001-09	Soil	01/13/06 10:50	01/17/06 08:00
#5 @ 1' bgs	6A17001-10	Soil	01/13/06 10:55	01/17/06 08:00
#6 @ 1' bgs	6A17001-11	Soil	01/13/06 11:00	01/17/06 08:00
#11 @ 1' bgs	6A17001-12	Soil	01/13/06 11:05	01/17/06 08:00
#18 @ 1' bgs	6A17001-13	Soil	01/13/06 13:05	01/17/06 08:00
Blend #1	6A17001-14	Soil	01/13/06 13:06	01/17/06 08:00
Blend #2	6A17001-15	Soil	01/13/06 14:10	01/17/06 08:00

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
#25 @ 2' bgs (6A17001-02) Soil									
Gasoline Range Organics C6-C12	ND	10.0	mg/kg dry	1	EA61709	01/17/06	01/17/06	EPA 8015M	
Diesel Range Organics >C12-C35	ND	10.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	10.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*97.0 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*86.6 %*	*70-130*		"	"	"	"	
#29 @ 3' bgs (6A17001-06) Soil									
Gasoline Range Organics C6-C12	ND	10.0	mg/kg dry	1	EA61709	01/17/06	01/17/06	EPA 8015M	
Diesel Range Organics >C12-C35	ND	10.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	10.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*104 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*92.4 %*	*70-130*		"	"	"	"	
#40 @ 5' bgs (6A17001-07) Soil									
Gasoline Range Organics C6-C12	ND	10.0	mg/kg dry	1	EA61709	01/17/06	01/17/06	EPA 8015M	
Diesel Range Organics >C12-C35	ND	10.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	10.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*99.8 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*88.4 %*	*70-130*		"	"	"	"	
#1 @ 1' bgs (6A17001-09) Soil									
Gasoline Range Organics C6-C12	ND	10.0	mg/kg dry	1	EA61709	01/17/06	01/17/06	EPA 8015M	
Diesel Range Organics >C12-C35	**192**	10.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	**192**	10.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*101 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*89.6 %*	*70-130*		"	"	"	"	

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
#26 @ 2' bgs (6A17001-01) Soil									
Chloride	**995**	20.0	mg/kg.	40	EA61708	01/17/06	01/17/06	EPA 300.0	
#25 @ 2' bgs (6A17001-02) Soil									
Chloride	**1280**	25.0	mg/kg	50	EA61708	01/17/06	01/17/06	EPA 300.0	
% Moisture	**4.9**	0.1	%	1	EA61801	01/17/06	01/18/06	% calculation	
#35 @ 1' bgs (6A17001-03) Soil									
Chloride	**2130**	25.0	mg/kg	50	EA61708	01/17/06	01/17/06	EPA 300.0	
#37 @ 5' bgs (6A17001-04) Soil									
Chloride	**594**	10.0	mg/kg	20	EA61708	01/17/06	01/17/06	EPA 300.0	
#30 @ 3' bgs (6A17001-05) Soil									
Chloride	**1410**	25.0	mg/kg	50	EA61708	01/17/06	01/17/06	EPA 300.0	
#29 @ 3' bgs (6A17001-06) Soil									
Chloride	**1480**	25.0	mg/kg	50	EA61708	01/17/06	01/17/06	EPA 300.0	
% Moisture	**5.0**	0.1	%	1	EA61801	01/17/06	01/18/06	% calculation	
#40 @ 5' bgs (6A17001-07) Soil									
Chloride	**1440**	25.0	mg/kg	50	EA61708	01/17/06	01/17/06	EPA 300.0	
% Moisture	**6.2**	0.1	%	1	EA61801	01/17/06	01/18/06	% calculation	
#31 @ 3' bgs (6A17001-08) Soil									
Chloride	**1060**	25.0	mg/kg	50	EA61708	01/17/06	01/17/06	EPA 300.0	
#1 @ 1' bgs (6A17001-09) Soil									
Chloride	**214**	10.0	mg/kg	20	EA61708	01/17/06	01/17/06	EPA 300.0	
% Moisture	**4.2**	0.1	%	1	EA61801	01/17/06	01/18/06	% calculation	

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
#5 @ 1' bgs (6A17001-10) Soil									
Chloride	**867**	25.0	mg/kg	50	EA61708	01/17/06	01/17/06	EPA 300.0	
#6 @ 1' bgs (6A17001-11) Soil									
Chloride	**594**	20.0	mg/kg	40	EA61708	01/17/06	01/17/06	EPA 300.0	
#11 @ 1' bgs (6A17001-12) Soil									
Chloride	**688**	20.0	mg/kg	40	EA61708	01/17/06	01/17/06	EPA 300.0	
#18 @ 1' bgs (6A17001-13) Soil									
Chloride	**334**	10.0	mg/kg	20	EA61708	01/17/06	01/17/06	EPA 300.0	
Blend #1 (6A17001-14) Soil									
Chloride	**322**	10.0	mg/kg	20	EA61708	01/17/06	01/17/06	EPA 300.0	
Blend #2 (6A17001-15) Soil									
Chloride	**356**	10.0	mg/kg	20	EA61708	01/17/06	01/17/06	EPA 300.0	

Organics by GC - Quality Control
Environmental Lab of Texas

Batch EA61709 - Solvent Extraction (GC)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (EA61709-BLK1)				Prepared & Analyzed: 01/17/06						
Gasoline Range Organics C6-C12	ND	10.0	mg/kg wet							
Diesel Range Organics >C12-C35	ND	10.0	"							
Total Hydrocarbon C6-C35	ND	10.0	"							
Surrogate: 1-Chlorooctane	*53.9*		*mg/kg*	*50.0*		*108*	*70-130*			
Surrogate: 1-Chlorooctadecane	*49.7*		*"*	*50.0*		*99.4*	*70-130*			
LCS (EA61709-BS1)				Prepared & Analyzed: 01/17/06						
Gasoline Range Organics C6-C12	445	10.0	mg/kg wet	500		89.0	75-125			
Diesel Range Organics >C12-C35	534	10.0	"	500		107	75-125			
Total Hydrocarbon C6-C35	979	10.0	"	1000		97.9	75-125			
Surrogate: 1-Chlorooctane	*52.0*		*mg/kg*	*50.0*		*104*	*70-130*			
Surrogate: 1-Chlorooctadecane	*41.8*		*"*	*50.0*		*83.6*	*70-130*			
Calibration Check (EA61709-CCV1)				Prepared: 01/17/06	Analyzed: 01/18/06					
Gasoline Range Organics C6-C12	478		mg/kg	500		95.6	80-120			
Diesel Range Organics >C12-C35	594		"	500		119	80-120			
Total Hydrocarbon C6-C35	1070		"	1000		107	80-120			
Surrogate: 1-Chlorooctane	*59.0*		*"*	*50.0*		*118*	*70-130*			
Surrogate: 1-Chlorooctadecane	*47.8*		*"*	*50.0*		*95.6*	*70-130*			
Matrix Spike (EA61709-MS1)	**Source: 6A17001-02**			Prepared & Analyzed: 01/17/06						
Gasoline Range Organics C6-C12	480	10.0	mg/kg dry	526	ND	91.3	75-125			
Diesel Range Organics >C12-C35	579	10.0	"	526	ND	110	75-125			
Total Hydrocarbon C6-C35	1060	10.0	"	1050	ND	101	75-125			
Surrogate: 1-Chlorooctane	*57.6*		*mg/kg*	*50.0*		*115*	*70-130*			
Surrogate: 1-Chlorooctadecane	*46.6*		*"*	*50.0*		*93.2*	*70-130*			
Matrix Spike Dup (EA61709-MSD1)	**Source: 6A17001-02**			Prepared & Analyzed: 01/17/06						
Gasoline Range Organics C6-C12	480	10.0	mg/kg dry	526	ND	91.3	75-125	0.00	20	
Diesel Range Organics >C12-C35	583	10.0	"	526	ND	111	75-125	0.688	20	
Total Hydrocarbon C6-C35	1060	10.0	"	1050	ND	101	75-125	0.00	20	
Surrogate: 1-Chlorooctane	*57.6*		*mg/kg*	*50.0*		*115*	*70-130*			
Surrogate: 1-Chlorooctadecane	*47.1*		*"*	*50.0*		*94.2*	*70-130*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA61708 - Water Extraction										
Blank (EA61708-BLK1)				Prepared & Analyzed: 01/17/06						
Chloride	ND	0.500	mg/kg							
LCS (EA61708-BS1)				Prepared & Analyzed: 01/17/06						
Chloride	8.48		mg/L	10.0		84.8	80-120			
Calibration Check (EA61708-CCV1)				Prepared & Analyzed: 01/17/06						
Chloride	8.71		mg/L	10.0		87.1	80-120			
Duplicate (EA61708-DUP1)		**Source: 6A16008-01**		Prepared & Analyzed: 01/17/06						
Chloride	3020	50.0	mg/kg		3010			0.332	20	
Batch EA61801 - General Preparation (Prep)										
Blank (EA61801-BLK1)				Prepared: 01/17/06	Analyzed: 01/18/06					
% Solids	100		%							
Duplicate (EA61801-DUP1)		**Source: 6A17001-02**		Prepared: 01/17/06	Analyzed: 01/18/06					
% Solids	95.2		%		95.1			0.105	20	
Duplicate (EA61801-DUP2)		**Source: 6A17009-01**		Prepared: 01/17/06	Analyzed: 01/18/06					
% Moisture	13.9	0.1	%		12.1			13.8	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Celey D Keene Date: 1/18/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
La Tasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Pg 1 of 2

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: Rice Operating
Company Address: 122 W Taylor
City/State/Zip: Hobbs, NM 88240
Telephone No: (505) 393-9174
Fax No: (505) 393-1471
Sampler Signature: Jennifer Johnson

Project Name: Abo Apache LA La
Project #:
Project Loc:
PO #:

LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO₃	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	TDS / [✓ CL] / SAR / EC	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	RUSH TAT (Pre-Schedule)
-01	#26 @ 2' bgs	1/11/06	1:05pm	1	X									X		X								
-02	#25 @ 2' bgs	1/11/06	1:00pm	1	X									X		X			X					X
-03	#35 @ 1' bgs	1/11/06	2:10pm	1	X									X		X								
[illegible]	#37 @ 5' bgs	1/10/06	2:00pm	1	X									X		X								X
	~~Pit Run #40~~ RRR	~~1/12/06~~	~~1:29pm~~	~~1~~	X									X		X								
[illegible]	#30 @ 3' bgs	1/12/06	9:15Am	1	X									X		X								
[illegible]	#29 @ 3' bgs	1/12/06	9:11Am	1	X									X		X			X					X
[illegible]	#40 @ 5' bgs	1/12/06	11:30Am	1	X									X		X			X					X
[illegible]	#31 @ 3' bgs	1/12/06	10:30Am	1	X									X		X								
[illegible]	#1 @ 1' bgs	1/13/06	10:50Am	1	X									X		X			X					X

TCLP:
TOTAL:

Special Instructions: PLEASE Run TPH on Designated sample if clean call 505-631-1278 Roy, & Rush samples marked Red, Disregard samples slashed & Initialed RRR

Relinquished by:	Date	Time	Received by:	Date	Time
Melanie Franks	1/16/06	4:00pm		1/16	17:30
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
	1/17	8:05		[illegible]	[illegible]

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt:
Laboratory Comments: [illegible]

Pg 2 of 2

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: Rice Operating
Company Address: 122 W Taylor
City/State/Zip: Hobbs, NM 88240
Telephone No: (505) 393-9174
Fax No: (505) 393-1471
Sampler Signature: Jennifer Johnson

Project Name: ABO Apache LA Loc
Project #:
Project Loc:
PO #:

LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative: Ice	HNO$_3$	HCl	NaOH	H$_2$SO$_4$	None	Other (Specify)	Matrix: Water	Sludge	Soil	Other (specify):	Analyze For: TDS / [✓ CL] / SAR / EC	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	RUSH TAT (Pre-Schedule)
-10	#5@ 1' bgs	1/13/06	10:55AM	1	X									X		X								
-11	#6@ 1' bgs	1/13/06	11:00AM	1	X									X		X								
-12	#11 @ 1' bgs	1/13/06	11:05AM	1	X									X		X								
-13	#18@ 1' bgs	1/13/06	1:05pm	1	X									X		X								
	~~Pile from 1 11~~ KRK	~~1/13/06~~	~~2:30pm~~	~~1~~	~~X~~									X		X								
-14	Blend #1	1/13/06	1:06pm	1	X									X		X								
-15	Blend #2	1/13/06	2:10pm	1	X									X		X								

TCLP:
TOTAL:

Special Instructions:

Relinquished by:	Date	Time	Received by:	Date	Time
Melanie Franko	1/16/06	4:00pm	C R [illegible]	1/16	17:30
Relinquished by: C R [illegible]	1/17	8:00	Received by ELOT: [illegible]	01-17-06	[illegible]

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt:
Laboratory Comments: 0.5 C
4 oz glass [illegible]
[illegible]

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Operating Co.

Date/Time: 01-17-06 @0800

Order #: 6A17001

Initials: JMM

Sample Receipt Checklist

Temperature of container/cooler?	[✓ Yes]	No	0.5 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	Yes	No	[✓ Not present]
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Roy Rascon
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak Site
Project Number: None Given
Location: None Given

Lab Order Number: 6A17001

Report Date: 01/18/06

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	01/18/06 09:45

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
#37 @ 5' bgs	6A17001-04	Soil	01/10/06 14:00	01/17/06 08:00
#40 @ 5' bgs	6A17001-07	Soil	01/12/06 11:30	01/17/06 08:00

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	01/18/06 09:45

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
#37 @ 5' bgs (6A17001-04) Soil									
Chloride	**594**	10.0	mg/kg	20	EA61708	01/17/06	01/17/06	EPA 300.0	
#40 @ 5' bgs (6A17001-07) Soil									
Chloride	**1440**	25.0	mg/kg	50	EA61708	01/17/06	01/17/06	EPA 300.0	
% Moisture	**6.2**	0.1	%	1	EA61801	01/17/06	01/18/06	% calculation	

General Chemistry Parameters by EPA / Standard Methods - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA61708 - Water Extraction										
Blank (EA61708-BLK1)				Prepared & Analyzed: 01/17/06						
Chloride	ND	0.500	mg/kg							
LCS (EA61708-BS1)				Prepared & Analyzed: 01/17/06						
Chloride	8.48		mg/L	10.0		84.8	80-120			
Calibration Check (EA61708-CCV1)				Prepared & Analyzed: 01/17/06						
Chloride	8.71		mg/L	10.0		87.1	80-120			
Duplicate (EA61708-DUP1)	**Source: 6A16008-01**			Prepared & Analyzed: 01/17/06						
Chloride	3020	50.0	mg/kg		3010			0.332	20	
Batch EA61801 - General Preparation (Prep)										
Blank (EA61801-BLK1)				Prepared: 01/17/06 Analyzed: 01/18/06						
% Solids	100		%							
Duplicate (EA61801-DUP1)	**Source: 6A17001-02**			Prepared: 01/17/06 Analyzed: 01/18/06						
% Solids	95.2		%		95.1			0.105	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 1/18/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer
Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Pg 1 of 2

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: Rice Operating
Company Address: 122 W Taylor
City/State/Zip: Hobbs, NM 88240
Telephone No: (505) 393-9174
Fax No: (505) 393-1471
Sampler Signature: Jennifer Johnson

Project Name: Abo Apache LA Leo
Project #:
Project Loc:
PO #:

					Preservative							Matrix				Analyze For: TCLP: / TOTAL:														
LAB # (lab use only) CA17006	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	TDS / [✓ CL] / SAR / EC	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030							RUSH TAT (Pre-Schedule)
-01	#26 @ 2' bgs	1/11/06	1:05pm	1	X									X		X														
-02	#25 @ 2' bgs	1/11/06	1:00pm	1	X									X		X			X											X
-03	#35 @ 1' bgs	1/11/06	2:10pm	1	X									X		X														
-04	#31 @ 5' bgs	1/10/06	2:00pm	1	X									X		X														X
	~~Pit from #40~~ RRR	~~1/12/06~~	~~1:29pm~~	~~1~~	~~X~~									~~X~~		~~X~~														
-05	#30 @ 3' bgs	1/12/06	9:15Am	1	X									X		X														
-06	#29 @ 3' bgs	1/12/06	9:11Am	1	X									X		X			X											X
-07	#40 @ 5' bgs	1/12/06	11:30AM	1	X									X		X			X											X
-08	#31 @ 3' bgs	1/12/06	10:30AM	1	X									X		X														
-09	#1 @ 1' bgs	1/13/06	10:50AM	1	X									X		X			X											X

Special Instructions: PLEASE Run TPH on DESIGNATED SAMPLE IF CLEAN CALL 505-631-1278 Roy, & Rush samples marked Red, Disregard samples slashed & Initialed RRR

Relinquished by:	Date	Time	Received by:	Date	Time
Melanie Franks	1/16/06	4:00pm		1/16	17:30
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
	1/17	8:05	[illegible]	01-17-06	[illegible]

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt:
Laboratory Comments: 0.5 C
[illegible]

Pg 2 of 2

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: Rice Operating
Company Address: 122 W Taylor
City/State/Zip: Hobbs, NM 88240
Telephone No: (505) 393-9174
Fax No: (505) 393-1471
Sampler Signature: Jennifer Johnson

Project Name: ABD Apache LA Loc
Project #:
Project Loc:
PO #:

					Preservative							Matrix				Analyze For: TCLP: TOTAL:														
LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	TDS / [✓ CL] / SAR / EC	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030							RUSH TAT (Pre-Schedule)
-10	#5@ 1' bgs	1/13/06	10:55AM	1	X									X		X														
-11	#6@ 1' bgs	1/13/06	11:00AM	1	X									X		X														
-12	#11 @ 1' bgs	1/13/06	11:05AM	1	X									X		X														
-13	#18@ 1' bgs	1/13/06	1:05pm	1	X									X		X														
	~~Pile from 1 11~~ RR	~~1/13/06~~	~~2:30pm~~	~~1~~	~~X~~									~~X~~		~~X~~														
-14	Blend #1	1/13/06	1:06pm	1	X									X		X														
-15	Blend #2	1/13/06	2:10pm	1	X									X		X														

Special Instructions:

Relinquished by:	Date	Time	Received by:	Date:	Time
Milanie Franko	1/16/06	4:00pm		1/16	17:30
Relinquished by:	**Date**	**Time**	**Received by ELOT:**	**Date:**	**Time**
	1/17	8:00		01-17-06	[illegible]

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt:
Laboratory Comments: -2.5
[illegible]

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Operating Co.

Date/Time: 01-17-06 @0800

Order #: 6A17001

Initials: JMM

Sample Receipt Checklist

Temperature of container/cooler?	[✓ Yes]	No	0.5 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	Yes	No	[✓ Not present]
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: - ________ Date/Time: ________ Contacted by: ________

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:
Roy Rascon
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak Site
Project Number: None Given
Location: None Given

Lab Order Number: 6A23001

Report Date: 01/25/06

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO-Apache LA Leak Site Project Number: None Given Project Manager: Roy Rascon	Fax: (505) 397-1471 **Reported:** 01/25/06 09:30

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
#35@ 2' bgs	6A23001-01	Soil	01/18/06 14:45	01/20/06 17:00
#9@ 2' bgs	6A23001-02	Soil	01/17/06 11:05	01/20/06 17:00
#63@ 5' bgs	6A23001-03	Soil	01/18/06 12:30	01/20/06 17:00
#55@ 5' bgs	6A23001-04	Soil	01/18/06 07:50	01/20/06 17:00
#32@ 2' bgs	6A23001-05	Soil	01/17/06 13:30	01/20/06 17:00
#31@ 5' bgs	6A23001-06	Soil	01/19/06 15:15	01/20/06 17:00
#3 pile	6A23001-07	Soil	01/20/06 08:20	01/20/06 17:00
#25@ 4' bgs	6A23001-08	Soil	01/19/06 15:10	01/20/06 17:00
#36@ 5' bgs	6A23001-09	Soil	01/20/06 08:18	01/20/06 17:00
#56@ 5' bgs	6A23001-10	Soil	01/19/06 12:35	01/20/06 17:00
#29@ 5' bgs	6A23001-11	Soil	01/19/06 10:40	01/20/06 17:00
#60@ 5' bgs	6A23001-12	Soil	01/18/06 08:30	01/20/06 17:00
Pile #4	6A23001-13	Soil	01/20/06 07:45	01/20/06 17:00
#33@ 2' bgs	6A23001-14	Soil	01/17/06 13:30	01/20/06 17:00
#54@ 3' bgs	6A23001-15	Soil	01/19/06 14:10	01/20/06 17:00
#30@ 5' bgs	6A23001-16	Soil	01/19/06 12:55	01/20/06 17:00
#10@ 2' bgs	6A23001-17	Soil	01/17/06 11:15	01/20/06 17:00
#61@ 5' bgs	6A23001-18	Soil	01/18/06 08:35	01/20/06 17:00

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
#35@ 2' bgs (6A23001-01) Soil									
Chloride	**1140**	25.0	mg/kg	50	EA62501	01/24/06	01/24/06	EPA 300.0	
#9@ 2' bgs (6A23001-02) Soil									
Chloride	**1040**	20.0	mg/kg	40	EA62501	01/24/06	01/24/06	EPA 300.0	
#63@ 5' bgs (6A23001-03) Soil									
Chloride	**1170**	20.0	mg/kg	40	EA62501	01/24/06	01/24/06	EPA 300.0	
#55@ 5' bgs (6A23001-04) Soil									
Chloride	**1470**	25.0	mg/kg	50	EA62501	01/24/06	01/24/06	EPA 300.0	
#32@ 2' bgs (6A23001-05) Soil									
Chloride	**1020**	25.0	mg/kg	50	EA62501	01/24/06	01/24/06	EPA 300.0	
#31@ 5' bgs (6A23001-06) Soil									
Chloride	**1380**	25.0	mg/kg	50	EA62501	01/24/06	01/24/06	EPA 300.0	
#3 pile (6A23001-07) Soil									
Chloride	**250**	10.0	mg/kg	20	EA62501	01/24/06	01/24/06	EPA 300.0	
#25@ 4' bgs (6A23001-08) Soil									
Chloride	**1170**	25.0	mg/kg	50	EA62501	01/24/06	01/24/06	EPA 300.0	
#36@ 5' bgs (6A23001-09) Soil									
Chloride	**2120**	25.0	mg/kg	50	EA62501	01/24/06	01/24/06	EPA 300.0	
#56@ 5' bgs (6A23001-10) Soil									
Chloride	**1640**	25.0	mg/kg	50	EA62501	01/24/06	01/24/06	EPA 300.0	
#29@ 5' bgs (6A23001-11) Soil									
Chloride	**933**	10.0	mg/kg	20	EA62501	01/24/06	01/24/06	EPA 300.0	

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
#60@ 5' bgs (6A23001-12) Soil									
Chloride	**1360**	20.0	mg/kg	40	EA62501	01/24/06	01/24/06	EPA 300.0	
Pile #4 (6A23001-13) Soil									
Chloride	**261**	10.0	mg/kg	20	EA62501	01/24/06	01/24/06	EPA 300.0	
#33@ 2' bgs (6A23001-14) Soil									
Chloride	**809**	10.0	mg/kg	20	EA62501	01/24/06	01/24/06	EPA 300.0	
#54@ 3' bgs (6A23001-15) Soil									
Chloride	**962**	20.0	mg/kg	40	EA62501	01/24/06	01/24/06	EPA 300.0	
#30@ 5' bgs (6A23001-16) Soil									
Chloride	**730**	10.0	mg/kg	20	EA62501	01/24/06	01/24/06	EPA 300.0	
#10@ 2' bgs (6A23001-17) Soil									
Chloride	**1050**	20.0	mg/kg	40	EA62501	01/24/06	01/24/06	EPA 300.0	
#61@ 5' bgs (6A23001-18) Soil									
Chloride	**1380**	20.0	mg/kg	40	EA62501	01/24/06	01/24/06	EPA 300.0	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA62501 - Water Extraction										
Blank (EA62501-BLK1)				Prepared & Analyzed: 01/24/06						
Chloride	ND	0.500	mg/kg							
LCS (EA62501-BS1)				Prepared & Analyzed: 01/24/06						
Chloride	8.29	0.500	mg/kg	10.0		82.9	80-120			
Calibration Check (EA62501-CCV1)				Prepared & Analyzed: 01/24/06						
Chloride	8.59		mg/L	10.0		85.9	80-120			
Duplicate (EA62501-DUP1)	**Source: 6A23001-01**			Prepared & Analyzed: 01/24/06						
Chloride	1090	25.0	mg/kg		1140			4.48	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Date: 1/25/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: Pride Operating Co.
Company Address: 122 W. Taylor
City/State/Zip: Hobbs NM 88240
Telephone No: (505) 393-9174
Fax No:
Sampler Signature: Jennifer Alphonso

Project Name: Abo Apache LA Leak
Project #:
Project Loc:
PO #:

LAB # (lab use only) 6A23001	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative							Matrix				Analyze For: TCLP: / TOTAL:															
					Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify)	TDS/ Cl / SAR / EC	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030							RUSH TAT (Pre-Schedule)
-01	#35@2' bgs	1/18/06	2:45	1	X									X		X														X
-02	#9@2' bgs	1/17/06	11:05	1	X									X		X														X
-03	#63 @5' bgs	1/18/06	12:30	1	X									X		X														
-04	#55 @5' bgs	1/18/06	7:50	1	X									X		X														
-05	#32@2' bgs	1/17/06	1:30	1	X									X		X														
-06	#31 @5' bgs	1/19/06	3:15	1	X									X		X														
-07	#3 pile	1/20/06	8:20	1	X									X		X														X
-08	#25 @4' bgs	1/19/06	3:10	1	X									X		X														X

Special Instructions: * call Roy for Rush ASAP

Relinquished by:	Date	Time	Received by:	Date	Time
Jennifer Alphonso	1/20/06	2:30		1/20	14:15

Relinquished by:	Date	Time	Received by ELOT:	Date	Time
	1/20	17:00		1/20/06	17:00

Sample Containers Intact? Y
Temperature Upon Receipt: 2.0 °C
Laboratory Comments:

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: Rice Operating Co
Company Address: 122 W. Taylor
City/State/Zip: Hobbs NM 88240
Telephone No: (505) 393-9174
Fax No:
Sampler Signature: Jennifer A Johnson

Project Name: NOD Apache LA Leak
Project #:
Project Loc:
PO #:

					Preservative							Matrix				Analyze For: TCLP: TOTAL:														
LAB # (lab use only) 6A2304	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify)	TDS (CL) SAR / EC	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030							RUSH TAT (Pre-Schedule)
-09	#36 @ 5' bgs	1/20/06	8:18	1	X									X		X														
-10	#56 @ 5' bgs	1/19/06	12:35	1	X									X		X														
-11	#29 @ 5' bgs	1/19/06	10.40	1	X									X		X														
-12	#60 @ 5' bgs	1/18/06	8:30	1	X									X		X														
-13	Pile #4	1/20/06	7:45	1	X									X		X														
-14	#33 @ 2' bgs	1/17/06	1:30	1	X									X		X														
-15	#54 @ 3' bgs	1/19/06	2:10	1	X									X		X														
-16	#30 @ 5' bgs	1/19/06	12:55	1	X									X		X														
-17	#10 @ 2' bgs	1/17/04	11:15pm	1	X									X		X														
-18	#61 @ 5' bgs	1/18/06	8:35	1	X									X		X														

Special Instructions:
X call Roy for rush
ASAP

Relinquished by:	Date	Time	Received by:	Date	Time
Jennifer A Johnson	1/20/06	2:00pm		1/20	14:05
Relinquished by:	Date 1/20	Time 17:00	Received by ELOT:	Date 1/20/06	Time 17:00

Sample Containers Intact? Y N
Temperature Upon Receipt:
Laboratory Comments:

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice op.

Date/Time: 1/20/06 17:00

Order #: 6A23001

Initials: CK

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	2.0 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	Yes	No	[✓ Not Applicable]

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:
Roy Rascon
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak Site
Project Number: Remediation
Location: None Given

Lab Order Number: 6A24004

Report Date: 01/26/06

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: Remediation	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	01/26/06 15:20

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Pile #1 Blended	6A24004-01	Soil	01/23/06 12:50	01/24/06 08:00
Pile #2 Blended	6A24004-02	Soil	01/23/06 14:45	01/24/06 08:00

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pile #1 Blended (6A24004-01) Soil									
Chloride	**288**	10.0	mg/kg	20	EA62404	01/25/06	01/26/06	EPA 300.0	
Pile #2 Blended (6A24004-02) Soil									
Chloride	**244**	10.0	mg/kg	20	EA62404	01/25/06	01/26/06	EPA 300.0	

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: Remediation	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	01/26/06 15:20

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA62404 - Water Extraction										
Blank (EA62404-BLK1)				Prepared: 01/25/06		Analyzed: 01/26/06				
Chloride	ND	0.500	mg/kg							
LCS (EA62404-BS1)				Prepared: 01/25/06		Analyzed: 01/26/06				
Chloride	8.31	0.500	mg/kg	10.0		83.1	80-120			
Calibration Check (EA62404-CCV1)				Prepared: 01/25/06		Analyzed: 01/26/06				
Chloride	8.24		mg/L	10.0		82.4	80-120			
Duplicate (EA62404-DUP1)	**Source: 6A24003-01**			Prepared: 01/25/06		Analyzed: 01/26/06				
Chloride	348	10.0	mg/kg		327			6.22	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 1/26/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon

Company Name Rice Operating Company

Company Address: 122 W Taylor

City/State/Zip: Hobbs, NM 88240

Telephone No: 505-393-9174

Fax No: 505-397-1471

Sampler Signature: Roy R. Rascon

Project Name: ABO APACHE LA Leak Site Remediation

Project #:

Project Loc:

PO #:

					Preservative							Matrix				Analyze For: TCLP: / TOTAL:															
6A24004 LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	CL	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	EC, CEC, SAR, ESP	Major cations/anions, TDS					RUSH TAT (Pre-Schedule)	Standard TAT
-01	Pile #1 Blended	1-23-06	1250	1						✓				X		✓															
-02	Pile #2 Blended	1-23-06	245 P	1						✓				X		✓															

Special Instructions:

Sample Containers Intact? [✓ Y] N

Temperature Upon Receipt: 1.5°C

Laboratory Comments: Labels w/ custody seals

462

Relinquished by:	Date	Time	Received by:	Date	Time
Roy R. Rascon	1-23-06	400 P ~~112 RRR~~		1/23	16:00
Relinquished by:	**Date**	**Time**	**Received by ELOT:**	**Date**	**Time**
	1/24	8:00	Rolandk Juele	1-24-06	0800

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Op.

Date/Time: 1/24/06 8:00

Order #: 6A24004

Initials: CK

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	1.5 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Roy Rascon
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak Site
Project Number: None Given
Location: None Given

Lab Order Number: 6B01009

Report Date: 02/06/06

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO-Apache LA Leak Site Project Number: None Given Project Manager: Roy Rascon	Fax: (505) 397-1471 **Reported:** 02/06/06 17:06

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Pile #6	6B01009-01	Soil	01/27/06 15:00	01/31/06 19:40

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO-Apache LA Leak Site Project Number: None Given Project Manager: Roy Rascon	Fax: (505) 397-1471 **Reported:** 02/06/06 17:06

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pile #6 (6B01009-01) Soil									
Chloride	**623**	10.0	mg/kg	20	EB60608	02/03/06	02/06/06	EPA 300.0	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EB60608 - Water Extraction										
Blank (EB60608-BLK1)				Prepared: 02/03/06		Analyzed: 02/06/06				
Chloride	ND	0.500	mg/kg							
LCS (EB60608-BS1)				Prepared: 02/03/06		Analyzed: 02/06/06				
Chloride	8.98		mg/L	10.0		89.8	80-120			
Calibration Check (EB60608-CCV1)				Prepared: 02/03/06		Analyzed: 02/06/06				
Chloride	9.05		mg/L	10.0		90.5	80-120			
Duplicate (EB60608-DUP1)	**Source: 6B01006-03**			Prepared: 02/03/06		Analyzed: 02/06/06				
Chloride	200	10.0	mg/kg		200			0.00	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 2/6/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer
Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: Rice Operating Company
Company Address: 122 W Taylor
City/State/Zip: Hobbs, NM 88240
Telephone No: 505-393-9174
Fax No: 505-397-1471
Sampler Signature: Roy R. Rascon

Project Name: ABO Apache LA Leak site Remd.
Project #:
Project Loc:
PO #:

6B01009

					Preservative							Matrix				Analyze For: TCLP: / TOTAL:															
LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil 4oz glass	Other (specify):	/CL /	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	EC, CEC, SAR, ESP	Major cations/anions, TDS					RUSH TAT (Pre-Schedule)	Standard TAT
-01	Pile #6	1-27-06	1500	1						✓				X		✓															

Special Instructions:

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt: 0.5°C
Laboratory Comments:
Labels w/ custody seals

Relinquished by:	Date	Time	Received by:	Date	Time
Roy R. Rascon	1-31-06	3:09 pm		1/31	17:00
Relinquished by:	**Date**	**Time**	**Received by ELOT:**	**Date**	**Time**
		19:40	Rolandk	1-31-06	1940

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Op.

Date/Time: 1/31/06 19:40

Order #: 6B01009

Initials: CK

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	0.5 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	Yes	No	[✓ Not Applicable]

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF
12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:
Roy Rascon
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak Site
Project Number: None Given
Location: None Given

Lab Order Number: 6B07001

Report Date: 02/09/06

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	02/09/06 13:41

ANALYTICAL REPORT FOR SAMPLES

Sample ID	**Laboratory ID**	**Matrix**	**Date Sampled**	**Date Received**
Grid 18 E. Wall @ 5'	6B07001-01	Soil	02/03/06 10:00	02/07/06 08:00
Grid 18 Bttm Comp. @ 5'	6B07001-02	Soil	02/03/06 10:05	02/07/06 08:00
Grid 18 W. Wall @ 5'	6B07001-03	Soil	02/03/06 10:10	02/07/06 08:00
Grid 12 E. Wall @ 5'	6B07001-04	Soil	02/03/06 10:15	02/07/06 08:00
Grid 12 Bttm. Comp. @ 5'	6B07001-05	Soil	02/03/06 10:20	02/07/06 08:00
Grid 12 W. Wall @ 5'	6B07001-06	Soil	02/03/06 10:25	02/07/06 08:00
Grid 10 E. Wall @ 5'	6B07001-07	Soil	02/03/06 10:30	02/07/06 08:00
Grid 10 Bttm. Comp. @ 5'	6B07001-08	Soil	02/03/06 10:35	02/07/06 08:00
Grid 10 E. Wall @ 5'	6B07001-09	Soil	02/03/06 10:40	02/07/06 08:00

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Grid 18 E. Wall @ 5' (6B07001-01) Soil									
Chloride	**200**	10.0	mg/kg	20	EB60823	02/08/06	02/09/06	EPA 300.0	
Grid 18 Bttm Comp. @ 5' (6B07001-02) Soil									
Chloride	**863**	20.0	mg/kg	40	EB60823	02/08/06	02/09/06	EPA 300.0	
Grid 18 W. Wall @ 5' (6B07001-03) Soil									
Chloride	**791**	10.0	mg/kg	20	EB60823	02/08/06	02/09/06	EPA 300.0	
Grid 12 E. Wall @ 5' (6B07001-04) Soil									
Chloride	**807**	25.0	mg/kg	50	EB60823	02/08/06	02/09/06	EPA 300.0	
Grid 12 Bttm. Comp. @ 5' (6B07001-05) Soil									
Chloride	**1060**	20.0	mg/kg	40	EB60823	02/08/06	02/09/06	EPA 300.0	
Grid 12 W. Wall @ 5' (6B07001-06) Soil									
Chloride	**2250**	50.0	mg/kg	100	EB60823	02/08/06	02/09/06	EPA 300.0	
Grid 10 E. Wall @ 5' (6B07001-07) Soil									
Chloride	**1370**	20.0	mg/kg	40	EB60823	02/08/06	02/09/06	EPA 300.0	
Grid 10 Bttm. Comp. @ 5' (6B07001-08) Soil									
Chloride	**514**	10.0	mg/kg	20	EB60823	02/08/06	02/09/06	EPA 300.0	
Grid 10 E. Wall @ 5' (6B07001-09) Soil									
Chloride	**1720**	20.0	mg/kg	40	EB60823	02/08/06	02/09/06	EPA 300.0	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EB60823 - Water Extraction										
Blank (EB60823-BLK1)				Prepared & Analyzed: 02/08/06						
Chloride	ND	0.500	mg/kg							
LCS (EB60823-BS1)				Prepared & Analyzed: 02/08/06						
Chloride	8.81	0.500	mg/kg	10.0		88.1	80-120			
Calibration Check (EB60823-CCV1)				Prepared & Analyzed: 02/08/06						
Chloride	9.22		mg/L	10.0		92.2	80-120			
Duplicate (EB60823-DUP1)	**Source: 6B07007-01**			Prepared & Analyzed: 02/08/06						
Chloride	66.2	5.00	mg/kg		65.3			1.37	20	

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	02/09/06 13:41

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K. Tuttle Date: 2/9/2006

Raland K. Tuttle, Lab Manager	Jeanne Mc Murrey, Inorg. Tech Director
Celey D. Keene, Lab Director, Org. Tech Director	LaTasha Cornish, Chemist
Peggy Allen, QA Officer	Sandra Sanchez, Lab Tech.

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon

Company Name: Rice Operating Company

Company Address: 122 W Taylor

City/State/Zip: Hobbs, NM 88240

Telephone No: 505-393-9174

Fax No: 505-397-1471

Sampler Signature:

Project Name: ABO APACHE L.A. Leak Site Remediation ~~ABO~~

Project #:

Project Loc:

PO #:

6B07001

					Preservative							Matrix				Analyze For:															
LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	CL-	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	EC, CEC, SAR, ESP	Major cations/anions, TDS					RUSH TAT (Pre-Schedule)	Standard TAT
-01	Grid 18 E. Wall @5'	2-3-06	1000	1	✓									✓		✓															
-02	Grid 18 BTTM Comp. @5'		1005	1																											
-03	Grid 18 W. Wall @ 5		1010	1																											
-04	Grid 12 E wall @5'	2-3-06	1015	1																											
-05	Grid 12 BTM Comp @5'		1020	1																											
-06	Grid 12 W wall @5'		1025	1																											
-07	Grid 10 E wall @5'	2 3 06	1030	1																											
-08	Grid 10 BTM Comp @5'		1035	1																											
-09	Grid 10 E wall @5'		1040	1																											

Special Instructions:

Sample Containers Intact? [✓ Y] N

Temperature Upon Receipt:

Laboratory Comments:

4.0°C

4oz glass on ice w/ labels + seals

Seal on cooler

Relinquished by:	Date	Time	Received by:	Date	Time
	020606	4:00P		2/7/6	8:00
Relinquished by:	**Date**	**Time**	**Received by ELOT:**	**Date**	**Time**
	2/7	8:00	Jeanne McMurry	02-07-06	0800

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Operating Co.

Date/Time: 02-07-06 @0800

Order #: 6B07001

Initials: JMM

Sample Receipt Checklist

Temperature of container/cooler?	[✓ Yes]	No	4.0 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	Yes	No	[✓ Not Applicable]

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:
Roy Rascon
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO- Apache Leak
Project Number: None Given
Location: None Given

Lab Order Number: 6B07002

Report Date: 02/13/06

Rice Operating Co.	Project: ABO- Apache Leak	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	02/13/06 10:36

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Grid 6 E. Wall @ 5'	6B07002-01	Soil	02/03/06 10:45	02/07/06 08:00
Grid 6 Bottom Comp. @ 5'	6B07002-02	Soil	02/03/06 10:50	02/07/06 08:00
Grid 6 W. Wall @ 5'	6B07002-03	Soil	02/03/06 10:55	02/07/06 08:00

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Grid 6 E. Wall @ 5' (6B07002-01) Soil									
Chloride	**209**	10.0	mg/kg	20	EB61002	02/09/06	02/10/06	EPA 300.0	
Grid 6 Bottom Comp. @ 5' (6B07002-02) Soil									
Chloride	**1140**	20.0	mg/kg	40	EB61002	02/09/06	02/10/06	EPA 300.0	
Grid 6 W. Wall @ 5' (6B07002-03) Soil									
Chloride	**465**	10.0	mg/kg	20	EB61002	02/09/06	02/10/06	EPA 300.0	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EB61002 - Water Extraction										
Blank (EB61002-BLK1)				Prepared: 02/09/06		Analyzed: 02/10/06				
Chloride	ND	0.500	mg/kg							
LCS (EB61002-BS1)				Prepared: 02/09/06		Analyzed: 02/10/06				
Chloride	8.93		mg/L	10.0		89.3	80-120			
Calibration Check (EB61002-CCV1)				Prepared: 02/09/06		Analyzed: 02/10/06				
Chloride	9.37		mg/L	10.0		93.7	80-120			
Duplicate (EB61002-DUP1)	**Source: 6B06018-33**			Prepared: 02/09/06		Analyzed: 02/10/06				
Chloride	12.2	5.00	mg/kg		12.2			0.00	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 2/13/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer
Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name Rice Operating Company
Company Address: 122 W Taylor
City/State/Zip: Hobbs, NM 88240
Telephone No: 505-393-9174
Fax No: 505-397-1471
Sampler Signature:

Project Name: [illegible] Remediation
Project #:
Project Loc:
PO #:

Analyze For: TCLP: TOTAL:

					Preservative							Matrix				Analyze For															
LAB # (lab use only) 6B07002	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Water	Sludge	Soil	Other (specify):	Cl	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	EC, CEC, SAR, ESP	Major cations/anions, TDS					RUSH TAT (Pre-Schedule)	Standard TAT
-01	Grid 6 E wall @ 5	020306	1045	1	✓									✓		✓															
-02	Grid 6 Bottom Comp @ 5	(	1050	1	✓									✓		✓															
-03	Grid 6 W wall @ 5	)	1055	1	✓									✓		✓															

Special Instructions:

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt:
Laboratory Comments:
4.0°C
4 oz glass on ice w/labels + seals
Seal on cooler

Relinquished by:	Date	Time	Received by:	Date	Time
	020606	4:00P		2/6	18:00

Relinquished by:	Date	Time	Received by ELOT:	Date	Time
	2/7	8:00	Jeanne McMurry	02-07-06	0800

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Operating Co.

Date/Time: 02-07-06 @ 0800

Order #: 6B07002

Initials: JMM

Sample Receipt Checklist

Temperature of container/cooler?	[✓ Yes]	No	4.0 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	Yes	No	[✓ Not Applicable]

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Roy Rascon
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak Site
Project Number: Remediation Project
Location: None Given

Lab Order Number: 6B15003

Report Date: 02/21/06

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO-Apache LA Leak Site Project Number: Remediation Project Project Manager: Roy Rascon	Fax: (505) 397-1471 **Reported:** 02/21/06 16:35

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Blended Backfill	6B15003-01	Soil	02/11/06 14:12	02/15/06 08:00
Sample P+A N Wall	6B15003-02	Soil	02/09/06 13:00	02/15/06 08:00
Sample P+A @ 5' Bottom Comp.	6B15003-03	Soil	02/09/06 13:05	02/15/06 08:00
Sample P+A S Wall	6B15003-04	Soil	02/09/06 13:10	02/15/06 08:00
Grid Z 2 Wall	6B15003-05	Soil	02/09/06 13:15	02/15/06 08:00
Grid Z N Wall	6B15003-06	Soil	02/09/06 13:20	02/15/06 08:00
Grid Z Bottom Comp. @ 5'	6B15003-07	Soil	02/09/06 13:25	02/15/06 08:00
Grid 3 N Wall	6B15003-08	Soil	02/09/06 13:20	02/15/06 08:00
Grid 3 BOH@ 5'	6B15003-09	Soil	02/09/06 13:40	02/15/06 08:00
Grid 3 2 Wall	6B15003-10	Soil	02/09/06 13:35	02/15/06 08:00

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Blended Backfill (6B15003-01) Soil									
Chloride	**236**	10.0	mg/kg	20	EB61613	02/16/06	02/17/06	EPA 300.0	
Sample P+A N Wall (6B15003-02) Soil									
Chloride	**626**	10.0	mg/kg	20	EB61613	02/16/06	02/17/06	EPA 300.0	
Sample P+A @ 5' Bottom Comp. (6B15003-03) Soil									
Chloride	**1060**	25.0	mg/kg	50	EB61613	02/16/06	02/17/06	EPA 300.0	
Sample P+A S Wall (6B15003-04) Soil									
Chloride	**1150**	25.0	mg/kg	50	EB61618	02/16/06	02/20/06	EPA 300.0	
Grid Z 2 Wall (6B15003-05) Soil									
Chloride	**1370**	25.0	mg/kg	50	EB61618	02/16/06	02/20/06	EPA 300.0	
Grid Z N Wall (6B15003-06) Soil									
Chloride	**737**	10.0	mg/kg	20	EB61618	02/16/06	02/20/06	EPA 300.0	
Grid Z Bottom Comp. @ 5' (6B15003-07) Soil									
Chloride	**1110**	20.0	mg/kg	40	EB61618	02/16/06	02/20/06	EPA 300.0	
Grid 3 N Wall (6B15003-08) Soil									
Chloride	**879**	20.0	mg/kg	40	EB61618	02/16/06	02/20/06	EPA 300.0	
Grid 3 BOH@ 5' (6B15003-09) Soil									
Chloride	**1250**	25.0	mg/kg	50	EB61618	02/16/06	02/20/06	EPA 300.0	
Grid 3 2 Wall (6B15003-10) Soil									
Chloride	**1040**	20.0	mg/kg	40	EB61618	02/16/06	02/20/06	EPA 300.0	

General Chemistry Parameters by EPA / Standard Methods - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EB61613 - Water Extraction										
Blank (EB61613-BLK1)				Prepared: 02/16/06		Analyzed: 02/17/06				
Chloride	ND	0.500	mg/kg							
LCS (EB61613-BS1)				Prepared: 02/16/06		Analyzed: 02/17/06				
Chloride	8.87	0.500	mg/kg	10.0		88.7	80-120			
Calibration Check (EB61613-CCV1)				Prepared: 02/16/06		Analyzed: 02/17/06				
Chloride	9.01		mg/L	10.0		90.1	80-120			
Duplicate (EB61613-DUP1)	**Source: 6B14010-05**			Prepared: 02/16/06		Analyzed: 02/17/06				
Chloride	38.5	5.00	mg/kg		38.6			0.259	20	
Batch EB61618 - Water Extraction										
Blank (EB61618-BLK1)				Prepared: 02/16/06		Analyzed: 02/20/06				
Chloride	ND	0.500	mg/kg							
LCS (EB61618-BS1)				Prepared: 02/16/06		Analyzed: 02/20/06				
Chloride	9.13	0.500	mg/kg	10.0		91.3	80-120			
Calibration Check (EB61618-CCV1)				Prepared: 02/16/06		Analyzed: 02/20/06				
Chloride	9.96		mg/L	10.0		99.6	80-120			
Duplicate (EB61618-DUP1)	**Source: 6B15003-05**			Prepared: 02/16/06		Analyzed: 02/20/06				
Chloride	1360	25.0	mg/kg		1370			0.733	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 2/21/2006

Raland K. Tuttle, Lab Manager	Jeanne Mc Murrey, Inorg. Tech Director
Celey D. Keene, Lab Director, Org. Tech Director	LaTasha Cornish, Chemist
Peggy Allen, QA Officer	Sandra Sanchez, Lab Tech.

Environmental Lab of Texas, Inc.

12600 West I-20 East
Odessa, Texas 79763

Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: RICE OPERAting Co
Company Address: 122 W Taylor
City/State/Zip: Hobbs N.M. 88240
Telephone No: (505) 393-9174
Fax No:
Sampler Signature: K Hall

Project Name: Abo Apache LA Lease Site
~~Project #~~: Remediation Project.
Project Loc:
PO #:

					Preservative							Matrix				Analyze For:														
LAB # (lab use only) [illegible]	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO$_3$	HCl	NaOH	H$_2$SO$_4$	None	Other (Specify)	Water	Sludge	Soil	Other (specify)	TDS / [✓ Cl] / SAR / EC	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030							RUSH TAT (Pre-Schedule)
-01	Blended Back fill	021106	2:12	1	✓									✓		✓														
-02	Sample Pt A N wall	020906	1:00	1	✓									✓		✓														
-03	Smp. Pt A @5' Bottom Comp	020906	1:05	1	✓									✓		✓														
-04	Smp Pt A S wall	020906	1:10	1	✓									✓		✓														
-05	Grid 2 S wall	020906	1:15	1	✓									✓		✓														
-06	Grid 2 N wall	020906	1:20	1	✓									✓		✓														
-07	Grid 2 Bottom Comp @5'	020906	1:25	1	✓									✓		✓														
-08	Grid 3 N wall	020906	1:20	1	✓									✓		✓														
-09	Grid 3 Bott @ 5'	020906	1:40	1	✓									✓		✓														
-10	Grid 3 S. wall	020906	1:35	1	✓									✓		✓														

Special Instructions:

Relinquished by:	Date	Time	Received by:	Date	Time
K Hall	021306	8:00A		2/14	17:00
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
	2/15	7:00		2/15/06	8:00

Sample Containers Intact? [✓ Y] N
Temperature Upon Receipt:
Laboratory Comments: [illegible]

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Op.

Date/Time: 2/15/06 8:00

Order #: 6B15003

Initials: Ck

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	2.0 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	Yes	No	
VOC samples have zero headspace?	Ck ~~Yes~~	No	[✓ Not Applicable]

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

R. T. HICKS CONSULTANTS, LTD.
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

April 27, 2006

Wayne Price
NMOCD Environmental Bureau Chief
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
Via E-mail and Federal Express

RE: Final Closure Report
Abo 1G Pipeline Release NMOCD Case #1R0415
Section 1, 17S, 36E, Unit G

Dear Wayne:

The attachment describes the implementation of the NMOCD-approved remedy: excavation and exportation of a portion of the upper vadose zone and the placement of a monolithic evapotranspiration (ET) infiltration barrier. The Table of Contents provides a description of the material in each section of this report. Only two sections of the attachment include new information to NMOCD. Tab 1, Executive Summary summarizes the implementation of the NMOCD-approved remedy. Tab 7 provides information on ET infiltration barriers that suggests that these barriers are very effective and as a result, moisture collection from lysimeters placed below the barrier may be difficult.

It is our understanding that NMOCD prefers to delay plugging and abandonment of the existing monitor well until two years of annual sampling confirms the performance of the ET cover. ROC is agreeable to this condition.

Please expect a report in early 2007 that presents the results of the lysimeter and monitor well sampling. If you have any questions regarding this submission, please contact me at our Albuquerque office. We trust this submission meets with your approval and written confirmation of your satisfaction would be appreciated.

Sincerely,
R.T. Hicks Consultants, Ltd.

Randall T. Hicks

Randall Hicks
Principal

Copy: Rice Operating Company

April 2006

Surface Restoration & Closure Report

ABO 1-G Release Site
Near Lovington, New Mexico

R.T. HICKS CONSULTANTS, LTD.

901 RIO GRANDE BLVD. NW, SUITE F-142, ALBUQUERQUE, NM 87104

April, 2006

Lovington Abo

Surface Restoration and Closure Report

RICE OPERATING COMPANY
HOBBS, NEW MEXICO

Prepared for:

Rice Operating Company
122 W. Taylor
Hobbs, NM 88240

R.T. HICKS CONSULTANTS, LTD.
901 RIO GRANDE, SUITE F-142, ALBUQUERQUE, NM, 87104

TABLE OF CONTENTS

TAB 1:

This Executive Summary is the only new information provided in this submission. The Executive Summary is a description of the excavation of the impacted soil and installation of the clay and soil ET barrier. The report contains supporting data and graphics as well as a description of the installation of vadose zone monitoring instruments which will measure the infiltration (if any) of moisture below the barrier.

TAB 2:

This section presents the relevant email communication to NMOCD from Rice Operating Company and Hicks Consultants and relevant email communication from NMOCD to ROC or Hicks Consultants. Included in this material is email communication with the City of Lovington. Communications in November 2005 establish the criteria for the final design of the excavation of soil and placement of the evapotranspiration infiltration barrier.

TAB 3:

Reports and other data submissions to NMOCD, including the final closure plan for the site (August 2005), are included in this section. These reports illustrate the history of the site activities. Site maps, hydrogeologic information, the construction details of the monitor wells and soil borings and other information are included in these reports. The August Corrective Action Plan provides the most recent summary of existing data.

TAB 4:

The available laboratory analytical reports for soils that support the data summarized in the Final Surface Restoration Report are in this section. Laboratory data sheets for the previous reports included in Tab 3 are included as appendices to those reports and are not duplicated herein.

TAB 5:

The manifests documenting removal of the chloride-impacted material pursuant to the NMOCD-approved corrective action plan are included in this section.

TAB 6:

The Quality Procedures used in the field are included in this section.

TAB 7:

This section contains a recent peer-reviewed paper by Scanlon and others (2005) that describes the performance (measured and simulated) of ET covers in New Mexico and Texas. A second publication by Roesler and others (2003) provides additional support of the efficacy of ET infiltration barriers.

EXECUTIVE SUMMARY

LOCATION

The Abo 1G Discharge Site is located about 6 miles southeast of the center of Lovington, New Mexico. Plate 1 is a 1:24,000 topographic map showing the location of the site relative to Route 18, the Hobbs-Lovington Highway. Plate 2 is a 1:6,000 image (2004) of the site location and nearby features such as the Navajo Lovington Refinery and the Lovington-Hobbs highway.

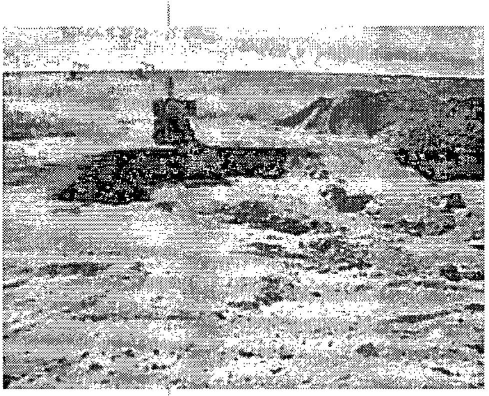


Figure 1. Adding Clay to Grid 63. View is to the South.

SPILL SITE REMEDIATION

NMOCD approved the Corrective Action Plan in November, 2005 and Rice began excavation of the site in January 2006. Initially, excavation proceeded in grids where the July 2005 field program (see Plate 3 and Table 1) revealed chloride above 1000 mg/kg. In general, excavation proceeded to a depth of 1-foot below ground surface (bgs) then ROC collected a five point composite sample from the bottom of the grid and field tested for chloride concentration and volatile organic compounds (VOC). If the result of the field chloride measurement was above 1000 mg/kg, excavation was continued vertically another foot. Additional grids with composite surface chloride concentrations above 1000 mg/kg were excavated following the same protocols as above. The Standard Operating Procedures (SOP) in Tab 6 of the attachment provides details on sample collection

Excavation within a grid ceased when either the composite floor sample yielded a chloride concentration below 1000 mg/kg or at a maximum depth of 5 feet bgs. In either of these cases, final samples were submitted to a laboratory for confirmatory analysis (see Table 2). Excavation was also halted in a grid if a final sample was only marginally above 1000 mg/kg and concentration the profile showed a declining chloride concentration with depth from previously excavated material.

As shown in Plate 4, 14 grid sections were excavated in a northern area and 15 grid sections were excavated in a southern area.

Excavated material was initially placed in stockpiles (Plate 4). Some of this material (Piles 3, 4, and 6) was blended with imported material to create the backfill material that would support vegetation. Imported material was composed of either a fine grained caliche byproduct material or a clean, top sand removed to expose caliche for quarrying. Suppliers were Wallach Concrete Co. and RWI. These materials were blended with the stockpiled material on the site to create the backfill material. Additional material was added and blended to a pile until a composite sample featured a chloride concentration below 250 mg/kg.

As a result of chloride concentrations obtained during the installation of Lysimeter 1, an additional area including parts of grids 2,6,7,10,12, and 18 was excavated to 5 feet bgs and capped with 1 foot of clay (Plate 4).

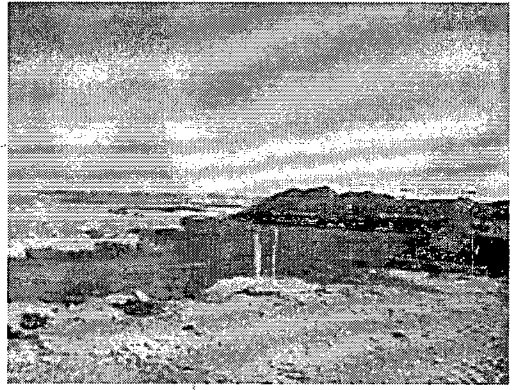


Figure 2. Clay Installed in the Southern Grids. View is to the Southeast.

As stated above, all backfill material featured chloride concentrations below 250 mg/kg. Those grids for which final bottom samples tested above 1000 mg/kg received a one-foot thick clay cap (uncompacted) extended to a 31 by 31 foot square (Plate 4). The clay was moistened as installed and a final top cover of the blow sand was placed over the clay. Grids with 1) final samples below 1000 mg/kg or with 2) a declining chloride concentration and a marginally higher than 1000 mg/kg concentration were finished with the backfill material (Plate 4). The site was graded with a crown to promote runoff from large precipitation events.

Imported materials consisted of:

- 1716 yards caliche base material from Wallach Concrete Co.
- 1092 yards of top sand from Wallach Concrete Co.
- 1392 yards caliche mixed with topsoil from RWI's caliche pit.
- 480 yards of red bed clay from Wallach Concrete Co.

Exported Materials consisted of:

- 2952 yards to Sundance Services Inc. in Eunice, N.M.
- 612 yards of material was spread on the ROC yard with NMOCD approval.

Lysimeter Installation

In order to provide a demonstration of the effectiveness of the ET infiltration barrier, Hicks Consultants installed a pan lysimeter and tensiometer access tubes in each of the excavated areas to allow sampling of vadose zone moisture. The lysimeters were placed 4 and 8 feet below the floor of the particular excavated grid section. The casings for tensiometers were installed to depths corresponding to both one-foot above and one-foot below each lysimeter. Should it be not possible to collect soil moisture samples, tensiometer (matric potential) measurements will provide an explanation as to if there exists a difficulty with the lysimeter. See Appendix A for a detailed description of the installation.

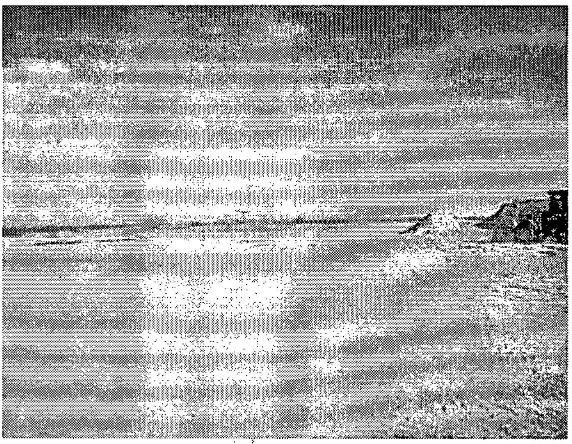


Figure 3. View is to the east of the northern excavated area as backfilling is being completed. Lysimeter 1 and MW-1 are in the center of the middle distance.

TABLES

Table 1: Abo Apache LA leak site Surface Samples

Samples Pulled: 7/21/05
Samples Titrated: 7/22/05
All highlighted squares sent to lab
ALL Squares are 25ft x 25ft

Square Number	Chloride	Square Number	Chloride
1	3653	39	3409
2	375	40	11067
3	93	41	316
4	826	42	44
5	13458	43	112
6	7860	44	1128
7	83	45	2143
8	348	46	127
9	7502	47	89
10	4855	48	74
11	9646	49	288
12	581	50	179
13	1216	51	246
14	12110	52	2351
15		53	634
16	948	54	284
17	407	55	6339
18	2715	56	2863
19	247	57	429
20	121	58	5192
21	77	59	7588
22	5686	60	10041
23	466	61	8222
24	708	62	3594
25	2240	63	1190
26	6806	64	515
27	11411	65	109
28	5347	66	137
29	1468	67	139
30	7732	68	104
31	7879	69	136
32	2279	70	222
33	8568	71	160
34	109	72	117
35	6749	73	63
36	7774	74	129
37	2399		
38	2327		

Table 2: ABO Apache LA Leak Site Remediation
Field CL- Titration Results

Lab Results in Bold

Grid#	Comments	1' bgs Cl-	2' bgs Cl-	3' bgs Cl-	4' bgs Cl-	5' bgs Cl-	
1	excavated to 1' bgs	247/ **214**					tph-192
2	Top 1' soil used to blend w/ soil from grid #1,5,6,11	no test					
3	Top 1' soil used to blend w/ soil from grid #1,5,6,11	no test					
4	Top 1' soil used to blend w/ soil from grid #1,5,6,11	no test					
5		576/ **867**					
6	excavated to 1' bgs	297/ 594					
7	Top 1' soil used to blend w/ soil from grid #1,5,6,11	no test					
8	Top 1' soil used to blend w/ soil from grid #1,5,6,11	no test					
9		835/ **2010**	579/ **1040**				Leave alone per Carolyn 1-25-06
10		840/ **1240**	1050				Leave alone per Carolyn 1-25-06
11		403					
12	not excavated	no test					
13		659/ **604**					no clay
14		451/ **706**					no clay
15	not excavated	no test					
16	not excavated	no test					
17	not excavated	no test					
18		193/ **334**					
19	not excavated	no test					
20	not excavated	no test					

Grid#	Comments	1' bgs Cl-	2' bgs Cl-	3' bgs Cl-	4' bgs Cl-	5' bgs Cl-	
21	not excavated	no test					
22		574/ **948**					no clay
23	not excavated	no test					
24	not excavated	no test					
25		1494	929	1087	818/ **1170**		Leave alone per Carolyn 1-25-06
26		489	794/ **754**				
27		405/ **756**					no clay
28		503/ 908					no clay
29		1250	1004	680/ **1480**	927	722/ **933**	no clay
30		2476	1529	904/ **1410**	815	701/ **730**	no clay
31		2690	1532	742/ **1060**	1080	1098/ **1380**	Install clay liner extend 3' over grid
32		1216/ **1960**	621/ **1020**				Leave alone per Carolyn 1-25-06
33		533/ **1020**	537/ **809**				no clay
34	not excavated	no test					
35		2801	579/ **1140**				Leave alone per Carolyn 1-25-06
36		2624				2120	Install clay liner extend 3' over grid
37	Initial excavation to 5' bgs					341/ **594**	no clay
38	Initial excavation to 5' bgs					1562/1 **330**	Install clay liner extend 3' over grid
39	Initial excavation to 5' bgs					739/ **1360**	Install clay liner extend 3' over grid
40		200 /1214	1070	1043	1043	1025	Install clay liner extend 3' over grid
41	not excavated						
42	not excavated						
43	not excavated						

Table 2: ABO Apache LA Leak Site Remediation; Field CL- Trtration Results

Grid#	Comments	1' bgs Cl-	2' bgs Cl-	3' bgs Cl-	4' bgs Cl-	5' bgs Cl-	
44	1'bgs edge of vegetation	253/ **290**					no clay
45	1'bgs edge of vegetation	227/ **267**					no clay
46	not excavated	no test					
47	not excavated	no test					
48	not excavated	no test					
49	not excavated	no test					
50	not excavated	no test					
51	not excavated	no test					
52		538/ **625**					no clay
53		218/ **734**					no clay
54		923/ **1960**	845	660/ **962**			no clay
55		1819	928	1048/ **1220**		1071/ **1470**	Install clay liner extend 3' over grid
56		309/ **2750**	1188	893	1675	1041/ **1640**	Install clay liner extend 3' over grid
57	Initial excavation to 5' bgs					906/ **1560**	Install clay liner extend 3' over grid
58	Initial excavation to 5' bgs					1273/ **1720**	Install clay liner extend 3' over grid
59	Initial excavation to 5' bgs					749/ **1100**	Install clay liner extend 3' over grid
60		2588	1010	852/ **1130**	921	1074/ **1360**	Install clay liner extend 3' over grid
61		2120	1154	927/ **1320**	876	1171/ **1380**	Install clay liner extend 3' over grid
62		197/ **785**					no clay
63		442/ **1260**			913	990/ **1170**	Install clay liner extend 3' over grid
64	not excavated	no test					
65	not excavated						
66	not excavated						
67	not excavated						
68	not excavated						

Table 2: ABO Apache LA Leak Site Remediation; Field CL- Trtration Results

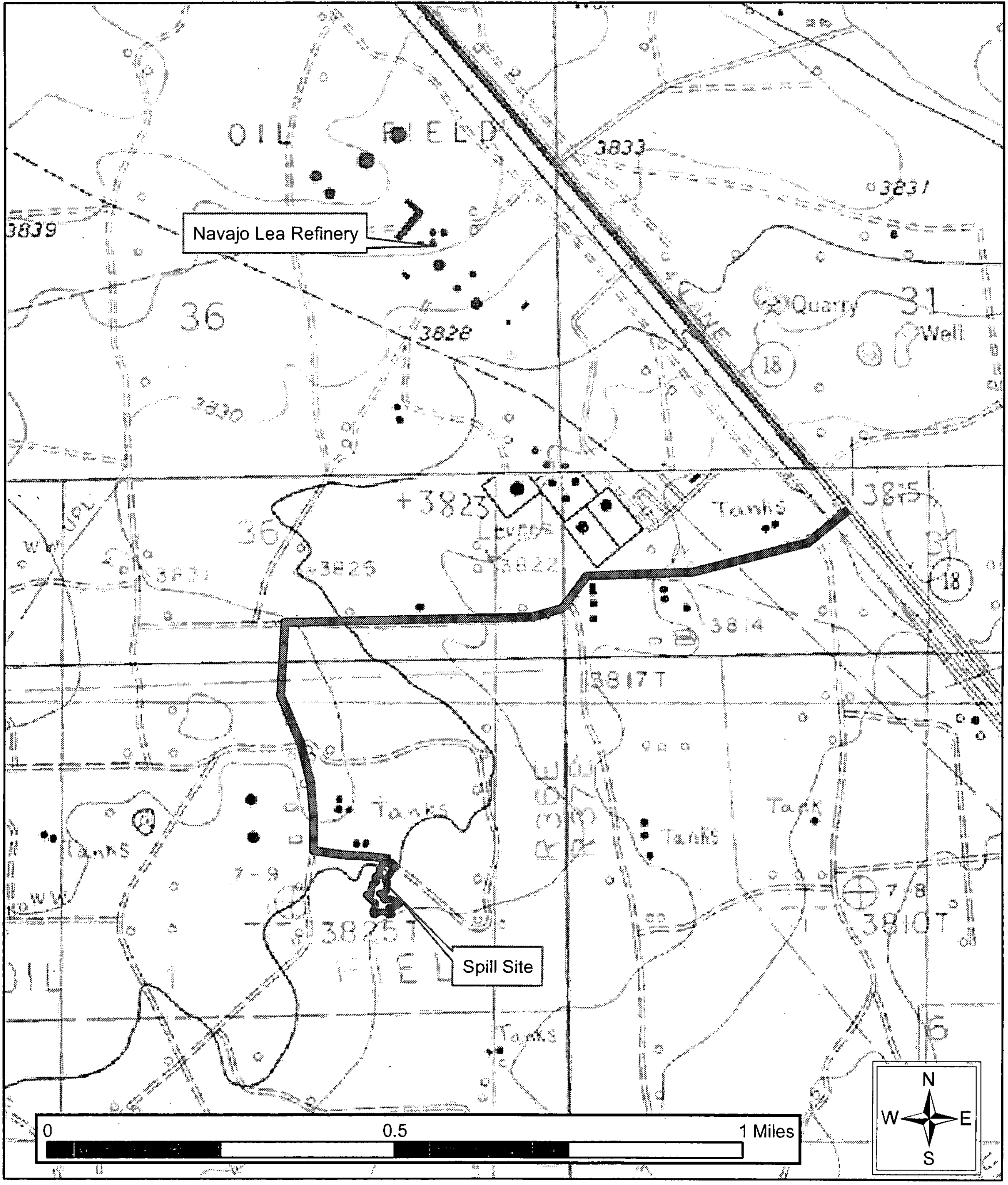
Grid#	Comments	1' bgs Cl-	2' bgs Cl-	3' bgs Cl-	4' bgs Cl-	5' bgs Cl-	
69	not excavated						
70	not excavated						
71	not excavated						
72	not excavated						
73	not excavated						
74	Initial excavation to 5' bgs to edge of vegetation					263/ **424**	no clay
75	Initial excavation to 5' bgs to edge of vegetation					322/ **712**	no clay
76	N. wall excavated to confirm cl- from #37						

Pile #3 Lab cl-250
Pile #4 Lab cl- 261

Table 2: ABO Apache LA Leak Site Remediation; Field CL- Trtration Results

PLATES

Directions: From Lovington, NM, proceed on Highway 18 for approximatly 5.3 miles. Head southwest on an unnamed dirt road (0.5 miles southeast of the Navajo Lea Refinery. Proceed on the dirt road for approximately 0.8 miles. Head south on an unamed dirt road for approximately 0.3 miles. Head east on an unnamed dirt road immediatley south of a tank battery. Proceed east for approximately 550 feet. The spill site is on the south side of the road.



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Site Location Map (USGS Lovington SE 7.5' Quad)	Plate 1
	ABO 1G Realease Site, OCD Case #1R0415	August 2005

Source: http://rgis.unm.edu (Oct. 2004 Aerial Photograph)

R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

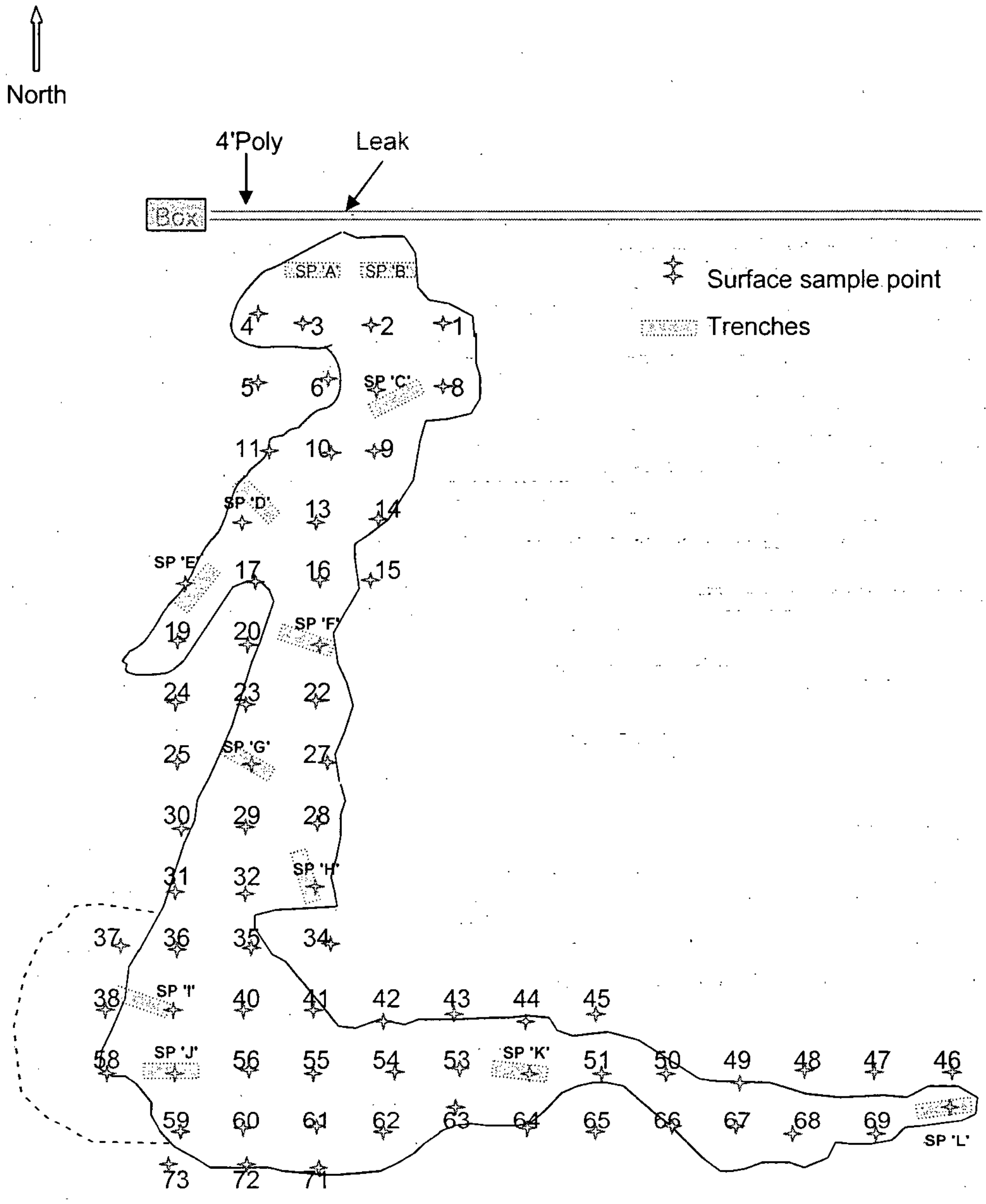
Location of Realese and Sourrounds

Plate 2

ABO 1G Realease Site, OCD Case #1R0415

August 2005

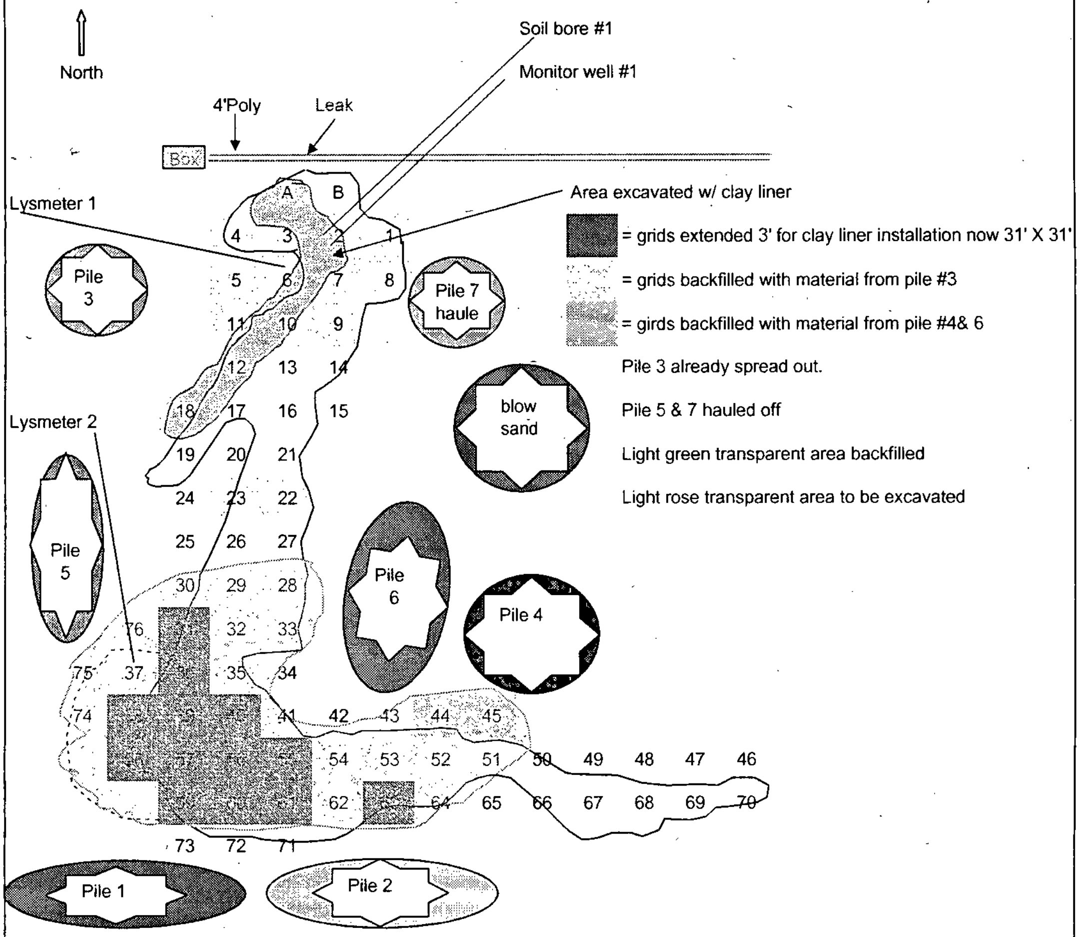
ABO Apache LA Leak



R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
505-266-5004

Abo 1-G Site	**Plate 3**
Abo 1-G Site Grid Map	**April 2006**

ABO Apache LA Leak Surface Points



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 505-266-5004	**Abo 1-G Site**	**Plate 4**
	Soil Remediation Schematic	**April 2006**

APPENDIX A

Appendix A

Lysimeter and Tensiometer Casing Installation at the Abo 1-G Site

Two pan lysimeters were installed by R.T. Hicks Consultants at the site on January 19 and 20, 2006. Lysimeters 1 and 2 were installed in grid numbers 6 and 38 respectively. Grid 6 is within the northern excavated area and grid 38 is within the southern excavated area. With each lysimeter, two casings were installed such that the bottoms of the casings access the vadose zone at depths above and below the lysimeters. These allow installation of a removable tensiometer to measure soil matric potential and hence, soil moisture content. Should retrieval of a sample of vadose zone water be not possible, these moisture contents will explain whether there is a problem with the lysimeter or that there is simply too little moisture to sample.

Grid 6 is approximately 50 feet south of the release origin and 30 feet west of MW-1. Lysimeter 1 was installed in trench dug 8 feet below the excavated ground surface, one foot below the former ground surface.

Grid 38 is approximately 35 feet southwest of SB-3 and was excavated to a depth of 5 feet below ground surface (bgs). Lysimeter 2 was installed in a trench dug 4 feet below the excavated ground surface or 9 feet bgs.

Both lysimeters were installed in vertically oriented 3 inch PVC casing with a sealed cap on the bottom. Six inches above the bottom of the cap is a horizontal extension composed of 2.5 feet of 3 inch diameter PVC casing slotted on its upper diameter exposing half of the casing to vadose zone flow. This lateral extension collects the vadose zone flux and delivers it to the six inch sump. The lysimeters are installed vertically in the six inch sumps.

The sumps and the horizontal extensions were filled with a blended mixture by volume of 30% silica flour and 70% clean fill sifted through a number 30 screen. The fill was field tested to contain 137 mg/kg chloride by ROC personnel.

The trench floors were horizontally excavated to allow the horizontal extension to be positioned laterally underneath the unexcavated vadose zone. After placement of the casing, the space between the casing and the unexcavated trench wall was packed first with the mixture of the silica flour and the screened fill and finally with the screened fill.

An additional 6 inch deep excavation was made in the trench floor to allow placement of the deep 2 inch PVC casing. The bottom of the casing and excavation was packed with the mix of silica flour and screened fill. The shallow casing was placed with its bottom a foot above the lsimeter pan by excavating a slot in the trench wall. The bottom of this casing was also packed with the silica flour and screened fill.

After covering the bottoms of all casings with the clean fill to a depth of one foot, the trenches were backfilled level to the previously excavated surface with the material originally excavated from the trench. A six inch thick bentonite cap was installed around each site's three vertical casings at this elevation with an additional bentonite cap placed around the casings upon backfill of the respective grids to the new ground level.

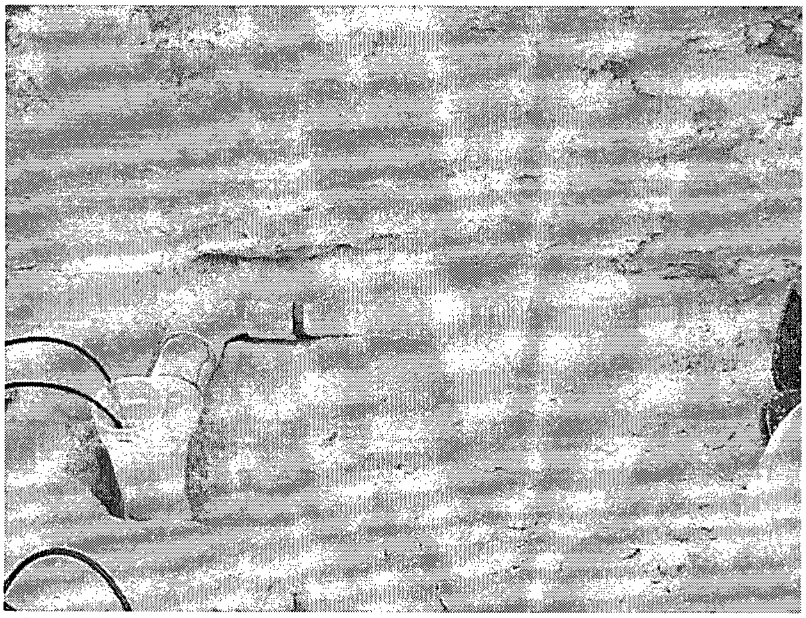


Figure 1: Lysimeter 2 with fill material during installation. Slotted collection pan is in trench dug under intact vadose zone material.

Figure 2 : Detail of Lysimeter 2 showing collection tubes to vertically mounted collection vessel in the capped sump.

Figure 3: Bentonite being placed around Lysimeter 1 casing and associated Tensiometer casings. MW-1 is visible to the upper right of Lysimeter 1 casings.

Kristin Pope

From: "Price, Wayne, EMNRD" <wayne.price@state.nm.us>
To: "Carolyn Doran Haynes" <cdhriceswd@valornet.com>; "Kristin Pope" <kpope@riceswd.com>; <r@rthicksconsult.com>
Cc: "Sheeley, Paul, EMNRD" <paul.sheeley@state.nm.us>; "Johnson, Larry, EMNRD" <larry.johnson@state.nm.us>; <hsncpbm@leaco.net>
Sent: Thursday, May 25, 2006 11:31 AM
Subject: Abo IG pipeline release OCD Case # 1R0415

OCD is in receipt of the April 27, 2006 "Final Closure Report" requesting acceptance of the work completed as of to date. OCD hereby approves of your request with the following conditions:

Provide OCD and the City of Lovington a final report in April of 2008 with the following information:

- color photos demonstrating re-vegetation.
- groundwater results from the monitor wells and lysimeters information.
- Report any exceedance of the groundwater standards.
- Monitoring well plugging proposal.

Please be advised that NMOCD approval of this plan does not relieve the owner/operator of Responsibility should their operations fail to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD approval does not relieve the owner/operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Wayne Price
Oil Conservation Div.
1220 S. Saint Francis
Santa Fe New Mexico 87505

phone: 505-476-3490
fax: 505-476-3462

R. T. Hicks Consultants, Ltd.
R@rthicksconsult.com 505-266-5004

Memo

To: Wayne Price

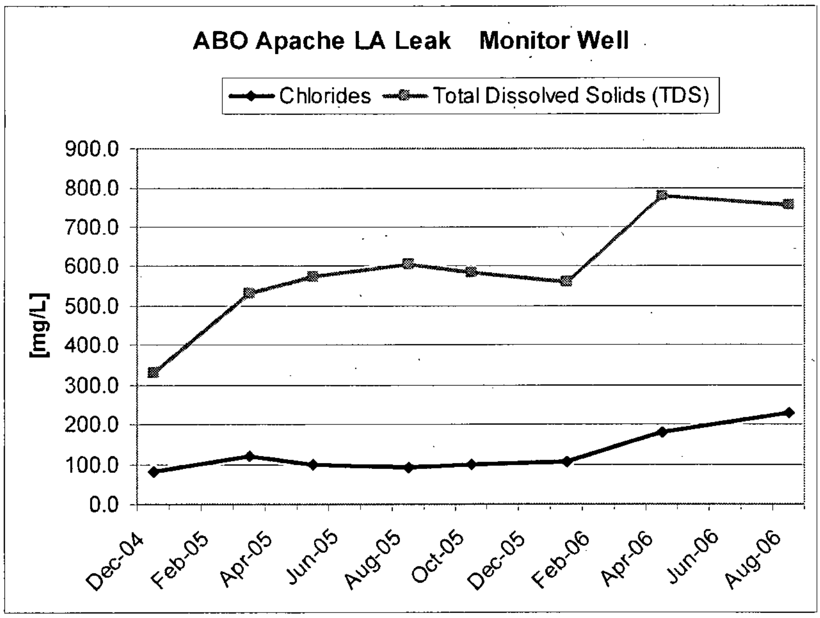
From: Randall Hicks

CC: Carolyn Haynes, Kristin Pope

Date: September 29, 2006

Re: Abo-1G

This submission presents recent data collected from the Abo-1G Release Site (1R0415). As shown below, chloride and TDS concentrations have increased by 100% and 30% percent respectively over the last six months. Chloride and TDS concentrations are approaching WQCC Standards. Based upon the information presented below, we conclude that this sudden increase in ground water chloride concentrations is due to the encroachment of an up gradient source. While calculations, modeling and fluid dynamics support our conclusion, this submission outlines a protocol to collect additional data that we believe will provide substantiation of the conclusion or prove the conclusion incorrect.



The following data and calculations support a conclusion that the Abo-1G site is not the source of the observed increase in chloride concentration.

1. As stated on page 9 of the August 31, 2005 report and illustrated in Plate 9 (attached hereto), at a depth of 35-36 feet a hard caliche layer limits the measured downward migration of the chloride center of mass to less than 1-foot per year. This is a fact supported by site data not a conclusion based upon calculations.
2. As shown in Figure 2 of the August 2005 report (copied at the end of this submission), the average chloride concentrations in the vadose zone below the spill is less than 500 mg/kg. NMOCD's highly conservative modeling presented at the Surface Waste Management Hearings, which conforms to our modeling experiments, shows that 1000 mg/kg chloride in the vadose zone poses no threat to ground water quality. The observed subsurface chloride concentrations are a fact. Although the conclusions of NMOCD and Hicks Consultants regarding the 1000 mg/kg chloride concentration are based upon sound science, they are nonetheless, conclusions based upon professional judgment.
3. At a measured chloride migration rate of 1- to 2-feet per year, about 30 years are required for chloride concentrations in excess of 1000 mg/kg (depth of 20 feet at MW-1) to migrate to ground water at 92 feet below ground surface. This is a simple arithmetic calculation based upon site data and is not a conclusion; it is a fact.
4. Robust, calibrated HYDRUS-1D simulations show that chloride will drain from the vadose zone over the next 20 years and could cause a steady increase in chloride concentrations in ground water. After 20 years, the main mass of chloride migrates to ground water and causes a temporary increase of chloride then ground water quality returns to background conditions by year 60 (see Figure 3 of the August 2005 report, reproduced below). This is our conclusion based upon sound science and field calibration of the model.
5. We understand that the City of Lovington recently ceased pumping two production wells located about ½ mile west (up gradient) from the Abo-1G site. These wells are shown on the western margin of Plate 1(August 2005 Report) as WW. This Plate is attached hereto. With the recent cessation of pumping, the natural southeast ground water gradient would be suddenly re-established. This is a conclusion based upon hearsay.
6. The Abo-1G site lies in the center of an oil field where numerous sources of chloride exist. This is a fact.

We propose the following plan of action to test the conclusions listed above.

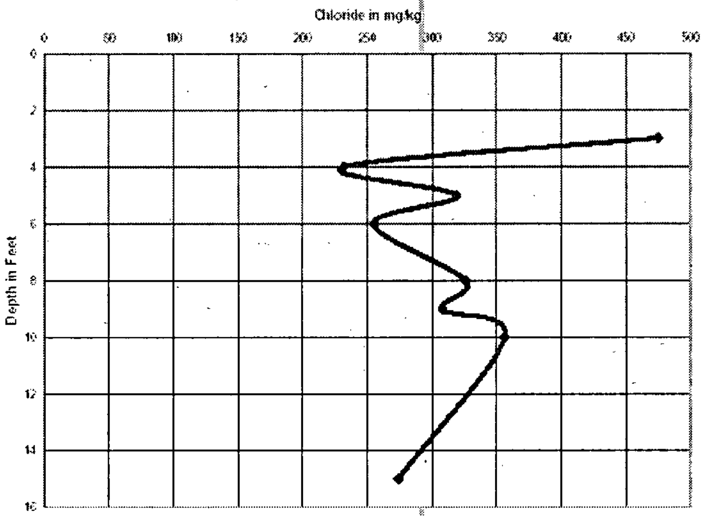
I. To test our conclusions that are based upon the results of the predictive modeling, a third series of soil samples will be collected adjacent to MW-1. The attached quality procedure identifies the field protocols for the collection of chloride, soil moisture, and lithologic texture data. These data will be employed to enhance the site calibration of the HYDRUS-1D model.

II. To test the conclusion that the cessation of pumping at the City of Lovington wells #17 and #21 would allow up gradient sources of chloride to migrate to the Abo-1G site, we propose to obtain and evaluate data from these two wells. Specifically we need the following information on these two wells from the City of Lovington:
   i. Water production meter readings or production volumes since 2004
   ii. Water quality data from any samples collected from these wells since 2004
   iii. Any aquifer test data collected from these wells
   iv. Well logs showing the well design and lithology of the aquifer.

   - v. Mapping of potential up gradient chloride sources
   - vi. Measured depth to ground water in the month of October.

III. To determine the hydraulic gradient in the absence of pumping at the City of Lovington wells, we will obtain the ground water elevation in three nearby monitoring wells, one up gradient windmill and the two City of Lovington wells.

IV. Submission of a letter report to NMOCD that summarizes our findings, including
   - i. An revised analysis of the migration of subsurface chloride at the Abo-1G site
   - ii. An analysis of the saturated zone transport of chloride to determine the possible up gradient location of a chloride source.
   - iii. If the data do not support our conclusions outlined herein, we will propose additional work that begins with the installation of an up gradient monitoring well.



ckground" location, however the
this soil boring, the chloride near
4-feet below grade to the total

Figure 2. SB-2 Field Chloride concentrations

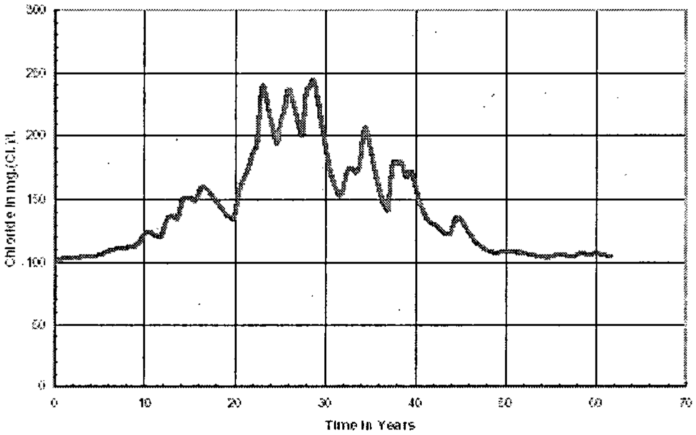


Figure 3. Chloride concentration in the aquifer for the Abo 1G Release Site, averaged chloride load from entire site, vegetation, 35% clay cap

R. T. HICKS CONSULTANTS, LTD.
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

February 12, 2007

Wayne Price
Oil Conservation Division
1220 S. St. Francis Drive
Santa Fe, NM 87505

RE: 2006 Annual Ground Water Monitoring Report
G-1 Leak Site (Abo Apache LA), Sec 01, T17S, R36E, Unit "G"
NMOCD Case #: 1R0415

Dear Mr. Wayne Price:

R.T. Hicks Consultants, Ltd is pleased to submit the 2006 Annual Ground Water Monitoring Report for the G-1 Leak Site (Abo Apache LA) site located in the Abo Salt Water Disposal System (SWD). This report consists of the following sections:

1. A table summarizing all laboratory results, depth to ground water and other pertinent data associated with ground water sampling at the site, including this past year.
2. Graphs showing chemical concentration vs. time for chloride and TDS.
3. Laboratory data sheets associated with the routine sampling for 2006.

The Final Closure Report was submitted to NMOCD on April 28, 2006. No NMOCD action is necessary at this time.

Thank you for your consideration of this annual summary information. The attached CD contains an electronic copy of the annual report. If you have any questions, please contact us at 505-266-5004, or Kristin Farris Pope at ROC, 505-393-9174.

Sincerely,
R.T. Hicks Consultants, Ltd.

Randall H

Randall T. Hicks
Principal

Copy: Hobbs NMOCD office; Rice Operating Company

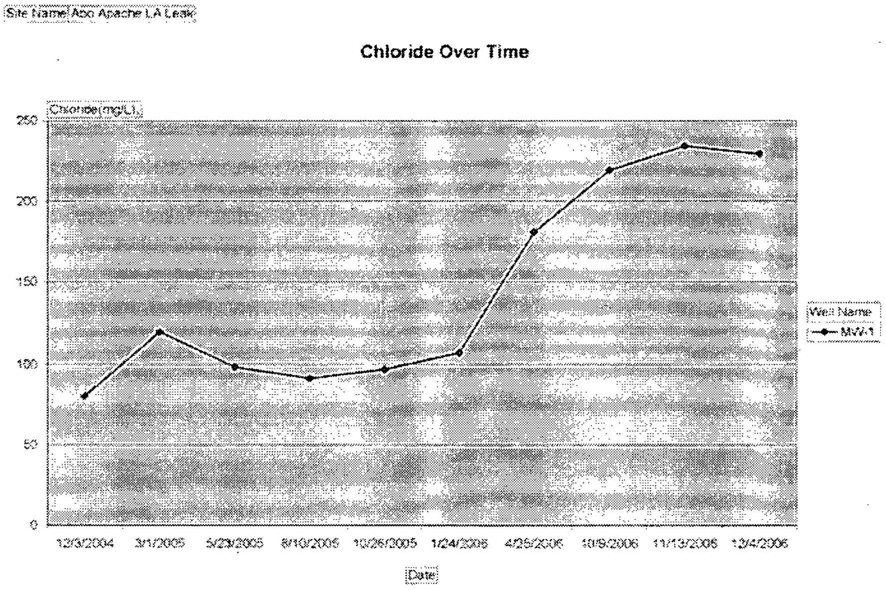
G-1 Leak Site (Abo Apache LA)

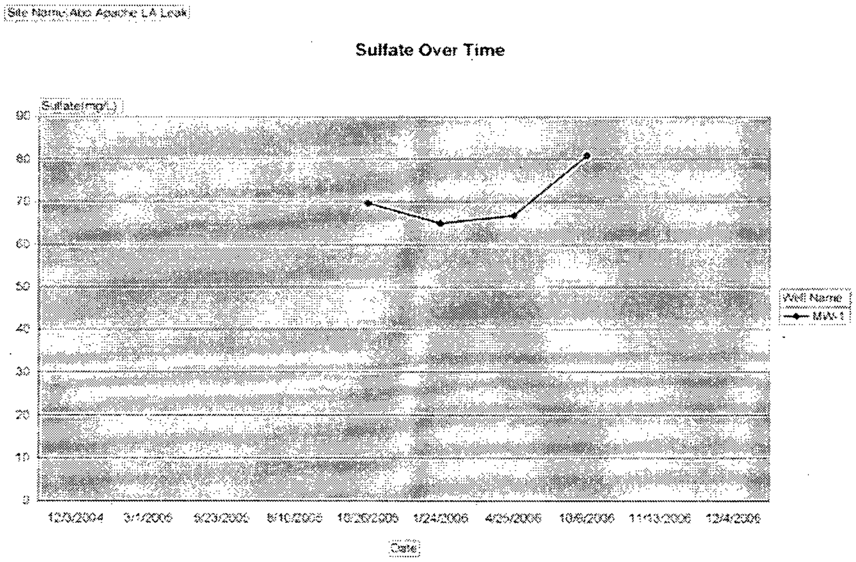
Table 1: chemistry over time

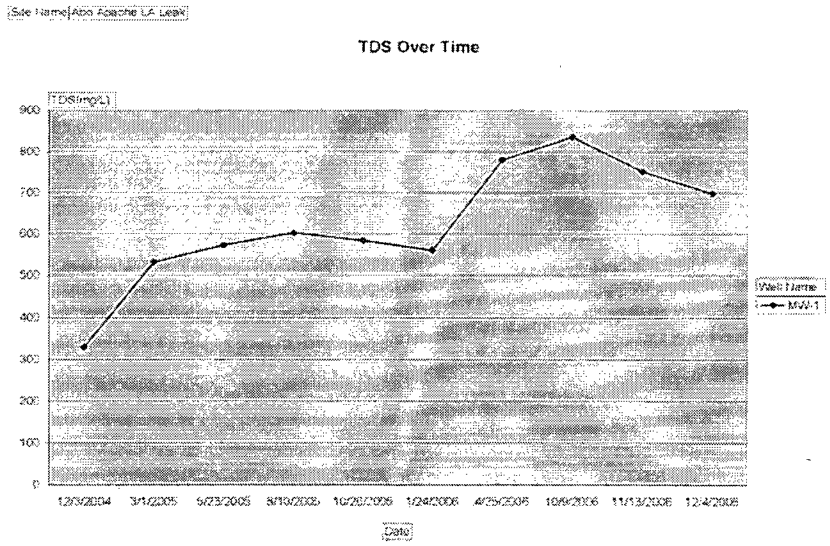
Well Name	*Date*	*DTW (ft)*	*Chloride (mg/L)*	*Sulfate (mg/L)*	*TDS (mg/L)*	*Benzene (ug/L)*	*Toluene (ug/L)*	*EthylBenzene (ug/L)*	*Total Xylenes (ug/L)*	*Comments*
MW-1	12/3/2004	92.10	80.5		329	<0.001	<0.001	<0.001	<0.001	
MW-1	3/1/2005	92.10	120		532	<0.001	<0.001	<0.001	<0.001	
MW-1	5/23/2005	92.30	98.4		573	<0.001	<0.001	<0.001	<0.001	
MW-1	8/10/2005	92.60	91.5		603	<0.001	<0.001	<0.001	<0.001	
MW-1	10/26/2005	92.88	96.9	69.7	584	<0.001	<0.001	<0.001	<0.001	Clear no odor
MW-1	1/24/2006	93.38	107	65	560	<0.001	<0.001	<0.001	<0.001	
MW-1	4/25/2006	93.55	181	66.8	780	<0.001	<0.001	<0.001	<0.001	
MW-1	10/9/2006	94.61	219	80.9	836	<0.001	<0.001	<0.001	<0.001	Clear
MW-1	11/13/2006	94.83	234	XXX	752	XXX	XXX	XXX	XXX	Clear with no odor
MW-1	12/4/2006	95.08	229	XXX	698	XXX	XXX	XXX	XXX	Clear / No Odor

Monday, February 05, 2007

Ground Water Quality at Abo Apache LA Leak







ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Farris-Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO- Apache Leak
Project Number: None Given
Location: Lea County

Lab Order Number: 6A25020

Report Date: 02/01/06

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471 **Reported:** 02/01/06 10:10

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well #1	6A25020-01	Water	01/24/06 09:30	01/25/06 13:25

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471 **Reported:** 02/01/06 10:10

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6A25020-01) Water									
Benzene	ND	0.00100	mg/L	1	EA62618	01/26/06	01/27/06	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*89.2 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*80.8 %*	*80-120*		"	"	"	"	

Rice Operating Co.	Project: ABO- Apache Leak	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	02/01/06 10:10

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6A25020-01) Water									
Total Alkalinity	**152**	2.00	mg/L	1	EA62406	01/26/06	01/26/06	EPA 310.1M	
Chloride	**107**	5.00	"	10	EA63004	01/30/06	01/30/06	EPA 300.0	
Total Dissolved Solids	**560**	5.00	"	1	EA63003	01/26/06	01/27/06	EPA 160.1	
Sulfate	**65.0**	5.00	"	10	EA63004	01/30/06	01/30/06	EPA 300.0	

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471 **Reported:** 02/01/06 10:10

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6A25020-01) Water									
Calcium	**98.2**	0.100	mg/L	10	EA62615	01/26/06	01/26/06	EPA 6010B	
Magnesium	**14.3**	0.0100	"	"	"	"	"	"	
Potassium	**3.79**	0.0500	"	1	"	"	"	"	
Sodium	**39.9**	0.100	"	10	"	"	"	"	

Organics by GC - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA62618 - EPA 5030C (GC)										
Blank (EA62618-BLK1)				Prepared: 01/26/06 Analyzed: 01/27/06						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*38.5*		*ug/l*	*40.0*		*96.2*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*42.4*		*"*	*40.0*		*106*	*80-120*			
LCS (EA62618-BS1)				Prepared: 01/26/06 Analyzed: 01/27/06						
Benzene	0.0566	0.00100	mg/L	0.0500		113	80-120			
Toluene	0.0557	0.00100	"	0.0500		111	80-120			
Ethylbenzene	0.0547	0.00100	"	0.0500		109	80-120			
Xylene (p/m)	0.102	0.00100	"	0.100		102	80-120			
Xylene (o)	0.0538	0.00100	"	0.0500		108	80-120			
Surrogate: a,a,a-Trifluorotoluene	*41.2*		*ug/l*	*40.0*		*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*32.8*		*"*	*40.0*		*82.0*	*80-120*			
Calibration Check (EA62618-CCV1)				Prepared: 01/26/06 Analyzed: 01/28/06						
Benzene	51.3		ug/l	50.0		103	80-120			
Toluene	52.5		"	50.0		105	80-120			
Ethylbenzene	54.5		"	50.0		109	80-120			
Xylene (p/m)	101		"	100		101	80-120			
Xylene (o)	55.6		"	50.0		111	80-120			
Surrogate: a,a,a-Trifluorotoluene	*34.3*		*"*	*40.0*		*85.8*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*39.5*		*"*	*40.0*		*98.8*	*80-120*			
Matrix Spike (EA62618-MS1)		**Source: 6A24010-01**		Prepared: 01/26/06 Analyzed: 01/27/06						
Benzene	0.0559	0.00100	mg/L	0.0500	ND	112	80-120			
Toluene	0.0548	0.00100	"	0.0500	ND	110	80-120			
Ethylbenzene	0.0515	0.00100	"	0.0500	ND	103	80-120			
Xylene (p/m)	0.0835	0.00100	"	0.100	ND	83.5	80-120			
Xylene (o)	0.0512	0.00100	"	0.0500	ND	102	80-120			
Surrogate: a,a,a-Trifluorotoluene	*37.5*		*ug/l*	*40.0*		*93.8*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*34.3*		*"*	*40.0*		*85.8*	*80-120*			

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA62618 - EPA 5030C (GC)										
Matrix Spike Dup (EA62618-MSD1)	**Source: 6A24010-01**		Prepared: 01/26/06 Analyzed: 01/28/06							
Benzene	0.0482	0.00100	mg/L	0.0500	ND	96.4	80-120	15.0	20	
Toluene	0.0484	0.00100	"	0.0500	ND	96.8	80-120	12.8	20	
Ethylbenzene	0.0456	0.00100	"	0.0500	ND	91.2	80-120	12.2	20	
Xylene (p/m)	0.0841	0.00100	"	0.100	ND	84.1	80-120	0.716	20	
Xylene (o)	0.0448	0.00100	"	0.0500	ND	89.6	80-120	12.9	20	
Surrogate: a,a,a-Trifluorotoluene	*33.0*		*ug/l*	*40.0*		*82.5*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*32.4*		*"*	*40.0*		*81.0*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA62406 - General Preparation (WetChem)										
Blank (EA62406-BLK1)				Prepared & Analyzed: 01/26/06						
Total Alkalinity	ND	2.00	mg/L							
LCS (EA62406-BS1)				Prepared & Analyzed: 01/26/06						
Bicarbonate Alkalinity	220		mg/L	200		110	85-115			
Duplicate (EA62406-DUP1)		**Source: 6A19005-01**		Prepared & Analyzed: 01/26/06						
Total Alkalinity	258	2.00	mg/L		256			0.778	20	
Reference (EA62406-SRM1)				Prepared & Analyzed: 01/26/06						
Total Alkalinity	97.0		mg/L	100		97.0	90-110			
Batch EA63003 - General Preparation (WetChem)										
Blank (EA63003-BLK1)				Prepared: 01/26/06 Analyzed: 01/27/06						
Total Dissolved Solids	ND	5.00	mg/L							
Duplicate (EA63003-DUP1)		**Source: 6A25018-01**		Prepared: 01/26/06 Analyzed: 01/27/06						
Total Dissolved Solids	2020	5.00	mg/L		2080			2.93	5	
Batch EA63004 - General Preparation (WetChem)										
Blank (EA63004-BLK1)				Prepared & Analyzed: 01/30/06						
Sulfate	ND	0.500	mg/L							
Chloride	ND	0.500	"							
LCS (EA63004-BS1)				Prepared & Analyzed: 01/30/06						
Sulfate	9.61	0.500	mg/L	10.0		96.1	80-120			
Chloride	8.40	0.500	"	10.0		84.0	80-120			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA63004 - General Preparation (WetChem)										
Calibration Check (EA63004-CCV1)				Prepared & Analyzed: 01/30/06						
Sulfate	9.82		mg/L	10.0		98.2	80-120			
Chloride	8.64		"	10.0		86.4	80-120			
Duplicate (EA63004-DUP1)		**Source: 6A25018-01**		Prepared & Analyzed: 01/30/06						
Sulfate	84.4	25.0	mg/L		88.2			4.40	20	
Chloride	879	25.0	"		886			0.793	20	

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EA62615 - 6010B/No Digestion										
Blank (EA62615-BLK1)				Prepared & Analyzed: 01/26/06						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Calibration Check (EA62615-CCV1)				Prepared & Analyzed: 01/26/06						
Calcium	2.12		mg/L	2.00		106	85-115			
Magnesium	1.99		"	2.00		99.5	85-115			
Potassium	1.88		"	2.00		94.0	85-115			
Sodium	1.94		"	2.00		97.0	85-115			
Duplicate (EA62615-DUP1)	**Source: 6A19005-01**			Prepared & Analyzed: 01/26/06						
Calcium	224	0.500	mg/L		222			0.897	20	
Magnesium	115	0.0500	"		120			4.26	20	
Potassium	14.6	0.500	"		15.2			4.03	20	
Sodium	306	0.500	"		313			2.26	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 2/1/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope kpriceswd@valornet.com

Company Name RICE Operating Company

Company Address: 122 W. Taylor Street

City/State/Zip: Hobbs, New Mexico 88240

Telephone No: (505) 393-9174

Fax No: (505) 397-1471

Sampler Signature: Rozanne Johnson (505) 631-9310

Email: rozanne@valornet.com

Project Name: ABO Apache Leak

Project #:

Project Loc: Lea County

PO #:

					Preservative							Matrix				Analyze For:															
																TCLP:															
																TOTAL:							X								
LAB # (lab use only) 6A25020	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl (2) 40 ml glass vials	NaOH	H_2SO_4	None (1) 1 Liter HDPE	Other (Specify)	Water	Sludge	Soil	Other (specify):	TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	RCI	N.O.R.M.	Total Dissolved Solids				RUSH TAT (Pre-Schedule)	Standard TAT
-01	Monitor Well #1	1/24/2006	9:30	3	X		2			1		X					X	X					X			X					X

Special Instructions:

PLEASE Email RESULTS TO: kpriceswd@valornet.com & mfranks@riceswd.com

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	1/25/06	1:25			
Relinquished by:	**Date**	**Time**	**Received by ELOT:**	**Date**	**Time**
				01-25-06	1325

Sample Containers Intact? [✓ Y] N

Labels on container? [✓ Y] N

Custody Seals: [✓ Containers] / [✓ Cooler]

Temperature Upon Receipt: -2.5 C

Laboratory Comments: not frozen

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Op.

Date/Time: 1/25/06 13:26

Order #: 6A25020

Initials: CK

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	-2.5 C
Shipping container/cooler in good condition?	[✓ Yes]	No	
Custody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
Custody Seals intact on sample bottles?	[✓ Yes]	No	Not present
Chain of custody present?	[✓ Yes]	No	
Sample Instructions complete on Chain of Custody?	[✓ Yes]	No	
Chain of Custody signed when relinquished and received?	[✓ Yes]	No	
Chain of custody agrees with sample label(s)	[✓ Yes]	No	
Container labels legible and intact?	[✓ Yes]	No	
Sample Matrix and properties same as on chain of custody?	[✓ Yes]	No	
Samples in proper container/bottle?	[✓ Yes]	No	
Samples properly preserved?	[✓ Yes]	No	
Sample bottles intact?	[✓ Yes]	No	
Preservations documented on Chain of Custody?	[✓ Yes]	No	
Containers documented on Chain of Custody?	[✓ Yes]	No	
Sufficient sample amount for indicated test?	[✓ Yes]	No	
All samples received within sufficient hold time?	[✓ Yes]	No	
VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: - Date/Time: Contacted by:

Regarding:

Corrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Farris-Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO-Apache LA Leak Site
Project Number: None Given
Location: Lea County

Lab Order Number: 6D27013

Report Date: 05/04/06

Rice Operating Co.	Project: ABO-Apache LA Leak Site	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	05/04/06 15:30

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well #1	6D27013-01	Water	04/25/06 14:30	04/27/06 10:30

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO-Apache LA Leak Site Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471 **Reported:** 05/04/06 15:30

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6D27013-01) Water									
Benzene	ND	0.00100	mg/L	1	ED62807	04/28/06	05/01/06	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*97.2 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*103 %*	*80-120*		"	"	"	"	

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO-Apache LA Leak Site Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471 **Reported:** 05/04/06 15:30

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6D27013-01) Water									
Total Alkalinity	**130**	2.00	mg/L	1	EE60301	05/03/06	05/03/06	EPA 310.1M	
Chloride	**181**	5.00	"	10	EE60116	05/01/06	05/01/06	EPA 300.0	
Total Dissolved Solids	**780**	5.00	"	1	EE60115	04/27/06	04/28/06	EPA 160.1	
Sulfate	**66.8**	5.00	"	10	EE60116	05/01/06	05/01/06	EPA 300.0	

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6D27013-01) Water									
Calcium	**121**	0.500	mg/L	50	ED62719	04/27/06	04/27/06	EPA 6010B	
Magnesium	**17.7**	0.0100	"	10	"	"	"	"	
Potassium	**2.39**	0.500	"	"	"	"	"	"	
Sodium	**55.1**	0.100	"	"	"	"	"	"	

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch ED62807 - EPA 5030C (GC)										
Blank (ED62807-BLK1)				Prepared: 04/28/06 Analyzed: 04/30/06						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*42.7*		*ug/l*	*40.0*		*107*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*42.2*		*"*	*40.0*		*106*	*80-120*			
LCS (ED62807-BS1)				Prepared: 04/28/06 Analyzed: 04/30/06						
Benzene	0.0599	0.00100	mg/L	0.0500		120	80-120			
Toluene	0.0580	0.00100	"	0.0500		116	80-120			
Ethylbenzene	0.0551	0.00100	"	0.0500		110	80-120			
Xylene (p/m)	0.120	0.00100	"	0.100		120	80-120			
Xylene (o)	0.0596	0.00100	"	0.0500		119	80-120			
Surrogate: a,a,a-Trifluorotoluene	*43.0*		*ug/l*	*40.0*		*108*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*42.2*		*"*	*40.0*		*106*	*80-120*			
Calibration Check (ED62807-CCV1)				Prepared: 04/28/06 Analyzed: 05/01/06						
Benzene	55.0		ug/l	50.0		110	80-120			
Toluene	53.0		"	50.0		106	80-120			
Ethylbenzene	55.9		"	50.0		112	80-120			
Xylene (p/m)	110		"	100		110	80-120			
Xylene (o)	55.9		"	50.0		112	80-120			
Surrogate: a,a,a-Trifluorotoluene	*39.0*		*"*	*40.0*		*97.5*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*39.1*		*"*	*40.0*		*97.8*	*80-120*			
Matrix Spike (ED62807-MS1)	**Source: 6D27008-01**			Prepared: 04/28/06 Analyzed: 05/01/06						
Benzene	0.0576	0.00100	mg/L	0.0500	ND	115	80-120			
Toluene	0.0568	0.00100	"	0.0500	ND	114	80-120			
Ethylbenzene	0.0587	0.00100	"	0.0500	ND	117	80-120			
Xylene (p/m)	0.120	0.00100	"	0.100	ND	120	80-120			
Xylene (o)	0.0600	0.00100	"	0.0500	ND	120	80-120			
Surrogate: a,a,a-Trifluorotoluene	*41.7*		*ug/l*	*40.0*		*104*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*47.5*		*"*	*40.0*		*119*	*80-120*			

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch ED62807 - EPA 5030C (GC)										
Matrix Spike Dup (ED62807-MSD1)	**Source: 6D27008-01**			Prepared: 04/28/06 Analyzed: 05/01/06						
Benzene	0.0597	0.00100	mg/L	0.0500	ND	119	80-120	3.42	20	
Toluene	0.0579	0.00100	"	0.0500	ND	116	80-120	1.74	20	
Ethylbenzene	0.0585	0.00100	"	0.0500	ND	117	80-120	0.00	20	
Xylene (p/m)	0.120	0.00100	"	0.100	ND	120	80-120	0.00	20	
Xylene (o)	0.0598	0.00100	"	0.0500	ND	120	80-120	0.00	20	
Surrogate: a,a,a-Trifluorotoluene	*43.5*		*ug/l*	*40.0*		*109*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*46.4*		*"*	*40.0*		*116*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE60115 - General Preparation (WetChem)										
Blank (EE60115-BLK1)				Prepared: 04/27/06 Analyzed: 04/28/06						
Total Dissolved Solids	ND	5.00	mg/L							
Duplicate (EE60115-DUP1)	**Source: 6D27015-01**			Prepared: 04/27/06 Analyzed: 04/28/06						
Total Dissolved Solids	3020	5.00	mg/L		3040			0.660	5	
Batch EE60116 - General Preparation (WetChem)										
Blank (EE60116-BLK1)				Prepared & Analyzed: 05/01/06						
Chloride	ND	0.500	mg/L							
Sulfate	ND	0.500	"							
LCS (EE60116-BS1)				Prepared & Analyzed: 05/01/06						
Sulfate	9.47	0.500	mg/L	10.0		94.7	80-120			
Chloride	9.71	0.500	"	10.0		97.1	80-120			
Calibration Check (EE60116-CCV1)				Prepared & Analyzed: 05/01/06						
Chloride	9.86		mg/L	10.0		98.6	80-120			
Sulfate	8.11		"	10.0		81.1	80-120			
Duplicate (EE60116-DUP1)	**Source: 6D27008-01**			Prepared & Analyzed: 05/01/06						
Sulfate	80.0	2.50	mg/L		79.2			1.01	20	
Chloride	49.3	2.50	"		49.0			0.610	20	
Batch EE60301 - General Preparation (WetChem)										
Blank (EE60301-BLK1)				Prepared & Analyzed: 05/03/06						
Total Alkalinity	ND	2.00	mg/L							

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE60301 - General Preparation (WetChem)										
LCS (EE60301-BS1)				Prepared & Analyzed: 05/03/06						
Bicarbonate Alkalinity	214		mg/L	200		107	85-115			
Duplicate (EE60301-DUP1)	**Source: 6D26006-01**			Prepared & Analyzed: 05/03/06						
Total Alkalinity	29.0	2.00	mg/L		28.0			3.51	20	
Reference (EE60301-SRM1)				Prepared & Analyzed: 05/03/06						
Total Alkalinity	96.0		mg/L	100		96.0	90-110			

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch ED62719 - 6010B/No Digestion										
Blank (ED62719-BLK1)				Prepared & Analyzed: 04/27/06						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Calibration Check (ED62719-CCV1)				Prepared & Analyzed: 04/27/06						
Calcium	2.08		mg/L				85-115			
Magnesium	2.16		"				85-115			
Potassium	1.94		"				85-115			
Sodium	1.96		"				85-115			
Duplicate (ED62719-DUP1)	**Source: 6D26006-01**			Prepared & Analyzed: 04/27/06						
Calcium	0.0366	0.0100	mg/L		0.0367			0.273	20	
Magnesium	ND	0.00100	"		ND				20	
Potassium	0.275	0.0500	"		0.275			0.00	20	
Sodium	13.0	0.100	"		12.1			7.17	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 5/4/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope kpope@riceswd.com

Company Name RICE Operating Company

Company Address: 122 W. Taylor Street

City/State/Zip: Hobbs, New Mexico 88240

Telephone No: (505) 393-9174

Fax No: (505) 397-1471

Sampler Signature: Rozanne Johnson (505) 631-9310

Email: rozanne@valornet.com

Project Name: ABO - Apache LA Leak

Project #:

Project Loc: Lea County

PO #:

					Preservative							Matrix				Analyze For:															
																			TCLP:												
																			TOTAL:				X								
6D27013 LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl (2) 40 ml glass vials	NaOH	H_2SO_4	None (1) 1 Liter HDPE	Other (Specify)	Water	Sludge	Soil	Other (specify):	TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	RCI	N.O.R.M.	Total Dissolved Solids				RUSH TAT (Pre-Schedule)	Standard TAT
-01	Monitor Well #1	4/25/2006	14:30	3	X		2			1		X					X	X					X			X					X

Special Instructions:

PLEASE Email RESULTS TO: kpope@riceswd.com & mfranks@riceswd.com

Sample Containers Intact? [✓ Y] N
Labels on container? [✓ Y] N
Custody Seals: [✓ Containers] / [✓ Cooler]
Temperature Upon Receipt: 2.0
Laboratory Comments:

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	4/27/06	6:00	James Johnson	4/27/06	6:01
Relinquished by:	**Date**	**Time**	**Received by ELOT:**	**Date**	**Time**
James Johnson	4/27/06	10:30		4/27/06	10:30

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

ent. Rice Op.

ate/Time: 4/27/06 10:30

der #: 6D27013

tials: CK

Sample Receipt Checklist

mperature of container/cooler?	Yes	No	2.0 C
ipping container/cooler in good condition?	[✓ Yes]	No	
stody Seals intact on shipping container/cooler?	[✓ Yes]	No	Not present
stody Seals intact on sample bottles?	[✓ Yes]	No	Not present
ain of custody present?	[✓ Yes]	No	
mple Instructions complete on Chain of Custody?	[✓ Yes]	No	
ain of Custody signed when relinquished and received?	[✓ Yes]	No	
ain of custody agrees with sample label(s)	[✓ Yes]	No	
ntainer labels legible and intact?	[✓ Yes]	No	
mple Matrix and properties same as on chain of custody?	[✓ Yes]	No	
mples in proper container/bottle?	[✓ Yes]	No	
mples properly preserved?	[✓ Yes]	No	
mple bottles intact?	[✓ Yes]	No	
servations documented on Chain of Custody?	[✓ Yes]	No	
ntainers documented on Chain of Custody?	[✓ Yes]	No	
fficient sample amount for indicated test?	[✓ Yes]	No	
samples received within sufficient hold time?	[✓ Yes]	No	
C samples have zero headspace?	[✓ Yes]	No	Not Applicable

her observations:

Variance Documentation:

ntact Person: - ________ Date/Time: ________ Contacted by: ________

egarding:

rrective Action Taken:

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Farris-Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO- Apache Leak
Project Number: None Given
Location: Lea County

Lab Order Number: 6H18012

Report Date: 08/30/06

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well #1	6H18012-01	Water	08/15/06 13:30	08-18-2006 10:20

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6H18012-01) Water									
Benzene	ND	0.00100	mg/L	1	EH62121	08/21/06	08/22/06	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*102 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*95.2 %*	*80-120*		"	"	"	"	

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6H18012-01) Water									
Total Alkalinity	**180**	2.00	mg/L	1	EH62128	08/21/06	08/21/06	EPA 310.1M	
Chloride	**228**	5.00	"	10	EH62101	08/21/06	08/21/06	EPA 300.0	
Total Dissolved Solids	**756**	10.0	"	1	EH62303	08/18/06	08/22/06	EPA 160.1	
Sulfate	**91.5**	5.00	"	10	EH62101	08/21/06	08/21/06	EPA 300.0	

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6H18012-01) Water									
Calcium	**132**	4.05	mg/L	50	EH62313	08/23/06	08/23/06	EPA 6010B	
Magnesium	**19.3**	0.360	"	10	"	"	"	"	
Potassium	**2.32**	0.600	"	"	"	"	"	"	
Sodium	**53.3**	0.430	"	"	"	"	"	"	

Organics by GC - Quality Control

Environmental Lab of Texas

Batch EH62121 - EPA 5030C (GC)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (EH62121-BLK1)				Prepared: 08/21/06 Analyzed: 08/22/06						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*40.3*		*ug/l*	*40.0*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*36.7*		*"*	*40.0*		*91.8*	*80-120*			
LCS (EH62121-BS1)				Prepared & Analyzed: 08/21/06						
Benzene	0.0460	0.00100	mg/L	0.0500		92.0	80-120			
Toluene	0.0503	0.00100	"	0.0500		101	80-120			
Ethylbenzene	0.0463	0.00100	"	0.0500		92.6	80-120			
Xylene (p/m)	0.113	0.00100	"	0.100		113	80-120			
Xylene (o)	0.0565	0.00100	"	0.0500		113	80-120			
Surrogate: a,a,a-Trifluorotoluene	*39.7*		*ug/l*	*40.0*		*99.2*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*45.0*		*"*	*40.0*		*112*	*80-120*			
Calibration Check (EH62121-CCV1)				Prepared: 08/21/06 Analyzed: 08/22/06						
Benzene	48.7		ug/l	50.0		97.4	80-120			
Toluene	52.3		"	50.0		105	80-120			
Ethylbenzene	57.3		"	50.0		115	80-120			
Xylene (p/m)	114		"	100		114	80-120			
Xylene (o)	57.6		"	50.0		115	80-120			
Surrogate: a,a,a-Trifluorotoluene	*44.7*		*"*	*40.0*		*112*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*38.3*		*"*	*40.0*		*95.8*	*80-120*			
Matrix Spike (EH62121-MS1)	**Source: 6H18007-01**			Prepared: 08/21/06 Analyzed: 08/22/06						
Benzene	0.0464	0.00100	mg/L	0.0500	ND	92.8	80-120			
Toluene	0.0550	0.00100	"	0.0500	ND	110	80-120			
Ethylbenzene	0.0554	0.00100	"	0.0500	ND	111	80-120			
Xylene (p/m)	0.117	0.00100	"	0.100	ND	117	80-120			
Xylene (o)	0.0575	0.00100	"	0.0500	ND	115	80-120			
Surrogate: a,a,a-Trifluorotoluene	*41.8*		*ug/l*	*40.0*		*104*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*46.5*		*"*	*40.0*		*116*	*80-120*			

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH62121 - EPA 5030C (GC)										
Matrix Spike Dup (EH62121-MSD1)		**Source: 6H18007-01**		Prepared: 08/21/06 Analyzed: 08/22/06						
Benzene	0.0473	0.00100	mg/L	0.0500	ND	94.6	80-120	1.92	20	
Toluene	0.0535	0.00100	"	0.0500	ND	107	80-120	2.76	20	
Ethylbenzene	0.0549	0.00100	"	0.0500	ND	110	80-120	0.905	20	
Xylene (p/m)	0.120	0.00100	"	0.100	ND	120	80-120	2.53	20	
Xylene (o)	0.0583	0.00100	"	0.0500	ND	117	80-120	1.72	20	
Surrogate: a,a,a-Trifluorotoluene	*42.9*		*ug/l*	*40.0*		*107*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*46.4*		*"*	*40.0*		*116*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH62101 - General Preparation (WetChem)										
Blank (EH62101-BLK1)				Prepared & Analyzed: 08/21/06						
Sulfate	ND	0.500	mg/L							
Chloride	ND	0.500	"							
LCS (EH62101-BS1)				Prepared & Analyzed: 08/21/06						
Sulfate	8.51	0.500	mg/L	10.0		85.1	80-120			
Chloride	10.0	0.500	"	10.0		100	80-120			
Calibration Check (EH62101-CCV1)				Prepared & Analyzed: 08/21/06						
Sulfate	8.34		mg/L	10.0		83.4	80-120			
Chloride	10.2		"	10.0		102	80-120			
Duplicate (EH62101-DUP1)	**Source: 6H18007-01**			Prepared & Analyzed: 08/21/06						
Sulfate	76.3	5.00	mg/L		65.9			14.6	20	
Chloride	105	5.00	"		98.9			5.98	20	
Duplicate (EH62101-DUP2)	**Source: 6H18013-04**			Prepared & Analyzed: 08/21/06						
Sulfate	331	5.00	mg/L		336			1.50	20	
Chloride	138	5.00	"		136			1.46	20	
Matrix Spike (EH62101-MS1)	**Source: 6H18007-01**			Prepared & Analyzed: 08/21/06						
Sulfate	172	5.00	mg/L	100	65.9	106	80-120			
Chloride	210	5.00	"	100	98.9	111	80-120			
Matrix Spike (EH62101-MS2)	**Source: 6H18013-04**			Prepared & Analyzed: 08/21/06						
Sulfate	422	5.00	mg/L	100	336	86.0	80-120			
Chloride	224	5.00	"	100	136	88.0	80-120			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH62128 - General Preparation (WetChem)										
Blank (EH62128-BLK1)				Prepared & Analyzed: 08/21/06						
Total Alkalinity	ND	2.00	mg/L							
LCS (EH62128-BS1)				Prepared & Analyzed: 08/21/06						
Total Alkalinity	178		mg/L	200		89.0	85-115			
Duplicate (EH62128-DUP1)	**Source: 6H18007-01**			Prepared & Analyzed: 08/21/06						
Total Alkalinity	186	2.00	mg/L		186			0.00	20	
Reference (EH62128-SRM1)				Prepared & Analyzed: 08/21/06						
Total Alkalinity	248		mg/L	250		99.2	90-110			
Batch EH62303 - Filtration Preparation										
Blank (EH62303-BLK1)				Prepared: 08/18/06 Analyzed: 08/22/06						
Total Dissolved Solids	ND	10.0	mg/L							
Duplicate (EH62303-DUP1)	**Source: 6H18007-01**			Prepared: 08/18/06 Analyzed: 08/22/06						
Total Dissolved Solids	556	10.0	mg/L		526			5.55	5	R5
Duplicate (EH62303-DUP2)	**Source: 6H18013-04**			Prepared: 08/18/06 Analyzed: 08/28/06						**R5**
Total Dissolved Solids	878	10.0	mg/L		930			5.75	5	

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH62313 - 6010B/No Digestion										
Blank (EH62313-BLK1)				Prepared & Analyzed: 08/23/06						
Calcium	ND	0.0810	mg/L							
Magnesium	ND	0.0360	"							
Potassium	ND	0.0600	"							
Sodium	ND	0.0430	"							
Calibration Check (EH62313-CCV1)				Prepared & Analyzed: 08/23/06						
Calcium	1.96		mg/L	2.00		98.0	85-115			
Magnesium	2.01		"	2.00		100	85-115			
Potassium	1.76		"	2.00		88.0	85-115			
Sodium	1.96		"	2.00		98.0	85-115			
Duplicate (EH62313-DUP1)	**Source: 6H15005-04**			Prepared & Analyzed: 08/23/06						
Calcium	44.4	0.810	mg/L		45.9			3.32	20	
Magnesium	48.1	0.360	"		49.3			2.46	20	
Potassium	42.9	0.600	"		42.6			0.702	20	
Sodium	44.4	0.430	"		43.5			2.05	20	

Notes and Definitions

R5	RPD is outside of historic values
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 8/30/2006

Raland K. Tuttle, Lab Manager	Jeanne Mc Murrey, Inorg. Tech Director
Celey D. Keene, Lab Director, Org. Tech Director	LaTasha Cornish, Chemist
Peggy Allen, QA Officer	Sandra Sanchez, Lab Tech.

This material is intended only for the use of the individual (s) or entity to whom it is addressed, and may contain information that is privileged and confidential.

If you have received this material in error, please notify us immediately at 432-563-1800.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope kpope@riceswd.com
Company Name: RICE Operating Company
Company Address: 122 W. Taylor Street
City/State/Zip: Hobbs, New Mexico 88240
Telephone No: (505) 393-9174
Fax No: (505) 397-1471
Sampler Signature: Rozanne Johnson (505) 631-9310
Email: rozanne@valornet.com

Project Name: Abo - Apache Leak
Project #:
Project Loc: Lea County
PO #:

					Preservative							Matrix				Analyze For:															
																TCLP:															
																TOTAL:							X								
6H18012 LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl (2) 40 ml glass vials	NaOH	H_2SO_4	None (1) 1 Liter HDPE	Other (Specify)	Water	Sludge	Soil	Other (specify):	TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	RCI	N.O.R.M.	Total Dissolved Solids				RUSH TAT (Pre-Schedule)	Standard TAT
-01	Monitor Well #1	8/15/2006	13:30	3	X		2			1		X					X	X					X			X					X

Special Instructions:

PLEASE Email RESULTS TO: kpope@riceswd.com; mfranks@riceswd.com
rozanne@valornet.com

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	8/18/06	5:30	James Johnson	8-18-06	5:31
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
	8/18/06	10:20		8/18/06	10:20

Sample Containers Intact? [✓ Y] N
Labels on container? [✓ Y] N
Custody Seals: [✓ Containers] / [✓ Cooler]
Temperature Upon Receipt:
Laboratory Comments: 4.0

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: Rice OP

Date/ Time: 8/18/06 10:20

_ab ID # : 6H18012

nitials: CK

Sample Receipt Checklist

					Client Initials
#1	Temperature of container/ cooler?	Yes	No	4.0 °C	
2	Shipping container in good condition?	[✓ Yes]	No		
3	Custody Seals intact on shipping container/ cooler?	[✓ Yes]	No	Not Present	
4	Custody Seals intact on sample bottles/ container?	[✓ Yes]	No	Not Present	
5	Chain of Custody present?	[✓ Yes]	No		
6	Sample instructions complete of Chain of Custody?	[✓ Yes]	No		
7	Chain of Custody signed when relinquished/ received?	[✓ Yes]	No		
8	Chain of Custody agrees with sample label(s)?	[✓ Yes]	No	ID written on Cont./ Lid	
9	Container label(s) legible and intact?	[✓ Yes]	No	Not Applicable	
10	Sample matrix/ properties agree with Chain of Custody?	[✓ Yes]	No		
11	Containers supplied by ELOT?	[✓ Yes]	No		
12	Samples in proper container/ bottle?	[✓ Yes]	No	See Below	
13	Samples properly preserved?	[✓ Yes]	No	See Below	
14	Sample bottles intact?	[✓ Yes]	No		
15	Preservations documented on Chain of Custody?	[✓ Yes]	No		
16	Containers documented on Chain of Custody?	[✓ Yes]	No		
17	Sufficient sample amount for indicated test(s)?	[✓ Yes]	No	See Below	
18	All samples received within sufficient hold time?	[✓ Yes]	No	See Below	
19	VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable	

Variance Documentation

ontact: ______ Contacted by: ______ Date/ Time: ______

egarding: ______

orrective Action Taken: ______

heck all that Apply:
☐ See attached e-mail/ fax
☐ Client understands and would like to proceed with analysis
☐ Cooling process had begun shortly after sampling event

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Farris-Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO- Apache Leak
Project Number: None Given
Location: T19S-R36E- Sect1G. Lea County, NM

Lab Order Number: 6I13001

Report Date: 09/19/06

Rice Operating Co.
122 W. Taylor
Hobbs NM, 88240

Project: ABO- Apache Leak
Project Number: None Given
Project Manager: Kristin Farris-Pope

Fax: (505) 397-1471

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well #1	6I13001-01	Water	09/12/06 17:07	09-13-2006 07:50

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6113001-01) Water									
Benzene	ND	0.00100	mg/L	1	E161318	09/13/06	09/14/06	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*96.5 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*84.0 %*	*80-120*		"	"	"	"	

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6113001-01) Water									
Total Alkalinity	**178**	2.00	mg/L	1	E161412	09/14/06	09/14/06	EPA 310.1M	
Chloride	**221**	5.00	"	10	E161815	09/15/06	09/19/06	EPA 300.0	
Total Dissolved Solids	**788**	10.0	"	1	E161502	09/13/06	09/14/06	EPA 160.1	
Sulfate	**80.7**	5.00	"	10	E161815	09/15/06	09/19/06	EPA 300.0	

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

Total Metals by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6113001-01) Water									
Calcium	**128**	4.05	mg/L	50	E161402	09/14/06	09/14/06	EPA 6010B	
Magnesium	**20.9**	0.360	"	10	"	"	"	"	
Potassium	**2.79**	0.600	"	"	"	"	"	"	
Sodium	**59.9**	0.430	"	"	"	"	"	"	

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EI61318 - EPA 5030C (GC)										
Blank (EI61318-BLK1)				Prepared: 09/13/06 Analyzed: 09/15/06						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*39.4*		*ug/l*	*40.0*		*98.5*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*32.5*		*"*	*40.0*		*81.2*	*80-120*			
LCS (EI61318-BS1)				Prepared: 09/13/06 Analyzed: 09/14/06						
Benzene	0.0559	0.00100	mg/L	0.0500		112	80-120			
Toluene	0.0461	0.00100	"	0.0500		92.2	80-120			
Ethylbenzene	0.0435	0.00100	"	0.0500		87.0	80-120			
Xylene (p/m)	0.0992	0.00100	"	0.100		99.2	80-120			
Xylene (o)	0.0509	0.00100	"	0.0500		102	80-120			
Surrogate: a,a,a-Trifluorotoluene	*41.8*		*ug/l*	*40.0*		*104*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*40.6*		*"*	*40.0*		*102*	*80-120*			
Calibration Check (EI61318-CCV1)				Prepared: 09/13/06 Analyzed: 09/14/06						
Benzene	0.0490		mg/L	0.0500		98.0	80-120			
Toluene	0.0438		"	0.0500		87.6	80-120			
Ethylbenzene	0.0442		"	0.0500		88.4	80-120			
Xylene (p/m)	0.0890		"	0.100		89.0	80-120			
Xylene (o)	0.0437		"	0.0500		87.4	80-120			
Surrogate: a,a,a-Trifluorotoluene	*39.8*		*ug/l*	*40.0*		*99.5*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*33.5*		*"*	*40.0*		*83.8*	*80-120*			
Matrix Spike (EI61318-MS1)	**Source: 6113001-01**			Prepared: 09/13/06 Analyzed: 09/15/06						
Benzene	0.0544	0.00100	mg/L	0.0500	ND	109	80-120			
Toluene	0.0466	0.00100	"	0.0500	ND	93.2	80-120			
Ethylbenzene	0.0476	0.00100	"	0.0500	ND	95.2	80-120			
Xylene (p/m)	0.101	0.00100	"	0.100	ND	101	80-120			
Xylene (o)	0.0509	0.00100	"	0.0500	ND	102	80-120			
Surrogate: a,a,a-Trifluorotoluene	*38.4*		*ug/l*	*40.0*		*96.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*38.7*		*"*	*40.0*		*96.8*	*80-120*			

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch E161318 - EPA 5030C (GC)										
Matrix Spike Dup (E161318-MSD1)	**Source: 6113001-01**		Prepared: 09/13/06 Analyzed: 09/15/06							
Benzene	0.0551	0.00100	mg/L	0.0500	ND	110	80-120	0.913	20	
Toluene	0.0451	0.00100	"	0.0500	ND	90.2	80-120	3.27	20	
Ethylbenzene	0.0452	0.00100	"	0.0500	ND	90.4	80-120	5.17	20	
Xylene (p/m)	0.0940	0.00100	"	0.100	ND	94.0	80-120	7.18	20	
Xylene (o)	0.0492	0.00100	"	0.0500	ND	98.4	80-120	3.59	20	
Surrogate: a,a,a-Trifluorotoluene	*38.2*		*ug/l*	*40.0*		*95.5*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*39.5*		*"*	*40.0*		*98.8*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EI61412 - General Preparation (WetChem)										
Blank (EI61412-BLK1)				Prepared & Analyzed: 09/14/06						
Total Alkalinity	ND	2.00	mg/L							
LCS (EI61412-BS1)				Prepared & Analyzed: 09/14/06						
Total Alkalinity	190	2.00	mg/L	200		95.0	85-115			
Duplicate (EI61412-DUP1)	**Source: 6111006-01**			Prepared & Analyzed: 09/14/06						
Total Alkalinity	192	2.00	mg/L		194			1.04	20	
Reference (EI61412-SRM1)				Prepared & Analyzed: 09/14/06						
Total Alkalinity	244		mg/L	250		97.6	90-110			
Batch EI61502 - Filtration Preparation										
Blank (EI61502-BLK1)				Prepared: 09/13/06 Analyzed: 09/14/06						
Total Dissolved Solids	ND	10.0	mg/L							
Duplicate (EI61502-DUP1)	**Source: 6113001-01**			Prepared: 09/13/06 Analyzed: 09/14/06						
Total Dissolved Solids	808	10.0	mg/L		788			2.51	5	
Duplicate (EI61502-DUP2)	**Source: 6113003-02**			Prepared: 09/13/06 Analyzed: 09/15/06						
Total Dissolved Solids	918	10.0	mg/L		2890			104	5	
Batch EI61815 - General Preparation (WetChem)										
Blank (EI61815-BLK1)				Prepared: 09/15/06 Analyzed: 09/19/06						
Chloride	ND	0.500	mg/L							
Sulfate	ND	0.500	"							

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch E161815 - General Preparation (WetChem)										
LCS (E161815-BS1)				Prepared: 09/15/06	Analyzed: 09/19/06					
Sulfate	10.1	0.500	mg/L	10.0		101	80-120			
Chloride	9.83	0.500	"	10.0		98.3	80-120			
Calibration Check (E161815-CCV1)				Prepared: 09/15/06	Analyzed: 09/19/06					
Sulfate	10.2		mg/L	10.0		102	80-120			
Chloride	9.86		"	10.0		98.6	80-120			
Duplicate (E161815-DUP1)		**Source: 6113001-01**		Prepared: 09/15/06	Analyzed: 09/19/06					
Sulfate	80.6	5.00	mg/L		80.7			0.124	20	
Chloride	223	5.00	"		221			0.901	20	
Duplicate (E161815-DUP2)		**Source: 6114014-02**		Prepared: 09/15/06	Analyzed: 09/19/06					
Sulfate	306	12.5	mg/L		306			0.00	20	
Chloride	547	12.5	"		546			0.183	20	
Matrix Spike (E161815-MS1)		**Source: 6113001-01**		Prepared: 09/15/06	Analyzed: 09/19/06					
Sulfate	185	5.00	mg/L	100	80.7	104	80-120			
Chloride	331	5.00	"	100	221	110	80-120			
Matrix Spike (E161815-MS2)		**Source: 6114014-02**		Prepared: 09/15/06	Analyzed: 09/19/06					
Sulfate	579	12.5	mg/L	250	306	109	80-120			
Chloride	829	12.5	"	250	546	113	80-120			

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Batch E161402 - 6010B/No Digestion

Blank (E161402-BLK1) Prepared & Analyzed: 09/14/06

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Calcium	ND	0.0810	mg/L							
Magnesium	ND	0.0360	"							
Potassium	ND	0.0600	"							
Sodium	ND	0.0430	"							

Calibration Check (E161402-CCV1) Prepared & Analyzed: 09/14/06

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Calcium	2.18		mg/L	2.00		109	85-115			
Magnesium	2.18		"	2.00		109	85-115			
Potassium	1.84		"	2.00		92.0	85-115			
Sodium	1.91		"	2.00		95.5	85-115			

Duplicate (E161402-DUP1) **Source: 6111006-01** Prepared & Analyzed: 09/14/06

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Calcium	51.8	0.810	mg/L		51.8			0.00	20	
Magnesium	29.0	0.360	"		29.0			0.00	20	
Potassium	5.34	0.600	"		5.64			5.46	20	
Sodium	72.1	0.430	"		75.0			3.94	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 9/19/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
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CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope kpope@riceswd.com
Company Name: RICE Operating Company
Company Address: 122 W. Taylor Street
City/State/Zip: Hobbs, New Mexico 88240
Telephone No: (505) 393-9174
Fax No: (505) 397-1471
Sampler Signature: Rozanne Johnson (505) 631-9310
Email: rozanne@valornet.com

Project Name: ABO-Apache Leak
Project Number:
Project Loc: T19S-R36E-Sec1G, Lea County NM
PO Number:

					Preservative							Matrix				Analyze For:															
																TCLP:															
																TOTAL:							X								
LAB # (lab use only) E13001	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl (2) 40 ml glass vials	NaOH	H_2SO_4	None (1) 1 Liter HDPE	Other (Specify)	Water	Sludge	Soil	Other (specify):	TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	RCI	N.O.R.M.	Total Dissolved Solids				RUSH TAT (Pre-Schedule)	Standard TAT
01	Monitor Well #1	9/12/2006	17:07	3	X		2			1		X					X	X					X			X					X

Special Instructions:

PLEASE Email RESULTS TO: kpope@riceswd.com; mfranks@riceswd.com
rozanne@valornet.com

Sample Containers Intact? [✓ Y] N
Labels on container? [✓ Y] N
Custody Seals: [✓ Containers / Cooler]
Temperature Upon Receipt: 2.0°C

Laboratory Comments:

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	9/13/06	5:00	James Johnson	9-13-06	5:01
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
James Johnson	9-13-06	0750		9-13-06	0750

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: Rice Op.

Date/ Time: 9/13/06 11:50

Lab ID # : 6I13001

Initials: CK

Sample Receipt Checklist

					Client Initials
#1	Temperature of container/ cooler?	Yes	No	2.0 °C	
#2	Shipping container in good condition?	[✓ Yes]	No		
#3	Custody Seals intact on shipping container/ cooler?	[✓ Yes]	No	Not Present	
#4	Custody Seals intact on sample bottles/ container?	[✓ Yes]	No	Not Present	
#5	Chain of Custody present?	[✓ Yes]	No		
#6	Sample instructions complete of Chain of Custody?	[✓ Yes]	No		
#7	Chain of Custody signed when relinquished/ received?	[✓ Yes]	No		
#8	Chain of Custody agrees with sample label(s)?	[✓ Yes]	No	ID written on Cont./ Lid	
#9	Container label(s) legible and intact?	[✓ Yes]	No	Not Applicable	
#10	Sample matrix/ properties agree with Chain of Custody?	[✓ Yes]	No		
#11	Containers supplied by ELOT?	[✓ Yes]	No		
#12	Samples in proper container/ bottle?	[✓ Yes]	No	See Below	
#13	Samples properly preserved?	[✓ Yes]	No	See Below	
14	Sample bottles intact?	[✓ Yes]	No		
#15	Preservations documented on Chain of Custody?	[✓ Yes]	No		
#16	Containers documented on Chain of Custody?	[✓ Yes]	No		
#17	Sufficient sample amount for indicated test(s)?	[✓ Yes]	No	See Below	
#18	All samples received within sufficient hold time?	[✓ Yes]	No	See Below	
#19	VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable	

Variance Documentation

ontact: ____________ Contacted by: ____________ Date/ Time: ____________

egarding: ____________

orrective Action Taken:

heck all that Apply:

☐ See attached e-mail/ fax

☐ Client understands and would like to proceed with analysis

☐ Cooling process had begun shortly after sampling event

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Farris-Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO- Apache Leak
Project Number: None Given
Location: T19S-R36E-Sec.1G, Lea County, NM

Lab Order Number: 6J12012

Report Date: 10/24/06

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well #1	6J12012-01	Water	10/09/06 16:20	10-12-2006 16:00

Rice Operating Co.	Project: ABO- Apache Leak	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6J12012-01) Water									
Benzene	ND	0.00100	mg/L	1	EJ61407	10/14/06	10/16/06	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*82.2 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*102 %*	*80-120*		"	"	"	"	

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6J12012-01) Water									
Total Alkalinity	**194**	2.00	mg/L	1	EJ61311	10/13/06	10/13/06	EPA 310.1M	
Chloride	**219**	5.00	"	10	EJ61403	10/19/06	10/19/06	EPA 300.0	
Total Dissolved Solids	**836**	10.0	"	1	EJ61404	10/14/06	10/15/06	EPA 160.1	
Sulfate	**80.9**	5.00	"	10	EJ61403	10/19/06	10/19/06	EPA 300.0	

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6J12012-01) Water									
Calcium	**133**	4.05	mg/L	50	EJ61604	10/13/06	10/16/06	EPA 6010B	
Magnesium	**20.6**	0.360	"	10	"	"	"	"	
Potassium	**2.72**	0.600	"	"	"	"	"	"	
Sodium	**48.0**	2.15	"	50	"	"	"	"	

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EJ61407 - EPA 5030C (GC)										
Blank (EJ61407-BLK1)				Prepared: 10/14/06 Analyzed: 10/15/06						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*33.5*		*ug/l*	*40.0*		*83.8*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*35.0*		*"*	*40.0*		*87.5*	*80-120*			
LCS (EJ61407-BS1)				Prepared: 10/14/06 Analyzed: 10/15/06						
Benzene	0.0451	0.00100	mg/L	0.0500		90.2	80-120			
Toluene	0.0430	0.00100	"	0.0500		86.0	80-120			
Ethylbenzene	0.0513	0.00100	"	0.0500		103	80-120			
Xylene (p/m)	0.0929	0.00100	"	0.100		92.9	80-120			
Xylene (o)	0.0423	0.00100	"	0.0500		84.6	80-120			
Surrogate: a,a,a-Trifluorotoluene	*34.4*		*ug/l*	*40.0*		*86.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*43.8*		*"*	*40.0*		*110*	*80-120*			
Calibration Check (EJ61407-CCV1)				Prepared: 10/14/06 Analyzed: 10/17/06						
Benzene	49.9		ug/l	50.0		99.8	80-120			
Toluene	43.1		"	50.0		86.2	80-120			
Ethylbenzene	42.0		"	50.0		84.0	80-120			
Xylene (p/m)	83.7		"	100		83.7	80-120			
Xylene (o)	41.2		"	50.0		82.4	80-120			
Surrogate: a,a,a-Trifluorotoluene	*36.1*		*"*	*40.0*		*90.2*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*34.3*		*"*	*40.0*		*85.8*	*80-120*			
Matrix Spike (EJ61407-MS1)	**Source: 6J12015-01**			Prepared: 10/14/06 Analyzed: 10/17/06						
Benzene	0.0501	0.00100	mg/L	0.0500	ND	100	80-120			
Toluene	0.0440	0.00100	"	0.0500	ND	88.0	80-120			
Ethylbenzene	0.0416	0.00100	"	0.0500	ND	83.2	80-120			
Xylene (p/m)	0.0914	0.00100	"	0.100	ND	91.4	80-120			
Xylene (o)	0.0427	0.00100	"	0.0500	ND	85.4	80-120			
Surrogate: a,a,a-Trifluorotoluene	*35.5*		*ug/l*	*40.0*		*88.8*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*40.2*		*"*	*40.0*		*100*	*80-120*			

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EJ61407 - EPA 5030C (GC)										
Matrix Spike Dup (EJ61407-MSD1)	**Source: 6J12015-01**			Prepared: 10/14/06 Analyzed: 10/17/06						
Benzene	0.0502	0.00100	mg/L	0.0500	ND	100	80-120	0.00	20	
Toluene	0.0442	0.00100	"	0.0500	ND	88.4	80-120	0.454	20	
Ethylbenzene	0.0412	0.00100	"	0.0500	ND	82.4	80-120	0.966	20	
Xylene (p/m)	0.0913	0.00100	"	0.100	ND	91.3	80-120	0.109	20	
Xylene (o)	0.0437	0.00100	"	0.0500	ND	87.4	80-120	2.31	20	
Surrogate: a,a,a-Trifluorotoluene	*35.4*		*ug/l*	*40.0*		*88.5*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*41.0*		*"*	*40.0*		*102*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EJ61311 - General Preparation (WetChem)										
Blank (EJ61311-BLK1)				Prepared & Analyzed: 10/13/06						
Total Alkalinity	ND	2.00	mg/L							
Carbonate Alkalinity	ND	0.100	"							
Bicarbonate Alkalinity	ND	2.00	"							
Hydroxide Alkalinity	ND	0.100	"							
LCS (EJ61311-BS1)				Prepared: 10/13/06 Analyzed: 10/20/06						
Bicarbonate Alkalinity	196	2.00	mg/L	200		98.0	85-115			
Duplicate (EJ61311-DUP1)	**Source: 6J12011-01**			Prepared & Analyzed: 10/13/06						
Total Alkalinity	238	2.00	mg/L		242			1.67	20	
Reference (EJ61311-SRM1)				Prepared & Analyzed: 10/13/06						
Total Alkalinity	250		mg/L	250		100	90-110			
Batch EJ61403 - General Preparation (WetChem)										
Blank (EJ61403-BLK1)				Prepared & Analyzed: 10/19/06						
Chloride	ND	0.500	mg/L							
Sulfate	ND	0.500	"							
LCS (EJ61403-BS1)				Prepared & Analyzed: 10/19/06						
Sulfate	9.55	0.500	mg/L	10.0		95.5	80-120			
Chloride	9.62	0.500	"	10.0		96.2	80-120			
Calibration Check (EJ61403-CCV1)				Prepared & Analyzed: 10/19/06						
Sulfate	10.1		mg/L	10.0		101	80-120			
Chloride	10.5		"	10.0		105	80-120			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EJ61403 - General Preparation (WetChem)										
Duplicate (EJ61403-DUP1)		**Source: 6J12011-01**		Prepared & Analyzed: 10/19/06						
Sulfate	291	25.0	mg/L		308			5.68	20	
Chloride	1430	25.0	"		1430			0.00	20	
Duplicate (EJ61403-DUP2)		**Source: 6J12016-02**		Prepared & Analyzed: 10/19/06						
Sulfate	236	12.5	mg/L		237			0.423	20	
Chloride	690	12.5	"		692			0.289	20	
Matrix Spike (EJ61403-MS1)		**Source: 6J12011-01**		Prepared & Analyzed: 10/19/06						
Chloride	2040	25.0	mg/L	500	1430	122	80-120			S-07
Sulfate	781	25.0	"	500	308	94.6	80-120			
Matrix Spike (EJ61403-MS2)		**Source: 6J12016-02**		Prepared & Analyzed: 10/19/06						
Sulfate	476	12.5	mg/L	250	237	95.6	80-120			
Chloride	979	12.5	"	250	692	115	80-120			
Batch EJ61404 - Filtration Preparation										
Blank (EJ61404-BLK1)				Prepared: 10/14/06 Analyzed: 10/15/06						
Total Dissolved Solids	ND	10.0	mg/L							
Duplicate (EJ61404-DUP1)		**Source: 6J12011-01**		Prepared: 10/14/06 Analyzed: 10/15/06						
Total Dissolved Solids	3380	10.0	mg/L		3260			3.61	5	
Duplicate (EJ61404-DUP2)		**Source: 6J12016-02**		Prepared: 10/14/06 Analyzed: 10/15/06						
Total Dissolved Solids	1850	10.0	mg/L		1900			2.67	5	

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EJ61604 - 6010B/No Digestion										
Blank (EJ61604-BLK1)				Prepared: 10/13/06 Analyzed: 10/16/06						
Calcium	ND	0.0810	mg/L							
Magnesium	ND	0.0360	"							
Potassium	ND	0.0600	"							
Sodium	ND	0.0430	"							
Calibration Check (EJ61604-CCV1)				Prepared: 10/13/06 Analyzed: 10/16/06						
Calcium	1.99		mg/L	2.00		99.5	85-115			
Magnesium	2.20		"	2.00		110	85-115			
Potassium	1.94		"	2.00		97.0	85-115			
Sodium	1.79		"	2.00		89.5	85-115			
Duplicate (EJ61604-DUP1)	**Source: 6J12001-04**			Prepared: 10/13/06 Analyzed: 10/16/06						
Calcium	0.426	0.0810	mg/L		0.427			0.234	20	
Magnesium	0.432	0.0360	"		0.422			2.34	20	
Potassium	0.596	0.0600	"		0.582			2.38	20	
Sodium	0.890	0.0430	"		0.866			2.73	20	

Notes and Definitions

S-07	Recovery outside Laboratory historical or method prescribed limits.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 10/24/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope kpope@riceswd.com
Company Name RICE Operating Company
Company Address: 122 W. Taylor Street
City/State/Zip: Hobbs, New Mexico 88240
Telephone No: (505) 393-9174
Fax No: (505) 397-1471
Sampler Signature: Rozanne Johnson (505) 631-9310
Email: rozanne@valornet.com

Project Name: ABO-Apache Leak
Project Number:
Project Loc: T19S-R36E-Sec1G, Lea County NM
PO Number:

					Preservative							Matrix				Analyze For:															
																TCLP:															
																TOTAL:							X								
6J12002 LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO_3	HCl (2) 40 ml glass vials	NaOH	H_2SO_4	None (1) 1 Liter HDPE	Other (Specify)	Water	Sludge	Soil	Other (specify):	TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	RCI	N.O.R.M.	Total Dissolved Solids				RUSH TAT (Pre-Schedule)	Standard TAT
-01	Monitor Well #1	10/9/2006	16:20	3	X		2			1		X					X	X					X			X					X

Special Instructions:

PLEASE Email RESULTS TO: kpope@riceswd.com; mfranks@riceswd.com
rozanne@valornet.com

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	10/12/06	4:00			
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
				10/12/06	4:00

Sample Containers Intact? [✓ Y] N
Labels on container? [✓ Y] N
Custody Seals: [✓ Containers] / [✓ Cooler]
Temperature Upon Receipt: 2.0
Laboratory Comments:

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

it: Rice Op

./ Time: 10/12/06 4:00

ID # : 6J12012

als: CK

Sample Receipt Checklist

				Client Initials
Temperature of container/ cooler?	Yes	No	2.0 °C	
Shipping container in good condition?	[✓ Yes]	No		
Custody Seals intact on shipping container/ cooler?	[✓ Yes]	No	Not Present	
Custody Seals intact on sample bottles/ container?	[✓ Yes]	No	Not Present	
Chain of Custody present?	[✓ Yes]	No		
Sample instructions complete of Chain of Custody?	[✓ Yes]	No		
Chain of Custody signed when relinquished/ received?	[✓ Yes]	No		
Chain of Custody agrees with sample label(s)?	[✓ Yes]	No	ID written on Cont./ Lid	
Container label(s) legible and intact?	[✓ Yes]	No	Not Applicable	
0 Sample matrix/ properties agree with Chain of Custody?	[✓ Yes]	No		
1 Containers supplied by ELOT?	[✓ Yes]	No		
2 Samples in proper container/ bottle?	[✓ Yes]	No	See Below	
3 Samples properly preserved?	[✓ Yes]	No	See Below	
14 Sample bottles intact?	[✓ Yes]	No		
15 Preservations documented on Chain of Custody?	[✓ Yes]	No		
16 Containers documented on Chain of Custody?	[✓ Yes]	No		
17 Sufficient sample amount for indicated test(s)?	[✓ Yes]	No	See Below	
18 All samples received within sufficient hold time?	[✓ Yes]	No	See Below	
19 VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable	

Variance Documentation

ontact: ________ Contacted by: ________ Date/ Time: ________

egarding:

Corrective Action Taken:

Check all that Apply:

☐ See attached e-mail/ fax
☐ Client understands and would like to proceed with analysis
☐ Cooling process had begun shortly after sampling event

ENVIRONMENTAL LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Farris-Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO- Apache Leak
Project Number: None Given
Location: T19S R37E Sec.1 G- Lea County, NM

Lab Order Number: 6K15004

Report Date: 11/22/06

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well #1	6K15004-01	Water	11/13/06 09:40	11-15-2006 08:10

Rice Operating Co.	Project: ABO- Apache Leak	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6K15004-01) Water									
Chloride	**234**	5.00	mg/L	10	EK61507	11/15/06	11/15/06	EPA 300.0	
Total Dissolved Solids	**752**	10.0	"	1	EK61611	11/15/06	11/16/06	EPA 160.1	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EK61507 - General Preparation (WetChem)										
Blank (EK61507-BLK1)				Prepared & Analyzed: 11/15/06						
Chloride	ND	0.500	mg/L							
LCS (EK61507-BS1)				Prepared & Analyzed: 11/15/06						
Chloride	11.1	0.500	mg/L	10.0		111	80-120			
Calibration Check (EK61507-CCV1)				Prepared & Analyzed: 11/15/06						
Chloride	10.7		mg/L	10.0		107	80-120			
Duplicate (EK61507-DUP1)	**Source: 6K15004-01**			Prepared & Analyzed: 11/15/06						
Chloride	232	5.00	mg/L		234			0.858	20	
Duplicate (EK61507-DUP2)	**Source: 6K15006-07**			Prepared & Analyzed: 11/15/06						
Chloride	37.9	5.00	mg/L		43.7			14.2	20	
Matrix Spike (EK61507-MS1)	**Source: 6K15004-01**			Prepared & Analyzed: 11/15/06						
Chloride	345	5.00	mg/L	100	234	111	80-120			
Matrix Spike (EK61507-MS2)	**Source: 6K15006-07**			Prepared & Analyzed: 11/15/06						
Chloride	142	5.00	mg/L	100	43.7	98.3	80-120			
Batch EK61611 - Filtration Preparation										
Blank (EK61611-BLK1)				Prepared: 11/15/06 Analyzed: 11/16/06						
Total Dissolved Solids	ND	10.0	mg/L							
Duplicate (EK61611-DUP1)	**Source: 6K15001-01**			Prepared: 11/15/06 Analyzed: 11/16/06						
Total Dissolved Solids	14000	10.0	mg/L		13200			5.88	5	QR-03

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EK61611 - Filtration Preparation										
Duplicate (EK61611-DUP2)		**Source: 6K15005-03**		Prepared: 11/15/06 Analyzed: 11/16/06						
Total Dissolved Solids	586	10.0	mg/L		622			5.96	5	QR-03

Notes and Definitions

QR-03	The RPD value for the sample duplicate or MS/MSD was outside of QC acceptance limits due to matrix interference. QC batch accepted based on LCS and/or LCSD recovery and/or RPD values.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 11/22/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer

Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

This material is intended only for the use of the individual (s) or entity to whom it is addressed, and may contain information that is privileged and confidential.

If you have received this material in error, please notify us immediately at 432-563-1800.

Environmental Lab of Texas

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

12800 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

Project Manager: Kristin Farris Pope kpope@riceswd.com

Company Name: RICE Operating Company

Company Address: 122 W. Taylor Street

City/State/Zip: Hobbs, New Mexico 88240

Telephone No: (505) 393-9174

Fax No: (505) 397-1471

Sampler Signature: Rozanne Johnson (505)631-9310

e-mail: rozanne@valornet.com

Project Name: ABO Apache Leak

Project #:

Project Loc: T19S R37E Sec1 G ~ Lea County New Mexico

PO #:

Report Format: ☒ Standard ☐ TRRP ☐ NPDES

(lab use only)
ORDER #: 6K15001

								Preservation & # of Containers								Matrix	Analyze For:															
LAB # (lab use only)	FIELD CODE	Beginning Depth	Ending Depth	Date Sampled	Time Sampled	Field Filtered	Total #. of Containers	Ice	HNO_3	HCl	H_2SO_4	NaOH	$Na_2S_2O_3$	None (1) 1 Liter HDPE	Other (Specify)	DW=Drinking Water SL=Sludge GW = Groundwater S=Soil/Solid NP=Non-Potable Specify Other	TPH: 418.1 8015M 8015B	TPH: TX 1005 TX 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, Alkalinity)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles (BTEX-N 8260)	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	Total Dissolved Solids	Chlorides		RUSH TAT (Pre-Schedule) 24, 48, 72 hrs	Standard TAT
-01	Monitor Well #1			11/13/2006	9:40		1	X						1		GW												X	X			X

TCLP:
TOTAL:

Special Instructions:

Please email to : kpope@riceswd.com mfranks@riceswd.com rozanne@valornet.com

	Date	Time		Date	Time
Relinquished by: Rozanne Johnson	11/14/06	20:00	Received by: James Johnson James Johnson	11/14/06	20:01
Relinquished by: James Johnson James Johnson	11/15/06	8:10	Received by:		
Relinquished by:			Received by ELOT: Cari Keller	11/15/06	8:10

Laboratory Comments:

Sample Containers Intact? [✓ Y] N
VOCs Free of Headspace? [✓ Y] N
Labels on container(s) [✓ Y] N
Custody seals on container(s) [✓ Y] N
Custody seals on cooler(s) [✓ Y] N
Sample Hand Delivered [✓ Y] N
by [✓ Sampler]/Client Rep. ? [✓ Y] N
by Courier? UPS DHL FedEx Lone Star

Temperature Upon Receipt: 0.5 °C

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

lient: Rico Op.

ate/ Time: 11/15/06 8:10

ab ID # : 6K15004

itials: CK

Sample Receipt Checklist

				Client Initials
1 Temperature of container/ cooler?	Yes	No	0.5 °C	
2 Shipping container in good condition?	[✓ Yes]	No		
3 Custody Seals intact on shipping container/ cooler?	[✓ Yes]	No	Not Present	
4 Custody Seals intact on sample bottles/ container?	[✓ Yes]	No	Not Present	
5 Chain of Custody present?	[✓ Yes]	No		
6 Sample instructions complete of Chain of Custody?	[✓ Yes]	No		
7 Chain of Custody signed when relinquished/ received?	[✓ Yes]	No		
8 Chain of Custody agrees with sample label(s)?	[✓ Yes]	No	ID written on Cont./ Lid	
9 Container label(s) legible and intact?	[✓ Yes]	No	Not Applicable	
10 Sample matrix/ properties agree with Chain of Custody?	[✓ Yes]	No		
11 Containers supplied by ELOT?	[✓ Yes]	No		
12 Samples in proper container/ bottle?	[✓ Yes]	No	See Below	
13 Samples properly preserved?	[✓ Yes]	No	See Below	
14 Sample bottles intact?	[✓ Yes]	No		
15 Preservations documented on Chain of Custody?	[✓ Yes]	No		
16 Containers documented on Chain of Custody?	[✓ Yes]	No		
17 Sufficient sample amount for indicated test(s)?	[✓ Yes]	No	See Below	
18 All samples received within sufficient hold time?	[✓ Yes]	No	See Below	
19 Subcontract of sample(s)?	Yes	No	[✓ Not Applicable]	
20 VOC samples have zero headspace?	Yes	No	[✓ Not Applicable]	

Variance Documentation

ontact: ______ Contacted by: ______ Date/ Time: ______

egarding: ______

orrective Action Taken: ______

heck all that Apply:
- ☐ See attached e-mail/ fax
- ☐ Client understands and would like to proceed with analysis
- ☐ Cooling process had begun shortly after sampling event

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:
Kristin Farris-Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO- Apache Leak
Project Number: None Given
Location: T19S R37E Sec. 1G- Lea County, NM

Lab Order Number: 6L07011

Report Date: 12/11/06

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well #1	6L07011-01	Water	12/04/06 08:05	12-07-2006 10:50

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6L07011-01) Water									
Chloride	**229**	5.00	mg/L	10	EL60801	12/07/06	12/07/06	EPA 300.0	
Total Dissolved Solids	**698**	10.0	"	1	EL60803	12/07/06	12/08/06	EPA 160.1	

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EL60801 - General Preparation (WetChem)										
Blank (EL60801-BLK1)				Prepared & Analyzed: 12/08/06						
Chloride	ND	0.500	mg/L							
LCS (EL60801-BS1)				Prepared & Analyzed: 12/08/06						
Chloride	10.0	0.500	mg/L	10.0		100	80-120			
Calibration Check (EL60801-CCV1)				Prepared & Analyzed: 12/08/06						
Chloride	10.4		mg/L	10.0		104	80-120			
Duplicate (EL60801-DUP1)	**Source: 6L07005-01**			Prepared & Analyzed: 12/08/06						
Chloride	129	2.50	mg/L		130			0.772	20	
Matrix Spike (EL60801-MS1)	**Source: 6L07005-01**			Prepared & Analyzed: 12/08/06						
Chloride	189	2.50	mg/L	50.0	130	118	80-120			
Batch EL60803 - Filtration Preparation										
Blank (EL60803-BLK1)				Prepared: 12/07/06 Analyzed: 12/08/06						
Total Dissolved Solids	ND	10.0	mg/L							
Duplicate (EL60803-DUP1)	**Source: 6L07005-01**			Prepared: 12/07/06 Analyzed: 12/08/06						
Total Dissolved Solids	266	10.0	mg/L		246			7.81	20	

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO- Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 12/11/2006

Raland K. Tuttle, Lab Manager	Jeanne Mc Murrey, Inorg. Tech Director
Celey D. Keene, Lab Director, Org. Tech Director	LaTasha Cornish, Chemist
Peggy Allen, QA Officer	Sandra Sanchez, Lab Tech.

Environmental Lab of Texas

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

Project Manager: Kristin Farris Pope kpope@riceswd.com

Company Name: RICE Operating Company

Company Address: 122 W. Taylor Street

City/State/Zip: Hobbs, New Mexico 88240

Telephone No: (505) 393-9174

Fax No: (505) 397-1471

Sampler Signature: Rozanne Johnson (505)631-9310

e-mail: rozanne@valornet.com

Project Name: ABO Apache Leak

Project #:

Project Loc: T19S R37E Sec1 G ~ Lea County New Mexico

PO #:

Report Format: ☒ Standard ☐ TRRP ☐ NPDES

(lab use only)
ORDER #: 6L07011

								Preservation & # of Containers								Matrix	Analyze For: TCLP: TOTAL:															
LAB # (lab use only)	FIELD CODE	Beginning Depth	Ending Depth	Date Sampled	Time Sampled	Field Filtered	Total #. of Containers	Ice	HNO_3	HCl	H_2SO_4	NaOH	$Na_2S_2O_3$	None (1) 1 Liter HDPE	Other (Specify)	DW=Drinking Water SL=Sludge GW = Groundwater S=Soil/Solid NP=Non-Potable Specify Other	TPH: 418.1 8015M 8015B	TPH: TX 1005 TX 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, Alkalinity)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles (BTEX-N 8260)	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	Total Dissolved Solids	Chlorides		RUSH TAT (Pre-Schedule) 24, 48, 72 hrs	Standard TAT
01	Monitor Well #1			12/4/2006	8:05		1	X						1		GW												X	X			X

Special Instructions:
Please email to : kpope@riceswd.com mfranks@riceswd.com rozanne@valornet.com

FAE

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	12-7-06	10:50			
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
				12/7/06	10:50

Laboratory Comments:
Sample Containers Intact? [✓ Y] N
VOCs Free of Headspace? [✓ Y] N
Labels on container(s) [✓ Y] N
Custody seals on container(s) [✓ Y]
Custody seals on cooler(s) [✓ Y]
Sample Hand Delivered Y
by [✓ Sampler]/Client Rep. ?
by Courier? UPS DHL Fe
Temperature Upon Receipt: -2
not frozen

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: Rice Op.

Date/ Time: 12/7/06 10:50

Lab ID #: 6L07011

Initials: CK

Sample Receipt Checklist

					Client Initials
#1	Temperature of container/ cooler?	Yes	No	-2.0 °C	
#2	Shipping container in good condition?	[✓ Yes]	No		
#3	Custody Seals intact on shipping container/ cooler?	[✓ Yes]	No	Not Present	
#4	Custody Seals intact on sample bottles/ container?	[✓ Yes]	No	Not Present	
#5	Chain of Custody present?	[✓ Yes]	No		
#6	Sample instructions complete of Chain of Custody?	[✓ Yes]	No		
#7	Chain of Custody signed when relinquished/ received?	[✓ Yes]	No		
#8	Chain of Custody agrees with sample label(s)?	[✓ Yes]	No	ID written on Cont./ Lid	
#9	Container label(s) legible and intact?	[✓ Yes]	No	Not Applicable	
#10	Sample matrix/ properties agree with Chain of Custody?	[✓ Yes]	No		
#11	Containers supplied by ELOT?	[✓ Yes]	No		
#12	Samples in proper container/ bottle?	[✓ Yes]	No	See Below	
#13	Samples properly preserved?	[✓ Yes]	No	See Below	
#14	Sample bottles intact?	[✓ Yes]	No		
#15	Preservations documented on Chain of Custody?	[✓ Yes]	No		
#16	Containers documented on Chain of Custody?	[✓ Yes]	No		
#17	Sufficient sample amount for indicated test(s)?	[✓ Yes]	No	See Below	
#18	All samples received within sufficient hold time?	[✓ Yes]	No	See Below	
#19	Subcontract of sample(s)?	Yes	No	[✓ Not Applicable]	
#20	VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable	

Variance Documentation

Contact: ____________ Contacted by: ____________ Date/ Time: ____________

Regarding: ____________

Corrective Action Taken: ____________

Check all that Apply:

☐ See attached e-mail/ fax

☐ Client understands and would like to proceed with analysis

☐ Cooling process had begun shortly after sampling event

R. T. HICKS CONSULTANTS, LTD.
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

January 24, 2008

Wayne Price
Oil Conservation Division
1220 S. St. Francis Drive
Santa Fe, NM 87505

RE: 2007 Annual Ground Water Monitoring Report
G-1 Site (Abo Apache LA), Sec 01, T17S, R36E, Unit "G"
NMOCD Case #: 1R0415

Dear Mr. Wayne Price:

R.T. Hicks Consultants, Ltd is pleased to submit the 2007 Annual Ground Water Monitoring Report for the G-1 Site (Abo Apache LA) site located in the Abo Salt Water Disposal System (SWD). This report consists of the following sections:

1. A table summarizing all laboratory results, depth to ground water and other pertinent data associated with ground water sampling at the site, including this past year.
2. Graphs showing chemical concentration over time for chloride, TDS, and sulfate.
3. Laboratory data sheets associated with the routine sampling for 2007.

A Final Closure Report was submitted to NMOCD on April 28, 2006. NMOCD granted conditional approval on May 25, 2006. Revegetation and soil moisture monitoring is ongoing. We plan to submit a Final Closure Report in the spring of 2008.

Thank you for your consideration of this annual summary information. The attached CD contains an electronic copy of this report. If you have any questions, please contact us at 505-266-5004, or Kristin Farris Pope at ROC, 505-393-9174.

Sincerely,
R.T. Hicks Consultants, Ltd.

Randall H

Randall T. Hicks
Principal

Copy: Hobbs NMOCD office; Rice Operating Company

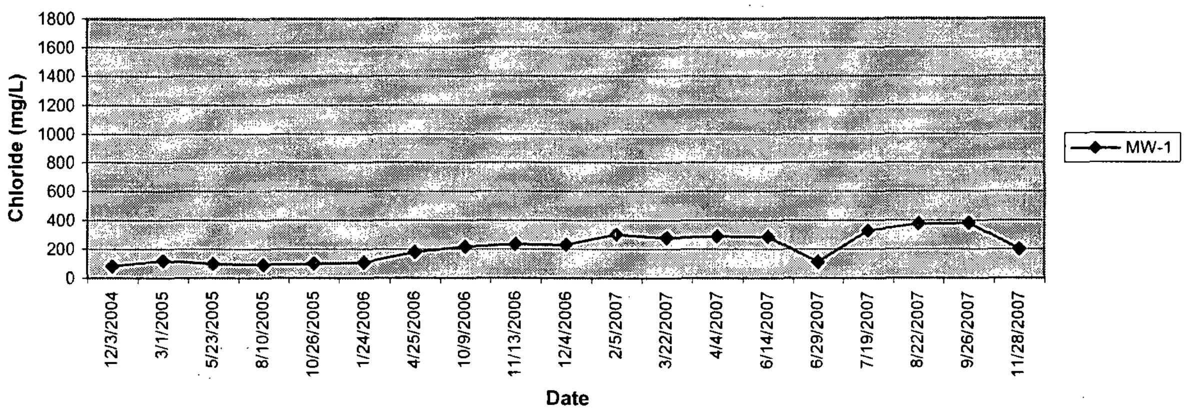
G-1 Site (Abo Apache LA)

Table 1: chemistry over time

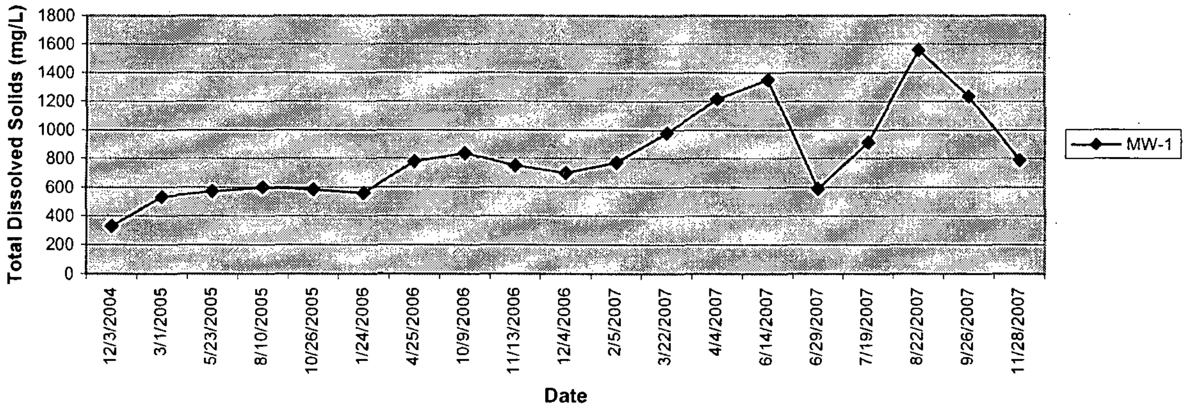
Well Name	Date	DTW (ft)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Benzene (mg/L)	Toluene (mg/L)	EthylBenzene (mg/L)	Total Xylenes (mg/L)	Comments
MW-1	12/3/2004	92.10	80.5		329	<0.001	<0.001	<0.001	<0.001	
MW-1	3/1/2005	92.10	120		532	<0.001	<0.001	<0.001	<0.001	
MW-1	5/23/2005	92.30	98.4		573	<0.001	<0.001	<0.001	<0.001	
MW-1	8/10/2005	92.60	91.5		603	<0.001	<0.001	<0.001	<0.001	
MW-1	10/26/2005	92.88	96.9	69.7	584	<0.001	<0.001	<0.001	<0.001	Clear
MW-1	1/24/2006	93.38	107	65	560	<0.001	<0.001	<0.001	<0.001	
MW-1	4/25/2006	93.55	181	66.8	780	<0.001	<0.001	<0.001	<0.001	
MW-1	10/9/2006	94.61	219	80.9	836	<0.001	<0.001	<0.001	<0.001	Clear
MW-1	11/13/2006	94.83	234	XXX	752	XXX	XXX	XXX	XXX	Clear with no odor
MW-1	12/4/2006	95.08	229	XXX	698	XXX	XXX	XXX	XXX	Clear / No Odor
MW-1	2/5/2007	95.12	301	83.1	772	<0.001	<0.001	<0.001	<0.001	Clear/
MW-1	3/22/2007		278		976					
MW-1	4/4/2007	95.10	290	XXX	1210	XXX	XXX	XXX	XXX	clear with no odor
MW-1	6/14/2007	95.12	285	XXX	1350	XXX	XXX	XXX	XXX	clear
MW-1	6/29/2007	95.12	112	74.4	588	<0.001	<0.001	<0.001	<0.001	Clear No Odor
MW-1	7/19/2007	95.40	328	XXX	912	XXX	XXX	XXX	XXX	Clear Slight Odor
MW-1	8/22/2007	95.46	376	91.1	1556	0.006	<0.002	<0.002	<0.006	Clear No Odor
MW-1	9/26/2007	95.61	380	XXX	1232	XXX	XXX	XXX	XXX	Clear with Slight Odor
MW-1	11/28/2007	95.88	200	76.6	791	<0.001	<0.001	<0.001	<0.003	Clear Slight odor

R:\Annual Reports\2007\g-1 site chart.xls

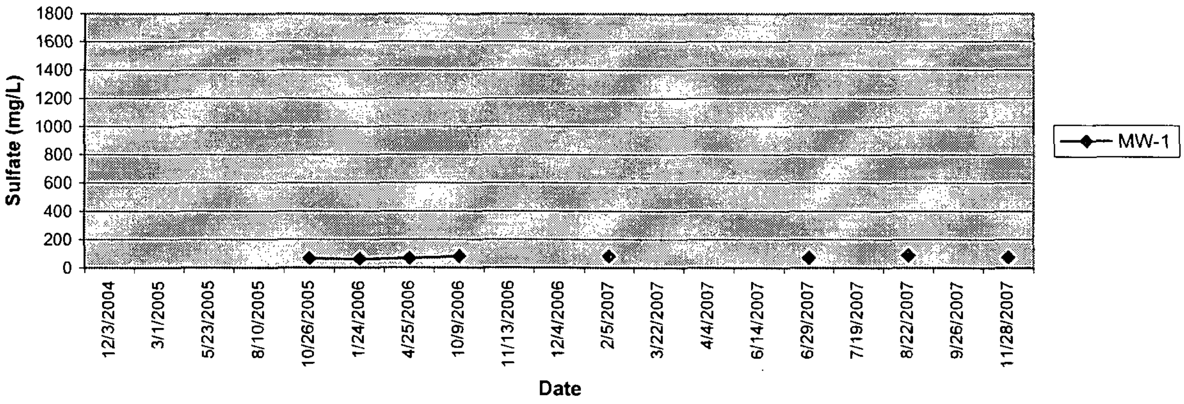
G-1 Site (Abo Apache LA)
Chloride Over Time



G-1 Site (Abo Apache LA)
TDS Over Time



G-1 Site (Abo Apache LA)
Sulfate Over Time



R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW, Suite F-142
Albuquerque, NM 87104
505-266-5004

Ground Water Chemistry

Rice Operating Company
2007 Annual Report

G-1 Site

1/24/2008

ENVIRONMENTAL LAB OF

12600 West I-20 East - Odessa, Texas 79765

A Xenco Laboratories Company

Analytical Report

Prepared for:

Kristin Farris-Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO Apache Leak
Project Number: None Given
Location: T19S R37E Sec1 G ~ Lea County New Mexico

Lab Order Number: 7D05010

Report Date: 04/11/07

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well # 1	7D05010-01	Water	04/04/07 19:20	04-05-2007 13:20

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well # 1 (7D05010-01) Water									
Chloride	**290**	5.00	mg/L	10	ED71003	04/10/07	04/10/07	EPA 300.0	
Total Dissolved Solids	**1210**	10.0	"	1	ED71008	04/05/07	04/06/07	EPA 160.1	

General Chemistry Parameters by EPA / Standard Methods - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch ED71003 - General Preparation (WetChem)										
Blank (ED71003-BLK1)				Prepared & Analyzed: 04/10/07						
Chloride	ND	0.500	mg/L							
LCS (ED71003-BS1)				Prepared & Analyzed: 04/10/07						
Chloride	12.0	0.500	mg/L	10.0		120	80-120			
Calibration Check (ED71003-CCV1)				Prepared & Analyzed: 04/10/07						
Chloride	9.00		mg/L	10.0		90.0	80-120			
Duplicate (ED71003-DUP1)		**Source: 7D05009-01**		Prepared & Analyzed: 04/10/07						
Chloride	1590	25.0	mg/L		1940			19.8	20	
Duplicate (ED71003-DUP2)		**Source: 7D05014-05**		Prepared & Analyzed: 04/10/07						
Chloride	1390	50.0	mg/L		1410			1.43	20	
Matrix Spike (ED71003-MS1)		**Source: 7D05009-01**		Prepared & Analyzed: 04/10/07						
Chloride	2080	25.0	mg/L	500	1940	28.0	80-120			
Matrix Spike (ED71003-MS2)		**Source: 7D05014-05**		Prepared & Analyzed: 04/10/07						
Chloride	2480	50.0	mg/L	1000	1410	107	80-120			
Batch ED71008 - General Preparation (WetChem)										
Blank (ED71008-BLK1)				Prepared: 04/05/07	Analyzed: 04/06/07					
Total Dissolved Solids	ND	10.0	mg/L							
Duplicate (ED71008-DUP1)		**Source: 7D05009-01**		Prepared: 04/05/07	Analyzed: 04/06/07					
Total Dissolved Solids	3700	10.0	mg/L		3070			18.6	20	

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Brent Barron Date: 4/11/2007

Brent Barron, Laboratory Director/Corp. Technical Director
Celey D. Keene, Org. Tech Director
Raland K. Tuttle, Laboratory Consultant

James Mathis, QA/QC Officer
Jeanne Mc Murrey, Inorg. Tech Director

Environmental Lab of Texas

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

Project Manager: Kristin Farris Pope kpope@riceswd.com
Company Name: RICE Operating Company
Company Address: 122 W. Taylor Street
City/State/Zip: Hobbs, New Mexico 88240
Telephone No: (505) 393-9174
Fax No: (505) 397-1471
Sampler Signature: Rozanne Johnson (505)631-9310
e-mail: rozanne@valornet.com

Project Name: ABO Apache Leak
Project #:
Project Loc: T19S R37E Sec1 G ~ Lea County New Mexico
PO #:
Report Format: ☒ Standard ☐ TRRP ☐ NPDES

(lab use only)
ORDER #: 7D05010

286303

								Preservation & # of Containers								Matrix			Analyze For: TCLP: TOTAL:															
LAB # (lab use only)	FIELD CODE	Beginning Depth	Ending Depth	Date Sampled	Time Sampled	Field Filtered	Total #. of Containers	Ice	HNO_3	HCl	H_2SO_4	NaOH	$Na_2S_2O_3$	None (1) 1 Liter HDPE	Other (Specify)	DW=Drinking Water SL=Sludge	GW = Groundwater S=Soil/Solid	NP=Non-Potable Specify Other	TPH: 418.1 8015M 8015B	TPH: TX 1005 TX 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, Alkalinity)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles (BTEX-N 8260)	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	Total Dissolved Solids	Chlorides		RUSH TAT (Pre-Schedule) 24, 48, 72 hrs	Standard TAT
01	Monitor Well #1			4/4/2007	19:20		1	X						1			GW													X	X			X

Special Instructions:

Please email to : kpope@riceswd.com matt@riceswd.com rozanne@valornet.com
jpurvis@riceswd.com

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	4-5-07	6:00	James Johnson	4-5-07	6:01
Relinquished by: James Johnson	4-5-07	1:20	Received by:		
Relinquished by:			Received by ELOT:	4-5-07	1:20

Laboratory Comments:

Sample Containers Intact?	[✓ Y]	N
VOCs Free of Headspace?	Y	N
Labels on container(s)	Y	N
Custody seals on container(s)	Y	N
Custody seals on cooler(s)	Y	N
Sample Hand Delivered	Y	N
by Sampler/Client Rep. ?	Y	N

by Courier? UPS DHL FedEx Lone Star

Temperature Upon Receipt: 2.0 °C

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

lient: Rice

ate/ Time: 4-5-07 1:20

ab ID # : 7D05010

itials: GL

Sample Receipt Checklist

					Client Initials
1	Temperature of container/ cooler?	[✓ Yes]	No	2.0 °C	
2	Shipping container in good condition?	[✓ Yes]	No		
3	Custody Seals intact on shipping container/ cooler?	[✓ Yes]	No	Not Present	
4	Custody Seals intact on sample bottles/ container?	[✓ Yes]	No	Not Present	
5	Chain of Custody present?	[✓ Yes]	No		
6	Sample instructions complete of Chain of Custody?	[✓ Yes]	No		
7	Chain of Custody signed when relinquished/ received?	[✓ Yes]	No		
8	Chain of Custody agrees with sample label(s)?	[✓ Yes]	No	ID written on Cont./ Lid	
9	Container label(s) legible and intact?	[✓ Yes]	No	Not Applicable	
10	Sample matrix/ properties agree with Chain of Custody?	[✓ Yes]	No		
11	Containers supplied by ELOT?	[✓ Yes]	No		
12	Samples in proper container/ bottle?	[✓ Yes]	No	See Below	
13	Samples properly preserved?	[✓ Yes]	No	See Below	
14	Sample bottles intact?	[✓ Yes]	No		
15	Preservations documented on Chain of Custody?	[✓ Yes]	No		
16	Containers documented on Chain of Custody?	[✓ Yes]	No		
17	Sufficient sample amount for indicated test(s)?	[✓ Yes]	No	See Below	
18	All samples received within sufficient hold time?	[✓ Yes]	No	~~See Below~~	
19	Subcontract of sample(s)?	Yes	No	Not Applicable	
20	VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable	

Variance Documentation

ontact: ______ Contacted by: ______ Date/ Time: ______

egarding: ______

orrective Action Taken: ______

heck all that Apply:

☐ See attached e-mail/ fax

☐ Client understands and would like to proceed with analysis

☐ Cooling process had begun shortly after sampling event

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

A Xenco Laboratories Company

Analytical Report

Prepared for:
Kristin Farris-Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO Apache Leak
Project Number: None Given
Location: T19S R36E Sec1 G ~ Lea County New Mexico

Lab Order Number: 7F06016

Report Date: 06/26/07

Rice Operating Co.	Project: ABO Apache Leak	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well # 1	7F06016-01	Water	05/31/07 07:30	06-06-2007 12:51

Rice Operating Co.
122 W. Taylor
Hobbs NM, 88240

Project: ABO Apache Leak
Project Number: None Given
Project Manager: Kristin Farris-Pope

Fax: (505) 397-1471

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well # 1 (7F06016-01) Water									
Benzene	**0.00237**	0.00100	mg/L	1	EF70802	06/08/07	06/09/07	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*113 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*98.6 %*	*80-120*		"	"	"	"	

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well # 1 (7F06016-01) Water									
Total Alkalinity	**224**	2.00	mg/L	1	EF71309	06/13/07	06/13/07	EPA 310.1M	
Chloride	**334**	5.00	"	10	EF71204	06/12/07	06/12/07	EPA 300.0	
Total Dissolved Solids	**1210**	10.0	"	1	EF71110	06/06/07	06/11/07	EPA 160.1	
Sulfate	**83.8**	5.00	"	10	EF71204	06/12/07	06/12/07	EPA 300.0	

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well # 1 (7F06016-01) Water									
Calcium	**179**	4.05	mg/L	50	EF70807	06/08/07	06/08/07	EPA 6010B	
Magnesium	**24.6**	0.360	"	10	"	"	"	"	
Potassium	**2.97**	0.600	"	"	"	"	"	"	
Sodium	**60.8**	2.15	"	50	"	"	"	"	

The results in this report apply to the samples analyzed in accordance with the samples received in the laboratory. This analytical report must be reproduced in its entirety, with written approval of Environmental Lab of Texas.

Organics by GC - Quality Control
Environmental Lab of Texas

Batch EF70802 - EPA 5030C (GC)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (EF70802-BLK1)				Prepared & Analyzed: 06/08/07						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*54.1*		*ug/l*	*50.0*		*108*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*45.4*		"	*50.0*		*90.8*	*80-120*			
LCS (EF70802-BS1)				Prepared & Analyzed: 06/08/07						
Benzene	0.0548	0.00100	mg/L	0.0500		110	80-120			
Toluene	0.0556	0.00100	"	0.0500		111	80-120			
Ethylbenzene	0.0543	0.00100	"	0.0500		109	80-120			
Xylene (p/m)	0.101	0.00100	"	0.100		101	80-120			
Xylene (o)	0.0569	0.00100	"	0.0500		114	80-120			
Surrogate: a,a,a-Trifluorotoluene	*54.6*		*ug/l*	*50.0*		*109*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*51.7*		"	*50.0*		*103*	*80-120*			
Calibration Check (EF70802-CCV1)				Prepared: 06/08/07		Analyzed: 06/09/07				
Benzene	0.0576		mg/L	0.0500		115	80-120			
Toluene	0.0567		"	0.0500		113	80-120			
Ethylbenzene	0.0537		"	0.0500		107	80-120			
Xylene (p/m)	0.0999		"	0.100		99.9	80-120			
Xylene (o)	0.0573		"	0.0500		115	80-120			
Surrogate: a,a,a-Trifluorotoluene	*57.9*		*ug/l*	*50.0*		*116*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*53.0*		"	*50.0*		*106*	*80-120*			
Matrix Spike (EF70802-MS1)	**Source: 7F06019-03**			Prepared: 06/08/07		Analyzed: 06/09/07				
Benzene	0.0598	0.00100	mg/L	0.0500	ND	120	80-120			
Toluene	0.0593	0.00100	"	0.0500	ND	119	80-120			
Ethylbenzene	0.0584	0.00100	"	0.0500	ND	117	80-120			
Xylene (p/m)	0.107	0.00100	"	0.100	ND	107	80-120			
Xylene (o)	0.0614	0.00100	"	0.0500	ND	123	80-120			M1
Surrogate: a,a,a-Trifluorotoluene	*58.4*		*ug/l*	*50.0*		*117*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*56.2*		"	*50.0*		*112*	*80-120*			

Rice Operating Co.
122 W. Taylor
Hobbs NM, 88240

Project: ABO Apache Leak
Project Number: None Given
Project Manager: Kristin Farris-Pope

Fax: (505) 397-1471

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EF70802 - EPA 5030C (GC)										
Matrix Spike Dup (EF70802-MSD1)	**Source: 7F06019-03**			Prepared: 06/08/07		Analyzed: 06/09/07				
Benzene	0.0565	0.00100	mg/L	0.0500	ND	113	80-120	6.01	20	
Toluene	0.0566	0.00100	"	0.0500	ND	113	80-120	5.17	20	
Ethylbenzene	0.0556	0.00100	"	0.0500	ND	111	80-120	5.26	20	
Xylene (p/m)	0.102	0.00100	"	0.100	ND	102	80-120	4.78	20	
Xylene (o)	0.0584	0.00100	"	0.0500	ND	117	80-120	5.00	20	
Surrogate: a,a,a-Trifluorotoluene	*58.3*		*ug/l*	*50.0*		*117*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*54.2*		*"*	*50.0*		*108*	*80-120*			

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EF71110 - General Preparation (WetChem)										
Blank (EF71110-BLK1)				Prepared: 06/07/07		Analyzed: 06/11/07				
Total Dissolved Solids	ND	10.0	mg/L							
Duplicate (EF71110-DUP1)	**Source: 7F06016-01**			Prepared: 06/07/07		Analyzed: 06/11/07				
Total Dissolved Solids	1270	10.0	mg/L		1210			4.84	20	
Duplicate (EF71110-DUP2)	**Source: 7F06019-03**			Prepared: 06/07/07		Analyzed: 06/11/07				
Total Dissolved Solids	7020	10.0	mg/L		6900			1.72	20	
Batch EF71204 - General Preparation (WetChem)										
Blank (EF71204-BLK1)				Prepared & Analyzed: 06/12/07						
Sulfate	ND	0.500	mg/L							
Chloride	ND	0.500	"							
LCS (EF71204-BS1)				Prepared & Analyzed: 06/12/07						
Sulfate	10.0	0.500	mg/L	10.0		100	80-120			
Chloride	10.8	0.500	"	10.0		108	80-120			
Calibration Check (EF71204-CCV1)				Prepared & Analyzed: 06/12/07						
Sulfate	10.0		mg/L	10.0		100	80-120			
Chloride	10.8		"	10.0		108	80-120			
Duplicate (EF71204-DUP1)	**Source: 7F06020-03**			Prepared & Analyzed: 06/12/07						
Sulfate	4550	250	mg/L		4670			2.60	20	
Chloride	17500	250	"		18100			3.37	20	
Matrix Spike (EF71204-MS1)	**Source: 7F06020-03**			Prepared & Analyzed: 06/12/07						
Chloride	21100	250	mg/L	5000	18100	60.0	80-120			QM-10
Sulfate	7770	250	"	5000	4670	62.0	80-120			QM-10

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EF71309 - General Preparation (WetChem)										
Blank (EF71309-BLK1)				Prepared & Analyzed: 06/13/07						
Total Alkalinity	ND	2.00	mg/L							
Carbonate Alkalinity	ND	0.100	"							
Bicarbonate Alkalinity	ND	2.00	"							
Hydroxide Alkalinity	ND	0.100	"							
LCS (EF71309-BS1)				Prepared & Analyzed: 06/13/07						
Bicarbonate Alkalinity	174	2.00	mg/L	200		87.0	85-115			
Duplicate (EF71309-DUP1)	**Source: 7F06017-02**			Prepared & Analyzed: 06/13/07						
Total Alkalinity	348	2.00	mg/L		348			0.00	20	
Reference (EF71309-SRM1)				Prepared & Analyzed: 06/13/07						
Total Alkalinity	250		mg/L	250		100	90-110			

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EF70807 - 6010B/No Digestion										
Blank (EF70807-BLK1)				Prepared & Analyzed: 06/08/07						
Calcium	ND	0.0810	mg/L							
Magnesium	ND	0.0360	"							
Potassium	ND	0.0600	"							
Sodium	ND	0.0430	"							
Calibration Check (EF70807-CCV1)				Prepared & Analyzed: 06/08/07						
Calcium	1.78		mg/L	2.00		89.0	85-115			
Magnesium	1.83		"	2.00		91.5	85-115			
Potassium	2.28		"	2.00		114	85-115			
Sodium	1.82		"	2.00		91.0	85-115			
Duplicate (EF70807-DUP1)	**Source: 7F05011-03**			Prepared & Analyzed: 06/08/07						
Calcium	139	4.05	mg/L		139			0.00	20	
Magnesium	29.5	0.360	"		29.8			1.01	20	
Potassium	6.37	0.600	"		6.57			3.09	20	
Sodium	121	2.15	"		124			2.45	20	

Notes and Definitions

QM-10	LCS/LCSD were analyzed in place of MS/MSD.
M1	The MS and/or MSD were above the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Brent Barron Date: 6/26/2007

Brent Barron, Laboratory Director/Corp. Technical Director
Celey D. Keene, Org. Tech Director
Raland K. Tuttle, Laboratory Consultant

James Mathis, QA/QC Officer
Jeanne Mc Murrey, Inorg. Tech Director

This material is intended only for the use of the individual (s) or entity to whom it is addressed, and may contain information that is privileged and confidential.

If you have received this material in error, please notify us immediately at 432-563-1800.

Environmental Lab of Texas

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

Project Manager: Kristin Farris Pope kpope@riceswd.com

Company Name: RICE Operating Company

Company Address: 122 W. Taylor Street

City/State/Zip: Hobbs, New Mexico 88240

Telephone No: (505) 393-9174

Fax No: (505) 397-1471

Sampler Signature: Rozanne Johnson (505)631-9310

e-mail: rozanne@valornet.com

Project Name: ABO Apache Leak

Project #:

Project Loc: T19S R36E Sec1 G ~ Lea County New Mexico

PO #:

Report Format: ☒ Standard ☐ TRRP ☐ NPDES

(lab use only)
ORDER #: 7F06016

283835

LAB # (lab use only)	FIELD CODE	Beginning Depth	Ending Depth	Date Sampled	Time Sampled	Field Filtered	Total #. of Containers	Preservation & # of Containers: Ice	HNO$_3$	HCl (2) 40 ml glass vials	H$_2$SO$_4$	NaOH	Na$_2$S$_2$O$_3$	None (1) 1 Liter HDPE	Other (Specify)	Matrix: DW=Drinking Water SL=Sludge GW = Groundwater S=Soil/Solid NP=Non-Potable Specify Other	Analyze For: TPH: 418.1 8015M 8015B	TPH: TX 1005 TX 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, Alkalinity)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles (BTEX-N 8260)	Semivolatiles	BTEX 8021B/5030	RCI	N.O.R.M.	Total Dissolved Solids			RUSH TAT (Pre-Schedule) 24, 48, 72 hrs	Standard TAT
TCLP: / TOTAL:																									TOTAL: X							
01	Monitor Well #1			5/31/2007	7:30		3	X		2				1		GW			X	X					X			X				X

Special Instructions:

Please email to : kpope@riceswd.com matt@riceswd.com rozanne@valornet.com
jpurvis@riceswd.com

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	6/6/07	8:45	Mary Morton	6/6/07	8:46
Relinquished by: Mary Morton	6/6/07		Received by:		
Relinquished by:			Received by ELOT: Andrea Ram	6-6-07	12:51

Laboratory Comments:

Sample Containers Intact? [✓ Y] N
VOCs Free of Headspace? [✓ Y] N
Labels on container(s) [✓ Y] N
Custody seals on container(s) [✓ Y] N
Custody seals on cooler(s) [✓ Y] N
Sample Hand Delivered [✓ Y] N
by Sampler/Client Rep. ? [✓ Y] N
by Courier? UPS DHL FedEx Lone Star

Temperature Upon Receipt: 2.0 °C

[redacted]

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: Rice

Date/ Time: 6-6-07 12:51

Lab ID # : 7F06016

Initials: AL

Sample Receipt Checklist

					Client Initials
#1	Temperature of container/ cooler?	[✓ Yes]	No	20 °C	
#2	Shipping container in good condition?	[✓ Yes]	No		
#3	Custody Seals intact on shipping container/ cooler?	[✓ Yes]	No	Not Present	
#4	Custody Seals intact on sample bottles/ container?	[✓ Yes]	No	Not Present	
#5	Chain of Custody present?	[✓ Yes]	No		
#6	Sample instructions complete of Chain of Custody?	[✓ Yes]	No		
#7	Chain of Custody signed when relinquished/ received?	[✓ Yes]	No		
#8	Chain of Custody agrees with sample label(s)?	[✓ Yes]	No	ID written on Cont./ Lid	
#9	Container label(s) legible and intact?	[✓ Yes]	No	Not Applicable	
#10	Sample matrix/ properties agree with Chain of Custody?	[✓ Yes]	No		
#11	Containers supplied by ELOT?	[✓ Yes]	No		
#12	Samples in proper container/ bottle?	[✓ Yes]	No	See Below	
#13	Samples properly preserved?	[✓ Yes]	No	See Below	
#14	Sample bottles intact?	[✓ Yes]	No		
#15	Preservations documented on Chain of Custody?	[✓ Yes]	No		
#16	Containers documented on Chain of Custody?	[✓ Yes]	No		
#17	Sufficient sample amount for indicated test(s)?	[✓ Yes]	No	See Below	
#18	All samples received within sufficient hold time?	[✓ Yes]	No	See Below	
#19	Subcontract of sample(s)?	Yes	No	[✓ Not Applicable]	
#20	VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable	

Variance Documentation

Contact: ____________ Contacted by: ____________ Date/ Time: ____________

Regarding: ____________

Corrective Action Taken: ____________

Check all that Apply:

☐ See attached e-mail/ fax

☐ Client understands and would like to proceed with analysis

☐ Cooling process had begun shortly after sampling event

ENVIRONMENTAL
LAB OF

12600 West I-20 East - Odessa, Texas 79765

A Xenco Laboratories Company

Analytical Report

Prepared for:

Kristin Farris-Pope
Rice Operating Co.
122 W. Taylor
Hobbs, NM 88240

Project: ABO Apache Leak
Project Number: None Given
Location: T19S R37E Sec1 G ~ Lea County New Mexico

Lab Order Number: 7F14021

Report Date: 06/20/07

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well # 1	7F14021-01	Water	06/14/07 07:10	06-14-2007 13:45

Rice Operating Co. 122 W. Taylor Hobbs NM, 88240	Project: ABO Apache Leak Project Number: None Given Project Manager: Kristin Farris-Pope	Fax: (505) 397-1471

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well # 1 (7F14021-01) Water									
Chloride	**285**	5.00	mg/L	10	EF71803	06/18/07	06/20/07	EPA 300.0	
Total Dissolved Solids	**1350**	10.0	"	1	EF72004	06/18/07	06/20/07	EPA 160.1	

The results in this report apply to the samples analyzed in accordance with the samples received in the laboratory. This analytical report must be reproduced in its entirety, with written approval of Environmental Lab of Texas.

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EF71803 - General Preparation (WetChem)										
Blank (EF71803-BLK1)				Prepared: 06/18/07		Analyzed: 06/20/07				
Chloride	ND	0.500	mg/L							
LCS (EF71803-BS1)				Prepared: 06/18/07		Analyzed: 06/20/07				
Chloride	9.87	0.500	mg/L	10.0		98.7	80-120			
Calibration Check (EF71803-CCV1)				Prepared: 06/18/07		Analyzed: 06/20/07				
Chloride	8.94		mg/L	10.0		89.4	80-120			
Duplicate (EF71803-DUP1)	**Source: 7F14003-06**			Prepared: 06/18/07		Analyzed: 06/20/07				
Chloride	8400	100	mg/L		6670			23.0	20	R2
Matrix Spike (EF71803-MS1)	**Source: 7F14003-06**			Prepared: 06/18/07		Analyzed: 06/20/07				
Chloride	9860	100	mg/L	2000	6670	160	80-120			QM-10
Batch EF72004 - General Preparation (WetChem)										
Blank (EF72004-BLK1)				Prepared: 06/18/07		Analyzed: 06/20/07				
Total Dissolved Solids	ND	10.0	mg/L							
Duplicate (EF72004-DUP1)	**Source: 7F14003-01**			Prepared: 06/18/07		Analyzed: 06/20/07				
Total Dissolved Solids	3220	10.0	mg/L		3180			1.25	20	
Duplicate (EF72004-DUP2)	**Source: 7F14020-03**			Prepared: 06/18/07		Analyzed: 06/20/07				
Total Dissolved Solids	526	10.0	mg/L		534			1.51	20	

Notes and Definitions

R2	The RPD exceeded the acceptance limit.
QM-10	LCS/LCSD were analyzed in place of MS/MSD.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Brent Barron Date: 6/20/2007

Brent Barron, Laboratory Director/Corp. Technical Director
Celey D. Keene, Org. Tech Director
Raland K. Tuttle, Laboratory Consultant

James Mathis, QA/QC Officer
Jeanne Mc Murrey, Inorg. Tech Director

This material is intended only for the use of the individual (s) or entity to whom it is addressed, and may contain information that is privileged and confidential.

If you have received this material in error, please notify us immediately at 432-563-1800.

Environmental Lab of Texas

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

Project Manager: Kristin Farris Pope kpope@riceswd.com

Company Name: RICE Operating Company

Company Address: 122 W. Taylor Street

City/State/Zip: Hobbs, New Mexico 88240

Telephone No: (505) 393-9174

Fax No: (505) 397-1471

Sampler Signature: Rozanne Johnson (505)631-9310

e-mail: rozanne@valornet.com

Project Name: ABO Apache Leak

Project #:

Project Loc: T19S R37E Sec1 G ~ Lea County New Mexico

PO #:

Report Format: ☒ Standard ☐ TRRP ☐ NPDES

(lab use only)
ORDER #: 7F14021

284307

								Preservation & # of Containers								Matrix	Analyze For:															
																					TCLP: TOTAL:											
LAB # (lab use only)	FIELD CODE	Beginning Depth	Ending Depth	Date Sampled	Time Sampled	Field Filtered	Total #. of Containers	Ice	HNO_3	HCl	H_2SO_4	NaOH	$Na_2S_2O_3$	None (1) 1 Liter HDPE	Other (Specify)	DW=Drinking Water SL=Sludge GW = Groundwater S=Soil/Solid NP=Non-Potable Specify Other	TPH: 418.1 8015M 8015B	TPH: TX 1005 TX 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, Alkalinity)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles (BTEX-N 8260)	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	Total Dissolved Solids	Chlorides		RUSH TAT (Pre-Schedule) 24, 48, 72 hrs	Standard TAT
01	Monitor Well #1			6/14/2007	7:10		1	X						1		GW												X	X			X

Special Instructions:

Please email to : kpope@riceswd.com matt@riceswd.com rozanne@valornet.com
jpurvis@riceswd.com

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	6-14-07	10:00	Raelyn Gardner Raelyn Gardner	6-14-07	10:01
Relinquished by: Raelyn Gardner Raelyn Gardner	6-14-07	1:46	Received by:		
Relinquished by:			Received by ELOT: Andrea Lam	6-14-07	1:45

Laboratory Comments:

Sample Containers Intact?	[✓ Y]	N
VOCs Free of Headspace?	Y	N n/a
Labels on container(s)	[✓ Y]	N
Custody seals on container(s)	[✓ Y]	N
Custody seals on cooler(s)	[✓ Y]	N
Sample Hand Delivered	[✓ Y]	N
by Sampler/Client Rep. ?	[✓ Y]	N
by Courier? UPS DHL	FedEx	Lone Star

Temperature Upon Receipt: 1.5 °C

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: Rice

Date/ Time: 6/14/07 1:45

Lab ID #: 7F14021

Initials: CK

Sample Receipt Checklist

				Client Initials
#1 Temperature of container/ cooler?	Yes	No	1.5 °C	
#2 Shipping container in good condition?	[✓ Yes]	No		
#3 Custody Seals intact on shipping container/ cooler?	[✓ Yes]	No	Not Present	
#4 Custody Seals intact on sample bottles/ container?	[✓ Yes]	No	Not Present	
#5 Chain of Custody present?	[✓ Yes]	No		
#6 Sample instructions complete of Chain of Custody?	[✓ Yes]	No		
#7 Chain of Custody signed when relinquished/ received?	[✓ Yes]	No		
#8 Chain of Custody agrees with sample label(s)?	[✓ Yes]	No	ID written on Cont./ Lid	
#9 Container label(s) legible and intact?	[✓ Yes]	No	Not Applicable	
#10 Sample matrix/ properties agree with Chain of Custody?	[✓ Yes]	No		
#11 Containers supplied by ELOT?	[✓ Yes]	No		
#12 Samples in proper container/ bottle?	[✓ Yes]	No	See Below	
#13 Samples properly preserved?	[✓ Yes]	No	See Below	
#14 Sample bottles intact?	[✓ Yes]	No		
#15 Preservations documented on Chain of Custody?	[✓ Yes]	No		
#16 Containers documented on Chain of Custody?	[✓ Yes]	No		
#17 Sufficient sample amount for indicated test(s)?	[✓ Yes]	No	See Below	
#18 All samples received within sufficient hold time?	[✓ Yes]	No	See Below	
#19 Subcontract of sample(s)?	Yes	No	[✓ Not Applicable]	
#20 VOC samples have zero headspace?	[✓ Yes]	No	Not Applicable	

Variance Documentation

Contact: ______ Contacted by: ______ Date/ Time: ______

Regarding: ______

Corrective Action Taken: ______

Check all that Apply:
- ☐ See attached e-mail/ fax
- ☐ Client understands and would like to proceed with analysis
- ☐ Cooling process had begun shortly after sampling event

Analytical Report 285440

for

Rice Operating Co.

Project Manager: Kristin Pope

ABP Apache Leak

12-JUL-07

ENVIRONMENTAL LAB OF

12600 West I-20 East Odessa, Texas 79765

A Xenco Laboratories Company

NELAC certification numbers:
Houston, TX E871002 - Miami, FL E86678 - Tampa, FL E86675

Houston - Dallas - San Antonio - Austin - Tampa - Miami - Latin America

XENCO Laboratories

12-JUL-07

Project Manager: **Kristin Pope**
Rice Operating Co.
122 West Taylor
Hobbs, NM 88240

Reference: XENCO Report No: **285440**
ABP Apache Leak
Project Address: T 19 S R37E Sec 1G ~ Lea County, NM

Kristin Pope:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 285440. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 285440 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Brent Barron
Odessa Laboratory Director

Sample Cross Reference 285440

Rice Operating Co., Hobbs, NM

ABP Apache Leak

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
Monitor Well # 1	W	Jun-29-07 07:05		285440-001

XENCO Laboratories

Certificate of Analysis Summary 285440

Rice Operating Co., Hobbs, NM

Project Name: ABP Apache Leak

Project Id:
Contact: Kristin Pope
Project Location: T 19 S R37E Sec 1G ~ Lea County, NM

Date Received in Lab: Jul-03-07 05:05 pm
Report Date: 12-JUL-07
Project Manager: Brent Barron, II

Analysis Requested	*Lab Id:*	285440-001				
	Field Id:	Monitor Well # 1				
	Depth:					
	Matrix:	WATER				
	Sampled:	Jun-29-07 07:05				
BTEX by EPA 8021B	*Extracted:*	Jul-10-07 11:54				
	Analyzed:	Jul-10-07 17:12				
	Units/RL:	mg/L	RL			
Benzene		ND	0.0010			
Toluene		ND	0.0010			
Ethylbenzene		ND	0.0010			
m,p-Xylene		ND	0.0020			
o-Xylene		ND	0.0010			
Total Xylenes		ND				
Total BTEX		ND				
Bicarbonate, Alkalinity by EPA 310.1	*Extracted:*					
	Analyzed:	Jul-06-07 15:00				
	Units/RL:	mg/L	RL			
Alkalinity, Bicarbonate		240	4.00			
Inorganic Anions by EPA 300	*Extracted:*					
	Analyzed:	Jul-09-07 18:09				
	Units/RL:	mg/L	RL			
Chloride		112	5.00			
Sulfate		74.4	5.00			
Metals per ICP by SW846 6010B	*Extracted:*					
	Analyzed:	Jul-11-07 14:37				
	Units/RL:	mg/L	RL			
Calcium		114	0.100			
Magnesium		13.1	0.010			
Potassium		2.65	0.500			
Sodium		47.2	0.500			
Residue, Filterable (TDS) by EPA 160.1	*Extracted:*					
	Analyzed:	Jul-06-07 15:15				
	Units/RL:	mg/L	RL			
Total dissolve solids		588	5.00			

Brent Barron
Odessa Laboratory Director

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL and above the SQL.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

Form 2 - Surrogate Recoveries

Project Name: ABP Apache Leak

Work Order #: 285440 **Project ID:**

Lab Batch #: 700105 **Sample:** 285371-018 S / MS **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX by EPA 8021B	SURROGATE RECOVERY STUDY				
Analytes	**Amount Found [A]**	**True Amount [B]**	**Recovery %R [D]**	**Control Limits %R**	**Flags**
4-Bromofluorobenzene	0.0483	0.0500	97	80-120	

Lab Batch #: 700105 **Sample:** 285371-018 SD / MSD **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX by EPA 8021B	SURROGATE RECOVERY STUDY				
Analytes	**Amount Found [A]**	**True Amount [B]**	**Recovery %R [D]**	**Control Limits %R**	**Flags**
4-Bromofluorobenzene	0.0504	0.0500	101	80-120	

Lab Batch #: 700105 **Sample:** 285440-001 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX by EPA 8021B	SURROGATE RECOVERY STUDY				
Analytes	**Amount Found [A]**	**True Amount [B]**	**Recovery %R [D]**	**Control Limits %R**	**Flags**
4-Bromofluorobenzene	0.0413	0.0500	83	80-120	

Lab Batch #: 700105 **Sample:** 496996-1-BKS / BKS **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX by EPA 8021B	SURROGATE RECOVERY STUDY				
Analytes	**Amount Found [A]**	**True Amount [B]**	**Recovery %R [D]**	**Control Limits %R**	**Flags**
4-Bromofluorobenzene	0.0531	0.0500	106	80-120	

Lab Batch #: 700105 **Sample:** 496996-1-BLK / BLK **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX by EPA 8021B	SURROGATE RECOVERY STUDY				
Analytes	**Amount Found [A]**	**True Amount [B]**	**Recovery %R [D]**	**Control Limits %R**	**Flags**
4-Bromofluorobenzene	0.0484	0.0500	97	80-120	

** Surrogates outside limits; data and surrogates confirmed by reanalysis

*** Poor recoveries due to dilution

Surrogate Recovery [D] = 100 * A / B

All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: ABP Apache Leak

Work Order #: 285440

Project ID:

Lab Batch #: 700105 **Sample:** 496996-1-BKS **Matrix:** Water

Date Analyzed: 07/10/2007 **Date Prepared:** 07/10/2007 **Analyst:** CELKEE

Reporting Units: mg/L **Batch #:** 1 **BLANK /BLANK SPIKE RECOVERY STUDY**

BTEX by EPA 8021B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Benzene	ND	0.0500	0.0482	96	70-125	
Toluene	ND	0.0500	0.0508	102	70-125	
Ethylbenzene	ND	0.0500	0.0562	112	71-129	
m,p-Xylene	ND	0.1000	0.1006	101	70-131	
o-Xylene	ND	0.0500	0.0549	110	71-133	

Lab Batch #: 700048 **Sample:** 700048-1-BKS **Matrix:** Water

Date Analyzed: 07/06/2007 **Date Prepared:** 07/06/2007 **Analyst:** WRU

Reporting Units: mg/L **Batch #:** 1 **BLANK /BLANK SPIKE RECOVERY STUDY**

Bicarbonate, Alkalinity by EPA 310.1 Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Alkalinity, Bicarbonate	ND	200	174	87	80-120	

Lab Batch #: 699973 **Sample:** 699973-1-BKS **Matrix:** Water

Date Analyzed: 07/09/2007 **Date Prepared:** 07/09/2007 **Analyst:** LATCOR

Reporting Units: mg/L **Batch #:** 1 **BLANK /BLANK SPIKE RECOVERY STUDY**

Inorganic Anions by EPA 300 Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Chloride	ND	10.0	9.80	98	90-110	
Sulfate	ND	10.0	9.58	96	90-110	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

XENCO Laboratories

Form 3 - MS Recoveries

Project Name: ABP Apache Leak

Work Order #: 285440
Lab Batch #: 699973
Date Analyzed: 07/09/2007
QC- Sample ID: 285440-001 S
Reporting Units: mg/L

Project ID:
Date Prepared: 07/09/2007
Analyst: LATCOR
Batch #: 1
Matrix: Water

MATRIX / MATRIX SPIKE RECOVERY STUDY

Inorganic Anions by EPA 300 Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	%R [D]	Control Limits %R	Flag
Chloride	112	100	206	94	90-110	
Sulfate	74.4	100	169	95	90-110	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference [E] = 200*(C-A)/(C+B)
All Results are based on MDL and Validated for QC Purposes

Form 3 - MS / MSD Recoveries

Project Name: ABP Apache Leak

Work Order # : 285440 **Project ID:**

Lab Batch ID: 700105 **QC- Sample ID:** 285371-018 S **Batch #:** 1 **Matrix:** Water

Date Analyzed: 07/11/2007 **Date Prepared:** 07/10/2007 **Analyst:** CELKEE

Reporting Units: mg/L

	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
BTEX by EPA 8021B **Analytes**	**Parent Sample Result [A]**	**Spike Added [B]**	**Spiked Sample Result [C]**	**Spiked Sample %R [D]**	**Spike Added [E]**	**Duplicate Spiked Sample Result [F]**	**Spiked Dup. %R [G]**	**RPD %**	**Control Limits %R**	**Control Limits %RPD**	**Flag**
Benzene	ND	0.0500	0.0509	102	0.0500	0.0494	99	3	70-125	25	
Toluene	ND	0.0500	0.0516	103	0.0500	0.0500	100	3	70-125	25	
Ethylbenzene	ND	0.0500	0.0553	111	0.0500	0.0537	107	4	71-129	25	
m,p-Xylene	ND	0.1000	0.0972	97	0.1000	0.0946	95	2	70-131	25	
o-Xylene	ND	0.0500	0.0536	107	0.0500	0.0524	105	2	71-133	25	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E
Relative Percent Difference RPD = 200*(D-G)/(D+G)

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Sample Duplicate Recovery

Project Name: ABP Apache Leak

Work Order #: 285440

Lab Batch #: 700048 **Project ID:**
Date Analyzed: 07/06/2007 **Date Prepared:** 07/06/2007 **Analyst:** WRU
QC- Sample ID: 285425-001 D **Batch #:** 1 **Matrix:** Water
Reporting Units: mg/L

	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Bicarbonate, Alkalinity by EPA 310.1 **Analyte**	**Parent Sample Result [A]**	**Sample Duplicate Result [B]**	**RPD**	**Control Limits %RPD**	**Flag**
Alkalinity, Bicarbonate	210	210	0	20	
Alkalinity, Carbonate	ND	ND	NC	20	

Lab Batch #: 699973
Date Analyzed: 07/09/2007 **Date Prepared:** 07/09/2007 **Analyst:** LATCOR
QC- Sample ID: 285440-001 D **Batch #:** 1 **Matrix:** Water
Reporting Units: mg/L

	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Inorganic Anions by EPA 300 **Analyte**	**Parent Sample Result [A]**	**Sample Duplicate Result [B]**	**RPD**	**Control Limits %RPD**	**Flag**
Chloride	112	111	1	20	
Sulfate	74.4	74.1	0	20	

Lab Batch #: 700076
Date Analyzed: 07/11/2007 **Date Prepared:** 07/11/2007 **Analyst:** LATCOR
QC- Sample ID: 284692-001 D **Batch #:** 1 **Matrix:** Water
Reporting Units: mg/L

	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Metals per ICP by SW846 6010B **Analyte**	**Parent Sample Result [A]**	**Sample Duplicate Result [B]**	**RPD**	**Control Limits %RPD**	**Flag**
Calcium	659	653	1	25	
Magnesium	85.0	88.8	4	25	
Potassium	21.2	20.4	4	25	
Sodium	4180	4190	0	25	

Lab Batch #: 699879
Date Analyzed: 07/06/2007 **Date Prepared:** 07/06/2007 **Analyst:** IRO
QC- Sample ID: 285440-001 D **Batch #:** 1 **Matrix:** Water
Reporting Units: mg/L

	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Residue, Filterable (TDS) by EPA 160.1 **Analyte**	**Parent Sample Result [A]**	**Sample Duplicate Result [B]**	**RPD**	**Control Limits %RPD**	**Flag**
Total dissolve solids	588	602	2	30	

Spike Relative Difference RPD 200 * | (B-A)/(B+A) |
All Results are based on MDL and validated for QC purposes.

Analytical Report 286347

for

Rice Operating Co.

Project Manager: Kristin Pope

ABO Apache Leak

27-JUL-07

ENVIRONMENTAL
LAB OF

12600 West I-20 East Odessa, Texas 79765

A Xenco Laboratories Company

NELAC certification numbers:
Houston, TX E871002 - Miami, FL E86678 - Tampa, FL E86675

Houston - Dallas - San Antonio - Austin - Tampa - Miami - Latin America

XENCO Laboratories

27-JUL-07

Project Manager: **Kristin Pope**
Rice Operating Co.
122 West Taylor
Hobbs, NM 88240

Reference: XENCO Report No: **286347**
ABO Apache Leak
Project Address: T19S R37E Sec 1 G ~ Lea County New Mexico

Kristin Pope:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 286347. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 286347 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Brent Barron
Odessa Laboratory Director

Recipient of the Prestigious Small Business Administration Award of Excellence in 1994.
Certified and approved by numerous States and Agencies.
A Small Business and Minority Status Company that delivers SERVICE and QUALITY
Houston - Dallas - San Antonio - Austin - Tampa - Miami - Latin America

Sample Cross Reference 286347

Rice Operating Co., Hobbs, NM

ABO Apache Leak

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
Monitor Well # 1	W	Jul-19-07 09:35		286347-001

Certificate of Analysis Summary 286347

Rice Operating Co., Hobbs, NM

Project Name: ABO Apache Leak

Project Id:
Contact: Kristin Pope
Project Location: T19S R37E Sec 1 G ~ Lea County New M

Date Received in Lab: Fri Jul-20-07 01:45 pm
Report Date: 27-JUL-07
Project Manager: Brent Barron, II

Analysis Requested	***Lab Id:***	286347-001						
	Field Id:	Monitor Well # 1						
	Depth:							
	Matrix:	WATER						
	Sampled:	Jul-19-07 09:35						
Inorganic Anions by EPA 300	***Extracted:***							
	Analyzed:	Jul-22-07 01:11						
	Units/RL:	mg/L	RL					
Chloride		328	5.00					
Residue, Filterable (TDS) by EPA 160.1	***Extracted:***							
	Analyzed:	Jul-25-07 16:30						
	Units/RL:	mg/L	RL					
Total dissolved solids		912	5.00					

Brent Barron
Odessa Laboratory Director

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL and above the SQL.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

Blank Spike Recovery

Project Name: ABO Apache Leak

Work Order #: 286347

Project ID:

Lab Batch #: 700978
Sample: 700978-1-BKS
Matrix: Water
Date Analyzed: 07/21/2007
Date Prepared: 07/21/2007
Analyst: IRO
Reporting Units: mg/L
Batch #: 1

Inorganic Anions by EPA 300	BLANK /BLANK SPIKE RECOVERY STUDY					
Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Chloride	ND	10.0	10.3	103	90-110	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

XENCO Laboratories

Form 3 - MS Recoveries

Project Name: ABO Apache Leak

Work Order #: 286347

Lab Batch #: 700978

Project ID:

Date Analyzed: 07/21/2007

Date Prepared: 07/21/2007

Analyst: IRO

QC- Sample ID: 286343-001 S

Batch #: 1

Matrix: Water

Reporting Units: mg/L

	MATRIX / MATRIX SPIKE RECOVERY STUDY					
Inorganic Anions by EPA 300 **Analytes**	**Parent Sample Result [A]**	**Spike Added [B]**	**Spiked Sample Result [C]**	**%R [D]**	**Control Limits %R**	**Flag**
Chloride	661	250	907	98	90-110	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B

Relative Percent Difference [E] = 200*(C-A)/(C+B)

All Results are based on MDL and Validated for QC Purposes

Sample Duplicate Recovery

Project Name: ABO Apache Leak

Work Order #: 286347

Lab Batch #: 700978
Project ID:
Date Analyzed: 07/21/2007
Date Prepared: 07/21/2007
Analyst: IRO
QC- Sample ID: 286343-001 D
Batch #: 1
Matrix: Water
Reporting Units: mg/L

	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Inorganic Anions by EPA 300 Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Chloride	661	663	0	20	

Lab Batch #: 701044
Date Analyzed: 07/25/2007
Date Prepared: 07/25/2007
Analyst: IRO
QC- Sample ID: 286343-001 D
Batch #: 1
Matrix: Water
Reporting Units: mg/L

	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Residue, Filterable (TDS) by EPA 160.1 Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Total dissolved solids	2090	2160	3	30	

Lab Batch #: 701044
Date Analyzed: 07/25/2007
Date Prepared: 07/25/2007
Analyst: IRO
QC- Sample ID: 286396-001 D
Batch #: 1
Matrix: Water
Reporting Units: mg/L

	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Residue, Filterable (TDS) by EPA 160.1 Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Total dissolved solids	2560	2580	1	30	

Spike Relative Difference RPD 200 * | (B-A)/(B+A) |
All Results are based on MDL and validated for QC purposes.

Environmental Lab of Texas

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

Project Manager: Kristin Farris Pope kpope@riceswd.com
Company Name: RICE Operating Company
Company Address: 122 W. Taylor Street
City/State/Zip: Hobbs, New Mexico 88240
Telephone No: (505) 393-9174
Fax No: (505) 397-1471
Sampler Signature: Rozanne Johnson (505)631-9310
e-mail: rozanne@valornet.com

Project Name: ABO Apache Leak
Project #:
Project Loc: T19S R37E Sec1 G ~ Lea County New Mexico
PO #:
Report Format: ☒ Standard ☐ TRRP ☐ NPDES

(lab use only)
ORDER #: 286347

								Preservation & # of Containers								Matrix	Analyze For: TCLP: / TOTAL:															
LAB # (lab use only)	FIELD CODE	Beginning Depth	Ending Depth	Date Sampled	Time Sampled	Field Filtered	Total #. of Containers	Ice	HNO_3	HCl	H_2SO_4	NaOH	$Na_2S_2O_3$	None (1) 1 Liter HDPE	Other (Specify)	DW=Drinking Water SL=Sludge GW = Groundwater S=Soil/Solid NP=Non-Potable Specify Other	TPH: 418.1 8015M 8015B	TPH: TX 1005 TX 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, Alkalinity)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles (BTEX-N 8260)	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	Total Dissolved Solids	Chlorides		RUSH TAT (Pre-Schedule) 24, 48, 72 hrs	Standard TAT
01	Monitor Well #1			7/19/2007	9:35		1	X						1		GW												X	X			X

Special Instructions:
Please email to : kpope@riceswd.com jpurvis@riceswd.com matt@riceswd.com rozanne@valornet.com

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	7-20-07	9:00	James Johnson James Johnson	7-20-07	9:01
Relinquished by: James Johnson James Johnson	7-20-07	1:45	Received by:		
Relinquished by:			Received by ELOT: Andrea	7-20-07	1:45

Laboratory Comments:

Sample Containers Intact?	[✓ Y]	N
VOCs Free of Headspace?	[✓ Y]	N
Labels on container(s)	[✓ Y]	N
Custody seals on container(s)	[✓ Y]	N
Custody seals on cooler(s)	[✓ Y]	N
Sample Hand Delivered	[✓ Y]	N
by Sampler/Client Rep. ?	[✓ Y]	N
by Courier? UPS DHL FedEx Lone Star		

Temperature Upon Receipt: -2.0 °C
Not Frozen

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: Rice

Date/ Time: 7·20·07 1:45

Lab ID #: 286397

Initials: al

Sample Receipt Checklist

				Client Initials
#1 Temperature of container/ cooler?	[✓ Yes]	No	-2 0 °C	Not Frozen
#2 Shipping container in good condition?	[✓ Yes]	No		
#3 Custody Seals intact on shipping container/ cooler?	[✓ Yes]	No	Not Present	
#4 Custody Seals intact on sample bottles/ container?	[✓ Yes]	No	Not Present	
#5 Chain of Custody present?	[✓ Yes]	No		
#6 Sample instructions complete of Chain of Custody?	[✓ Yes]	No		
#7 Chain of Custody signed when relinquished/ received?	[✓ Yes]	No		
#8 Chain of Custody agrees with sample label(s)?	[✓ Yes]	No	ID written on Cont./ Lid	
#9 Container label(s) legible and intact?	[✓ Yes]	No	Not Applicable	
#10 Sample matrix/ properties agree with Chain of Custody?	[✓ Yes]	No		
#11 Containers supplied by ELOT?	[✓ Yes]	No		
#12 Samples in proper container/ bottle?	[✓ Yes]	No	See Below	
#13 Samples properly preserved?	[✓ Yes]	No	See Below	
#14 Sample bottles intact?	[✓ Yes]	No		
#15 Preservations documented on Chain of Custody?	[✓ Yes]	No		
#16 Containers documented on Chain of Custody?	[✓ Yes]	No		
#17 Sufficient sample amount for indicated test(s)?	[✓ Yes]	No	See Below	
#18 All samples received within sufficient hold time?	[✓ Yes]	No	See Below	
#19 Subcontract of sample(s)?	Yes	No	~~Not Applicable~~	
#20 VOC samples have zero headspace?	~~Yes~~	No	Not Applicable	

Variance Documentation

Contact: ______ Contacted by: ______ Date/ Time: ______

Regarding: ______

Corrective Action Taken:

Check all that Apply:

☐ See attached e-mail/ fax
☐ Client understands and would like to proceed with analysis
☐ Cooling process had begun shortly after sampling event

CARDINAL LABORATORIES

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

ANALYTICAL RESULTS FOR
RICE OPERATING COMPANY
ATTN: KRISTIN FARRIS-POPE
122 W. TAYLOR STREET
HOBBS, NM 88240
FAX TO: (575) 397-1471

Receiving Date: 11/30/07
Reporting Date: 12/07/07
Project Number: NOT GIVEN
Project Name: ABO APACHE LEAK
Project Location: T19S-RE-SEC1 G~LEA COUNTY, NM

Sampling Date: 11/28/07
Sample Type: WATER
Sample Condition: COOL & INTACT
Sample Received By: NF
Analyzed By: HM/KS

LAB NUMBER	SAMPLE ID	Na (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Conductivity (uS/cm)	T-Alkalinity (mgCaCO$_3$/L)
ANALYSIS DATE:		12/04/07	12/04/07	12/04/07	12/04/07	12/04/07	12/04/07
H13806-1	MONITOR WELL #1	87	125	21.8	4.41	1,207	236
Quality Control		NR	49.2	50.8	2.88	1,423	NR
True Value QC		NR	50.0	50.0	3.00	1,413	NR
% Recovery		NR	98.5	102	96.0	101	NR
Relative Percent Difference		NR	< 0.1	1.6	12.4	1.1	NR
METHODS:			SM3500-Ca-D	3500-Mg E	8049	120.1	310.1

		Cl$^-$ (mg/L)	SO$_4$ (mg/L)	CO$_3$ (mg/L)	HCO$_3$ (mg/L)	pH (s.u.)	TDS (mg/L)
ANALYSIS DATE:		12/06/07	12/04/07	12/04/07	12/04/07	12/04/07	12/03/07
H13806-1	MONITOR WELL #1	200	76.6	0	288	7.36	791
Quality Control		500	28.0	NR	988	7.05	NR
True Value QC		500	25.0	NR	1000	7.00	NR
% Recovery		100	112	NR	98.8	101	NR
Relative Percent Difference		< 0.1	5.8	NR	1.2	0.1	NR
METHODS:		SM4500-Cl-B	375.4	310.1	310.1	150.1	160.1

Kristen Supioto
Chemist

12/07/07
Date

CARDINAL LABORATORIES

PHONE (325) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
RICE OPERATING COMPANY
ATTN: KRISTIN FARRIS-POPE
122 W. TAYLOR
HOBBS, NM 88240
FAX TO: (575) 397-1471

Receiving Date: 11/30/07
Reporting Date: 12/03/07
Project Number: NOT GIVEN
Project Name: ABO APACHE LEAK
Project Location: T19S-RE-SEC1 G ~ LEA COUNTY, NM

Sampling Date: 11/28/07
Sample Type: WATER
Sample Condition: COOL & INTACT
Sample Received By: NF
Analyzed By: AB

LAB NUMBER	SAMPLE ID	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL BENZENE (mg/L)	TOTAL XYLENES (mg/L)
ANALYSIS DATE		11/30/07	11/30/07	11/30/07	11/30/07
H13806-1	MONITOR WELL #1	<0.001	<0.001	<0.001	<0.003
Quality Control		0.107	0.096	0.095	0.300
True Value QC		0.100	0.100	0.100	0.300
% Recovery		107	96	95	100
Relative Percent Difference		1.7	3.4	3.3	4.1

METHOD: EPA SW-846 8021B

Burgess J. A. Cooke
Chemist

12/03/07
Date

Page 1 of 1

101 East Marland - Hobbs, New Mexico 88240
Tel (505) 393-2326
Fax (505) 393-2476

Cardinal Laboratories, Inc.

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

LAB Order ID # ____________

Company Name: RICE Operating Company

Project Manager: Kristin Farris-Pope, Project Scientist

Address: (Street, City, Zip) 122 W Taylor Street ~ Hobbs, New Mexico 88240

Phone #: (505) 393-9174 Fax #: (505)397-1471

Project #: Project Name: Abo Apache Leak

Project Location: T19S-RE-Sec1 G ~ Lea County - New Mexico

BILL TO Company: RICE Operating Company PO#

Address: (Street, City, Zip) 122 W Taylor Street ~ Hobbs, New Mexico 88240

Phone#: (505) 393-9174 Fax#: (505)397-1471

Sampler Signature: Rozanne Johnson (505)631-9310
rozanne@valornet.com

ANALYSIS REQUEST

(Circle or Specify Method No.)

LAB # (LAB USE ONLY)	FIELD CODE	(G)rab or (C)omp	# CONTAINERS	MATRIX					PRESERVATIVE METHOD						SAMPLING		MTBE 8021B/602	BTEX 8021B/602	TPH 418.1/TX1005 / TX1005 Extended (C35)	PAH 8270C	Total Metals Ag As Ba Cd Cr Pb Se Hg 6010B/200.7	TCLP Metals Ag As Ba Cd Cr Pb Se Hg	TCLP Volatiles	TCLP Semi Volatiles	TCLP Pesticides	RCI	GC/MS Vol. 8260B/624	GC/MS Semi. Vol. 8270C/625	PCB's 8082/608	Pesticides 8081A/608	BOD, TSS, pH	Moisture Content		Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	Total Dissolved Solids	Chlorides	Turn Around Time ~ 24 Hours
				WATER	SOIL	AIR	SLUDGE		HCL (2 40ml VOA)	HNO_3	$NaHSO_4$	H_2SO_4	ICE (1-1Liter HDPE)	NONE	DATE (2007)	TIME																						
H13306-1	Monitor Well #1	G	3	X					2				1		11-28	8:6		X																X	X	X		

Relinquished by: Rozanne Johnson Date: 11-30-2007 Time: 10:00

Received by: Date: 11-30-07 Time: 10:00 AM

Relinquished by: Date: Time:

Received By: (Laboratory Staff) Date: Time:

Delivered By: (Circle One)

Sampler - UPS - Bus - Other:

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

CHECKED BY:
(Initials) NA.

Phone Results ☐ Yes ☐ No
Fax Results ☐ Yes ☐ No Additional Fax Number:

REMARKS:

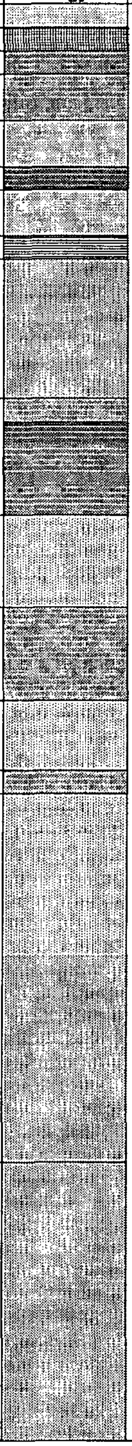
Email Results to: kpope@riceswd.com
lweinheimer@riceswd.com
rozanne@valornet.com

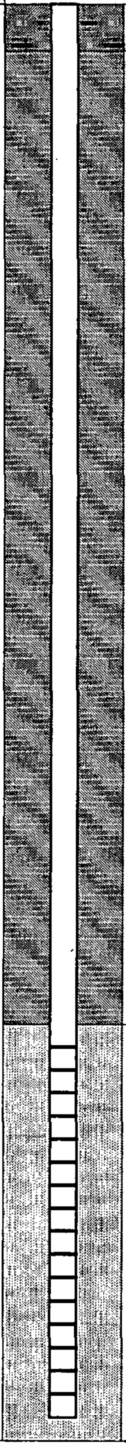
Appendix B:

Field Data

R. T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. Suite F-142
Albuquerque, NM 87501

Logger:	David Hamilton	**Client:**	**Well ID:**
Driller:	Eades Drilling	ROC	
Drilling Method:	Air Rotary	**Project Name:**	
Start Date:	11/5/2004	Abo Apache LA 1-G Release Site	**MW-1**
End Date:	11/6/2004	**Location:**	
		Section 1, 17S, 36E, Unit 1G	





Depth (feet)	Description	Comments	Well Construction
0.0	Surface, 0 - 0.5 feet	Hard drilling	Cement, 0-3 feet
2.0	Frac. caliche, sand, clay, 0.5 - 3 feet, tan		
4.0	Sand and caliche, 3 - 5 feet, tan		Hydrated bentonite, 3-87 feet
6.0	Very fine grained sand, silt, some caliche, 5 - 10 feet, tan		
8.0			
10.0	Very fine grained sand, silt, little caliche, 10 - 15 feet, tan		
12.0			
14.0	Indurated caliche, 15 - 17 feet		
16.0	Very fine grained sand, silt, little caliche, 17 - 20 feet		
18.0			
20.0	Thin caliche layers in sand, 20 - 22 feet		
22.0	Very fine grained sand, silt, 22 - 33 feet, tan with reddish tinge		
24.0			
26.0			
28.0		Samples fell out of spoon, collected with shovel	
30.0			
32.0			
34.0	Very fine grained sand, silt, caliche , 33 -44 feet, light tan. Well indurated caliche layer from 35 to 36 feet.		
36.0			
38.0			
40.0			
42.0			
44.0	Very fine grained sand, silt, 44 - 53 feet, tan		
46.0			
48.0			
50.0			
52.0	Very fine grained sand, silt, some caliche, 53 - 60 feet, tan		
54.0			
56.0			
58.0			
60.0	Very fine grained sand, silt, 60 - 67 feet, tan		
62.0			
64.0			
66.0	Indurated sand, silt, 67 - 68 feet	Hard drilling	
68.0	Very fine grained sand, silt, 68 - 100 feet tan. Slightly redder below 83 feet.		
70.0			
72.0			
74.0			
76.0			
78.0			
80.0			
82.0			
84.0			
86.0			
88.0			Sand, 87-122 feet
90.0			
92.0			
94.0			
96.0		Soil moist at 100 feet	
98.0			
100.0	Very fine grained sand, silt, 100 - 122 feet		
102.0			
104.0			
106.0			
108.0		Hole was drilled with water below 100 feet due to borehole collapse	
110.0			
112.0			
114.0			
116.0			
118.0			
120.0			
122.0			

Field data		
Depth	Chloride mg/kg	PID
6.0	1245	6.3
11.0	553	7.3
16.0	1307	5.2
21.0	905	8.2
26.0	741	1.1
31.0	493	0.8
36.0	566	0.8
41.0	126	3.3
46.0	83	2.0
51.0	49	1.0
61.0	59	2.4
71.0	50	2.9
81.0	59	3.7
91.0	55	2.7

R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
505-266-5004

ROC Abo 1-G Site

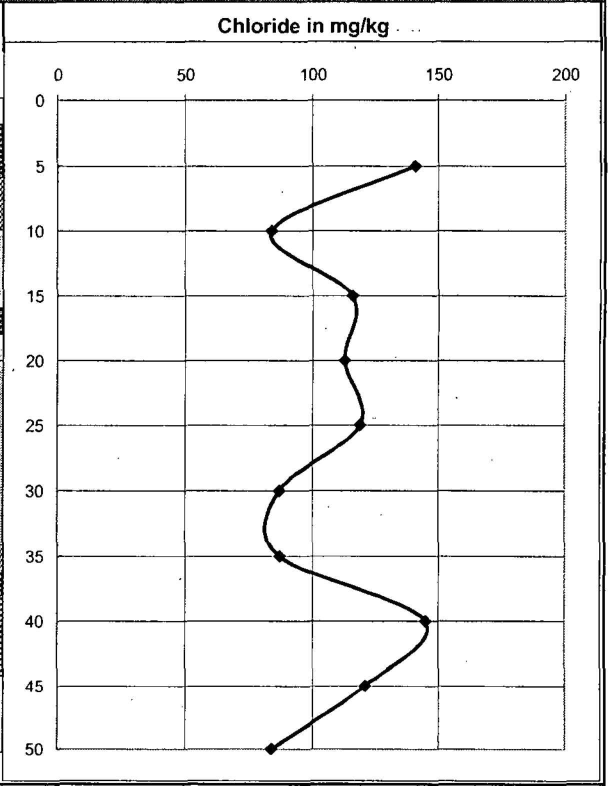
Monitoring Well Boring

Appendix B

March 2005

Logger:	David Hamilton	**Client:**	**Boring ID:**
Driller:	Harrison Cooper Drilling	ROC	
Drilling Method:	Air Rotary	**Project Name:**	
Start Date:	12/12/2006	Abo Apache 1-G Site	
End Date:	12/12/2006	**Location:**	**SBB**
		Section 1, 17S, 36E, Unit 1G	

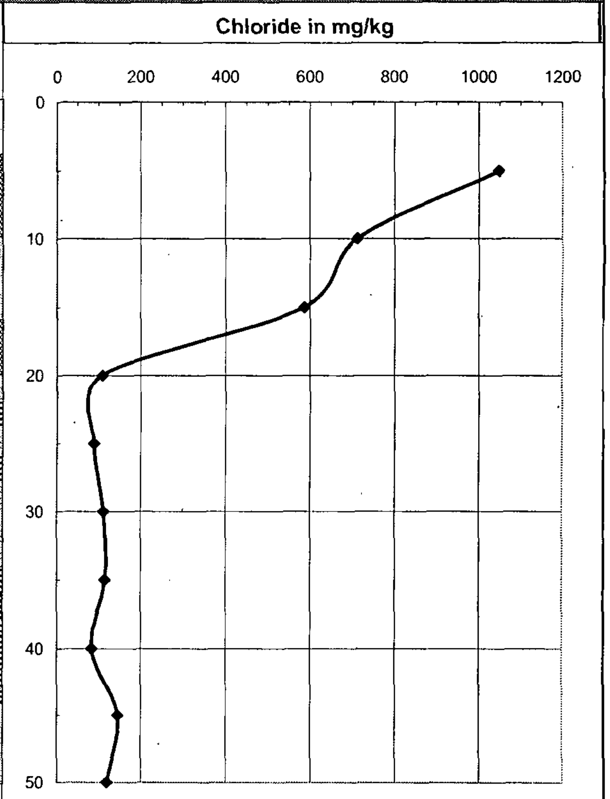
Depth (feet)	Description	Lithology
0.0	Surface, 0 - 2 feet	▨
2.0	Frac. caliche, sand, clay, 2 to 5 feet, tan	▨
4.0		
6.0	Very fine grained sand, silt, some caliche, 5 - 11 feet, tan	▨
8.0		
10.0	Very fine grained sand, silt, little caliche, 11 - 16 feet, tan	▨
12.0		
14.0		
16.0	Indurated caliche, 16 - 17 feet	▨
18.0	VFfine grained sand, silt, little caliche, 17 - 20 feet	▨
20.0	Very fine grained sand, silt, some thin caliche layers, 20 - 33 feet, tan with reddish tinge	▨
22.0		
24.0		
26.0		
28.0		
30.0		
32.0		
34.0	Very fine grained sand, silt, caliche , 33 -45 feet, light tan. Well indurated caliche layer from 35 to 37 feet.	▨
36.0		
38.0		
40.0		
42.0		
44.0	Very fine grained sand, silt, 44 - 50 feet, tan	▨
46.0		
48.0		
50.0		



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 505-266-5004	**ROC Abo Apache 1-G Site**	**Appendix B**
	SBB Boring Site	**November 2007**

Logger:	David Hamilton	**Client:**	**Boring ID:**
Driller:	Harrison Cooper Drilling	ROC	
Drilling Method:	Air Rotary	**Project Name:**	
Start Date:	12/12/2006	Abo Apache 1-G Site	**SBE-2**
End Date:	12/12/2006	**Location:**	
		Section 1, 17S, 36E, Unit 1G	

Depth (feet)	**Description**	**Lithology**
0.0	Fill, 0 - 4 feet	▨
2.0		
4.0	Very fine grained sand, silt, some caliche, 5 - 11 feet, tan	▨
6.0		
8.0		
10.0	Very fine grained sand, silt, little caliche, 11 - 16 feet, tan	▨
12.0		
14.0		
16.0	V fine grained sand, silt, some caliche, 17 - 20 feet	▨
18.0		
20.0	Very fine grained sand, silt, some thin caliche layers, 20 - 33 feet, tan with reddish tinge	▨
22.0		
24.0		
26.0		
28.0		
30.0		
32.0		
34.0	Very fine grained sand, silt, caliche , 33 -45 feet, light tan. Well indurated caliche layer from 36 to 37 feet.	▨
36.0		
38.0		
40.0		
42.0		
44.0	Very fine grained sand, silt, 45 - 50 feet, tan	▨
46.0		
48.0		
50.0		



R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
505-266-5004

ROC Abo Apache 1-G Site

Appendix B

SBE-2 Boring Site

November 2007

Appendix C:

Analysis of Chloride Migration

R. T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. Suite F-142
Albuquerque, NM 87501

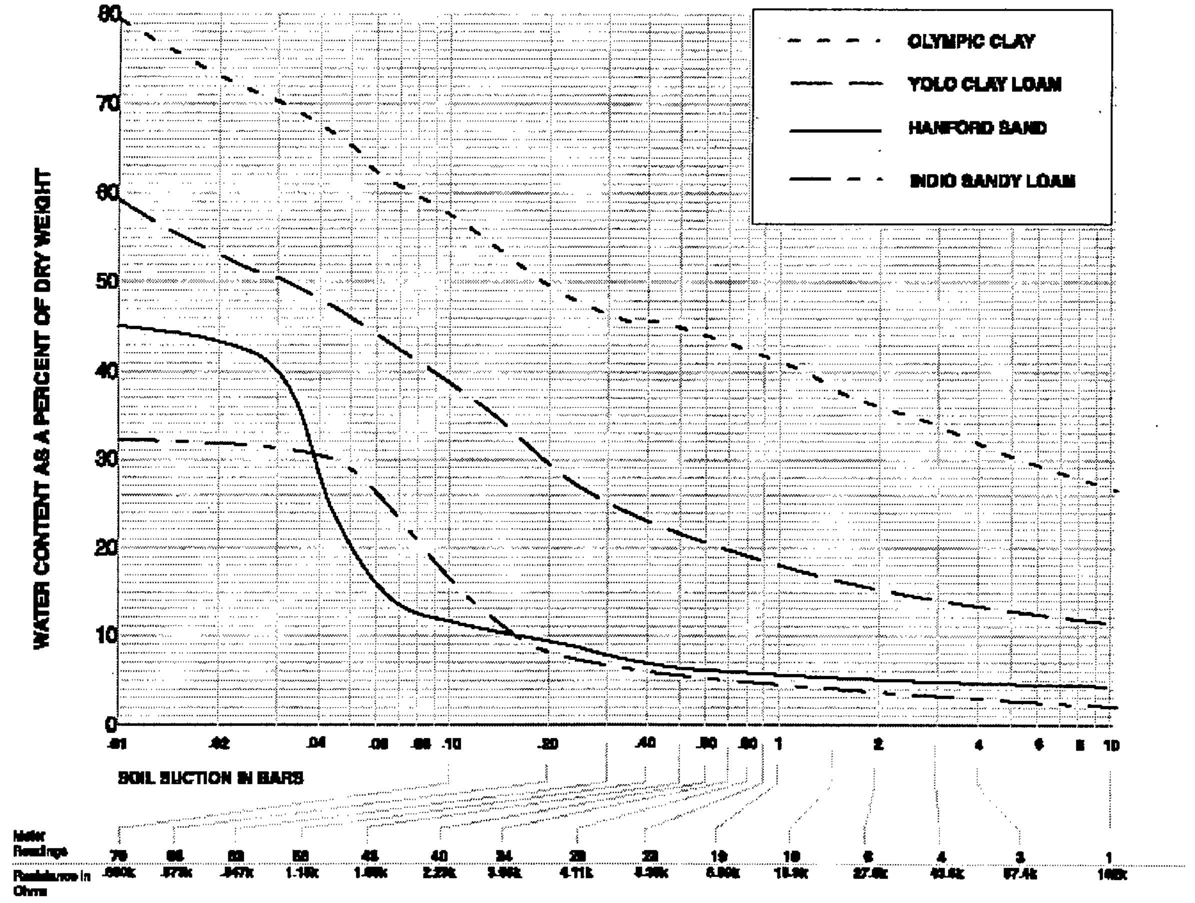
Appendix C: Soil Moisture Monitoring

Soil Moisture Monitoring Methods

Soil moisture monitoring occurs at two locations within the Abo 1-G site by measuring the electrical resistance of gypsum blocks which are in direct contact with the surrounding vadose zone material. Higher electrical resistance correlates to lower soil moisture. The blocks are installed below the soil horizon, about 7 and 9 feet below grade at each location. The northern location measures soil moisture below the sub-surface clay cap while the clay cap does not cover the southern location. Plate 3 of the 2008 Closure Report shows the locations of the soil moisture monitoring sites..

Table 1 of this appendix shows resistance measured in the gypsum blocks. These resistance readings have been correlated with water content as a percentage of dry weight for different soil types by the manufacturer (link to the SMS website: http://www.soilmoisture.com/prod_details.asp?prod_id=346&cat_id=10 for detailed information on the use of these devices). Figure C-1 shows the relationship between electrical resistance of the gypsum block, the meter reading, and moisture contents of various soil textures. At the Abo-1G site, we believe the sandy caliche of the upper vadose zone will behave similar to a mixture of the Indio Sandy Loam and the Hanford Sand.

Figure C-1 Of note is that SMS Soil Moisture readings vary inversely with electrical resistance.



Summary of Observations

1. In November 2007, SMS meter readings at the northern measuring ports (nearest the monitoring well) were 88 at the deep installation (9.8 feet) and 71 at the shallow installation (7.4 feet). At the southern measuring ports, which are about 250 feet to the south and not covered by the clay cap, meter readings are 71 and 48 for the deep (9.1 feet) and shallow (7.4 feet) ports respectively. Soil moisture is also greater at the northern location for other dates shown in Table 1.

2. At both locations, there is decreasing soil moisture content at the depth of the shallow ports. At the southern location, the decrease in meter readings from 72 (12/15/06) to 48 (11/16/07) is larger than the 83 to 71 decrease observed at the northern location for the same dates. Beneath the clay cap, the shallow soil is drying slower than the soil at the southern location.

3. At both locations, soil moisture adjacent to the deeper ports (9.8 feet and 9.1 feet in depth) is greater than moisture in the soil at the 7.4 foot horizon. Also, soil moisture below the clay cap at the deeper monitoring horizon is greater than that observed at the southern monitoring location.

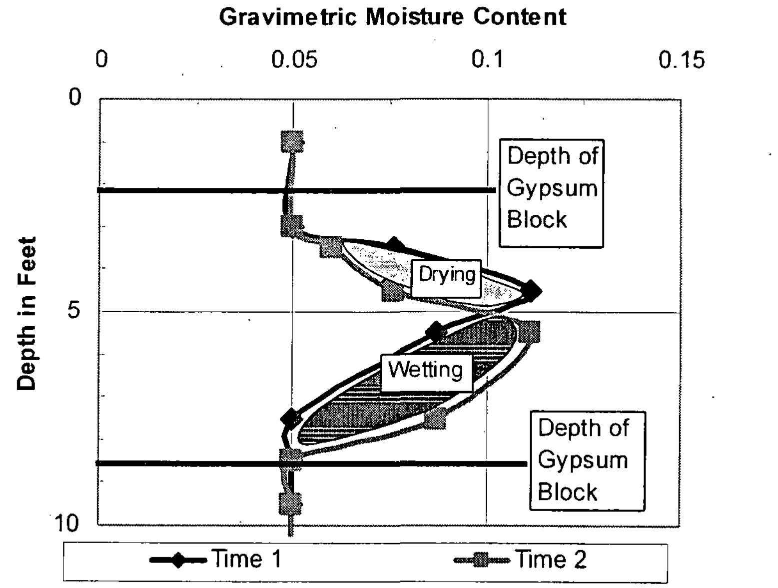
4. At both locations, the shallow soil is drying while the deeper soil is gaining moisture.

Conclusions

Soil Moisture Measurements Show Chloride Migration Less Than 3 Feet/Year

At both locations, the decreasing moisture content of the shallow port with the increasing moisture content of the deep port suggests a moisture pulse (flux) from the shallow zone to the deeper zone. Because the chloride is within the pore water, chloride migrates at the same rate as the moisture flux. The downward moisture (and chloride) migration cannot be greater than the distance between the measuring points over the time of observations. This is 2.5 feet in 11 months (less than 3 feet per year) at the northern location and 1.7 feet in 11 months (less than 2 feet per year) at the southern location. Figure C-2 explains the logic supporting this conclusion. At Time 1, the center of mass of chloride (and pore water) is below the upper gypsum block moisture probe. At Time 2, which could represent 11 months later, the center of mass has migrated downward. As the moisture and chloride move downward, portions of the vadose zone above the center of mass dry while the vadose zone below the center of mass gains moisture due to

Figure C-2: Schematic Figure of Moisture Migration



the migration – as shown in the figure. In this example, the migration of the chloride and moisture center of mass is small relative to the distance between the measuring points.

At the southern soil moisture monitoring locations, the rate is less than at the northern monitoring location. This is because the soil is dryer at the southern location and the hydraulic conductivity of the material is therefore lower.

Since the duration of the monitoring has not been sufficiently long to observe a pulse of moisture passing through the instrumented depth interval, the actual rate of moisture movement is may be less than the calculated rates above.

With establishment of vegetation at the site, there will be a further reduction in moisture content of the upper vadose zone. Redistribution of the moisture below this will result in lowered hydraulic conductivities and decreased fluxes throughout the vadose zone.

Table 1: Gypsum Block Moisture Content (gravimetric) Measurements at the Abo 1-G Site.

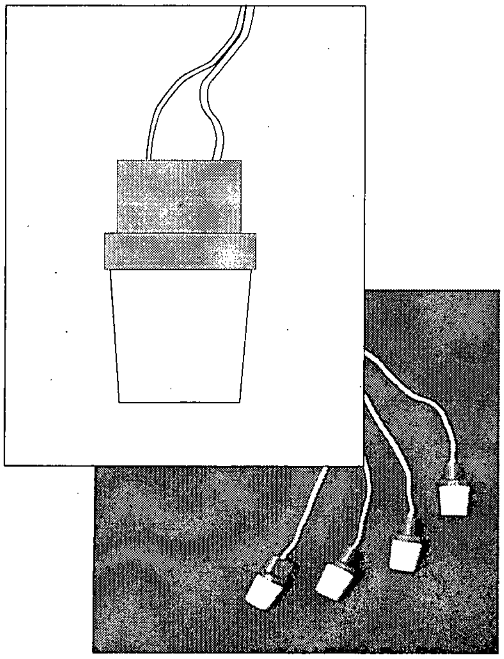
	North Monitoring Ports					
	Deep			Shallow		
Depth (feet)	9.835			7.375		
	SMS Soil Meter Resistance Measurement	Equivalent Moisture Content (SMS Conversion Graph)		SMS Soil Meter Resistance Measurement	Equivalent Moisture Content (SMS Conversion Graph)	
		Hanford Sand	Indio Sandy Loam		Hanford Sand	Indio Sandy Loam
Date						
12/15/2006 (installation)	78	> 0.12	> 0.16	83	> 0.12	> 0.16
5/21/2007	81	> 0.12	> 0.16	77	> 0.12	> 0.16
7/12/2007	86	> 0.12	> 0.16	77	> 0.12	> 0.16
11/15/2007	88	> 0.12	> 0.16	71	> 0.12	> 0.16
	South Monitoring Ports					
	Deep			Shallow		
Depth (feet)	9.08			7.375		
	SMS Soil Meter Resistance Measurement	Equivalent Moisture Content (SMS Conversion Graph)		SMS Soil Meter Resistance Measurement	Equivalent Moisture Content (SMS Conversion Graph)	
		Hanford Sand	Indio Sandy Loam		Hanford Sand	Indio Sandy Loam
Date						
12/15/2006 (installation)	82	> 0.12	> 0.16	72	0.12	0.16
5/21/2007	70	0.12	0.16	50	0.06	0.055
7/12/2007	71	0.12	0.16	50	0.06	0.055
11/15/2007	71	0.12	0.16	48	0.06	0.05

5201F1

OPERATING INSTRUCTIONS

5201F1 Soilmoisture G-Blocks

January 2000



The new Soilmoisture G-Blocks are an evolution in design. They provide quick response and true sensitivity to conditions where moisture remains relatively high. All Soilmoisture G-Blocks are wetted and checked for speed of response and ability to maintain overall consistency from block to block prior to shipping. The new design of electrode spacing ensures a sensitive response to changing moisture conditions below 2 bars of matric suction with overall operation range to 10 bars of matric suction. The new Soilmoisture G-Blocks should provide significant improvements over any competitive blocks or older Soilmoisture blocks.

To properly use the new Soilmoisture G-Blocks, it is important that you reference the new look up tables and formulas at the end of these instructions.

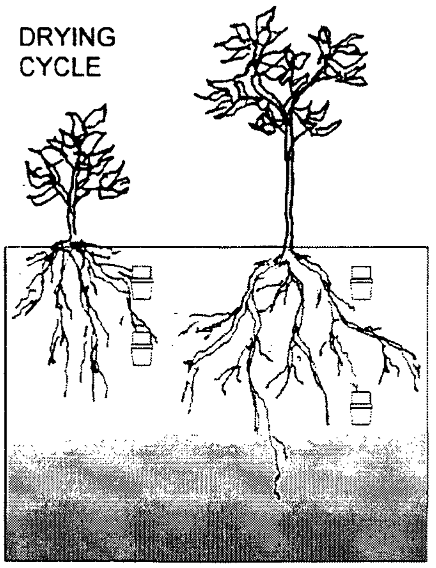
How To Optimize Water Usage Using Soilmoisture G-Blocks

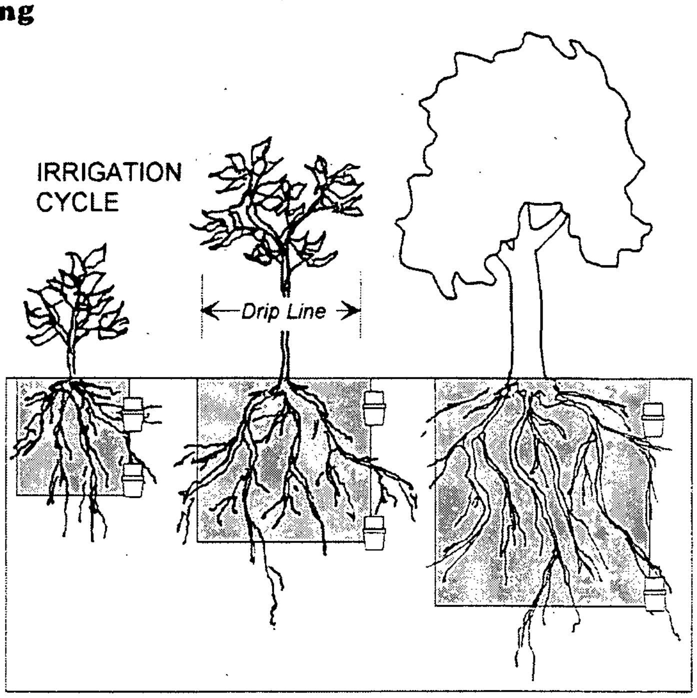
Limits Method of Monitoring

There are several methods that can be used to optimize water using Soilmoisture G-Blocks. The first, and easiest, method is the Limits Method of water management. This simple, but effective, method requires that you determine the limits to which you want water to migrate. The plant maturity rooting depth, rooting patterns, and the system of irrigation will help you to determine these limits. Older and less effective irrigation, such as flood or furrow, will have a broader range of water limits. Shallow rooting and precision applicators will have a narrower limit band. Soilmoisture G-Blocks are placed at the minimum water level (also known as minimum refill point) and at the maximum water level (also know as maximum refill point) for irrigation cycles. Frequently, another G-block is placed at a depth past the maximum refill point to ensure irrigation water does not exceed the set minimum-maximum limits. Minimum limits may be set as shallow as 3 inches in young or sensitive shallow-rooted plants, and maximums can vary from 12 inches in young plants to 6-8 feet in mature orchards where flood irrigation is practiced. Look for the existing rooting patterns of the plant in question and use the 75% Rule for both vertical depth and lateral distances.

When using this or any other water monitoring system 75% of the rooting volume will be responsible for 95% of the plant's uptake of water and nutrients. Therefore, be careful not to place the Soilmoisture G-Blocks at the deepest possible rooting depth, but more accurately at depths that represent 75-80% of the maximum rooting depth. Rooting volumes and uptake will develop in the areas of specific wetting associated with drippers or spitters. It is, therefore, very important to ensure that 75% of rooted volume will receive sufficient subsurface wetting necessary for its livelihood and maintenance.

How to Optimize Water Usage Using Soilmoisture G-Blocks



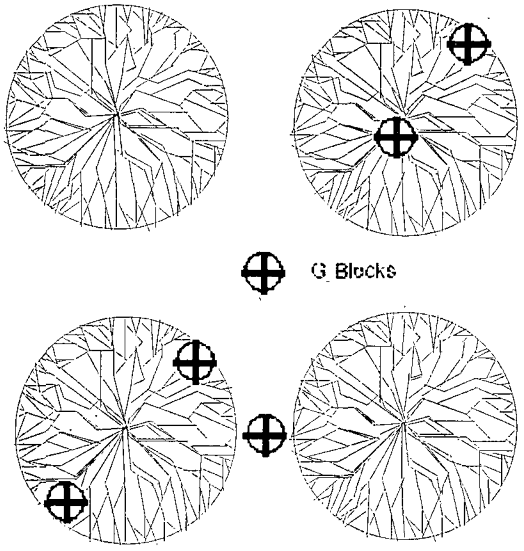


The first illustration shows the depletion of water from the soil profile due to root uptake and evaporation at the soil surface. This would be typical of drying, accelerated or depressed due to day time temperatures, soil surface conditions, winds, rain, etc. The second illustration shows wetting fronts as they progress from younger to older rooting patterns. Water moving as a wetting front from the surface to some vertical depth is consistent with the time interval that water is applied in the irrigation cycle.

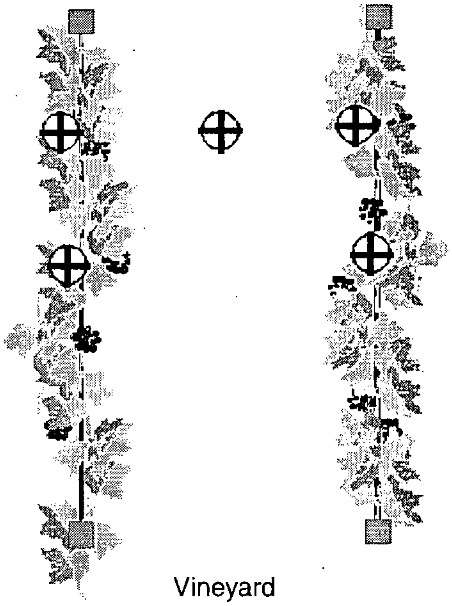
As you can see in the above illustrations, placement of the Soilmoisture G-Blocks is important in achieving best overall results. Not only do you want to place blocks to provide the 75% depth requirement, but you must also consider the lateral extent of rooting. Rule of thumb is that roots commonly do not extend laterally beyond the drip line of the tree or shrub. The drip line is a theoretical maximum diameter equivalent to the largest leaf area from which rain will drip from the overhead leaf canopy of the plant. Once the blocks are in place, you can monitor the wetting front as it passes the limit blocks. Irrigation practices are optimized as you limit timing and, therefore, areas watered to rooting areas only. You will also want to consider modifying less effective irrigation practices such as furrow to drip. You will irrigate based on what the conditions are at near surface and at deepest rooting depths. If, for instance, minimum level blocks show a low moisture content and maximum level blocks show continuing wet conditions, you wouldn't need to irrigate to full depth. You would only need to irrigate to the minimum level depth, or slightly beyond, to refill moisture in upper regions, which means running shorter irrigation cycles. Determination of the time needed to fully refill the profile to minimum level refill point is an important tool in overall water management. The goal is to keep plants within tolerable limits of stress (matric suction), by providing water to most roots (not all) in a scheduled program of full recharge of the soil profile as determined by the limit blocks; and partial recharge of the soil profile to replace shallow drying and root uptake effects.

Matrix/Segmental Method of Monitoring

The Matrix/Segmental Method of monitoring is simply an extension of the Limits concept. By adding additional Soilmoisture G-Blocks between the minimum-maximum limits, you are able to more accurately monitor subsurface moisture due to root uptake, evaporation, and the water release characteristics of different soil types. This added information can be used to more accurately determine the precise level required for partial recharges. Besides the incremental measuring at different depths, you extend a pattern of monitoring points horizontally in a matrix to capture the lateral extent of wetting fronts and to access root withdrawal areas. Placement of Soilmoisture G-Blocks in a matrix of points at defined depth segments can be very useful in optimizing water application systems, such as drip and subsurface emitters, for maximum efficiency.



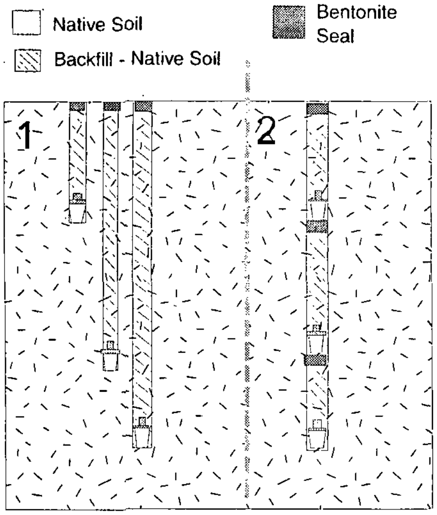
Mature Orchard



Vineyard

In the illustrations above are two typical installations shown in overhead view. In the first case, an orchard with mature trees using spitters, one would want to provide a defined lateral spacing of sensors consistent with spitter spacing, tree spacing, and canopy size. Each sensor spot measures sequential depths of 1 foot, 3 feet, and 6 feet. The matrix pattern of sensors in both vertical and horizontal aspects is used to monitor uniformity of water distribution under the tree, to check for shadow effects from wind, trunk obstructions, or pressure differentials. You will notice that sensing between the trees addresses precise determination of water migration in the subsurface areas beyond the drip line and to assess the residual water content from rain or snow. The second illustration shows sensor placement in a vineyard with the first set of sensors situated along the row at a drip emitter and half way between drippers. Sensors are placed in vertical profile at each location to ensure that a wetting ball is established at drippers and that there is adequate subsurface water migration for all rooted areas. A sensor placed in between rows is used to monitor residual moisture due to rain and/or snow. Soilmoisture G-Blocks used in this prescribed manner can provide a wealth of information, improving irrigation practices, and saving on water and energy costs.

INSTALLATION

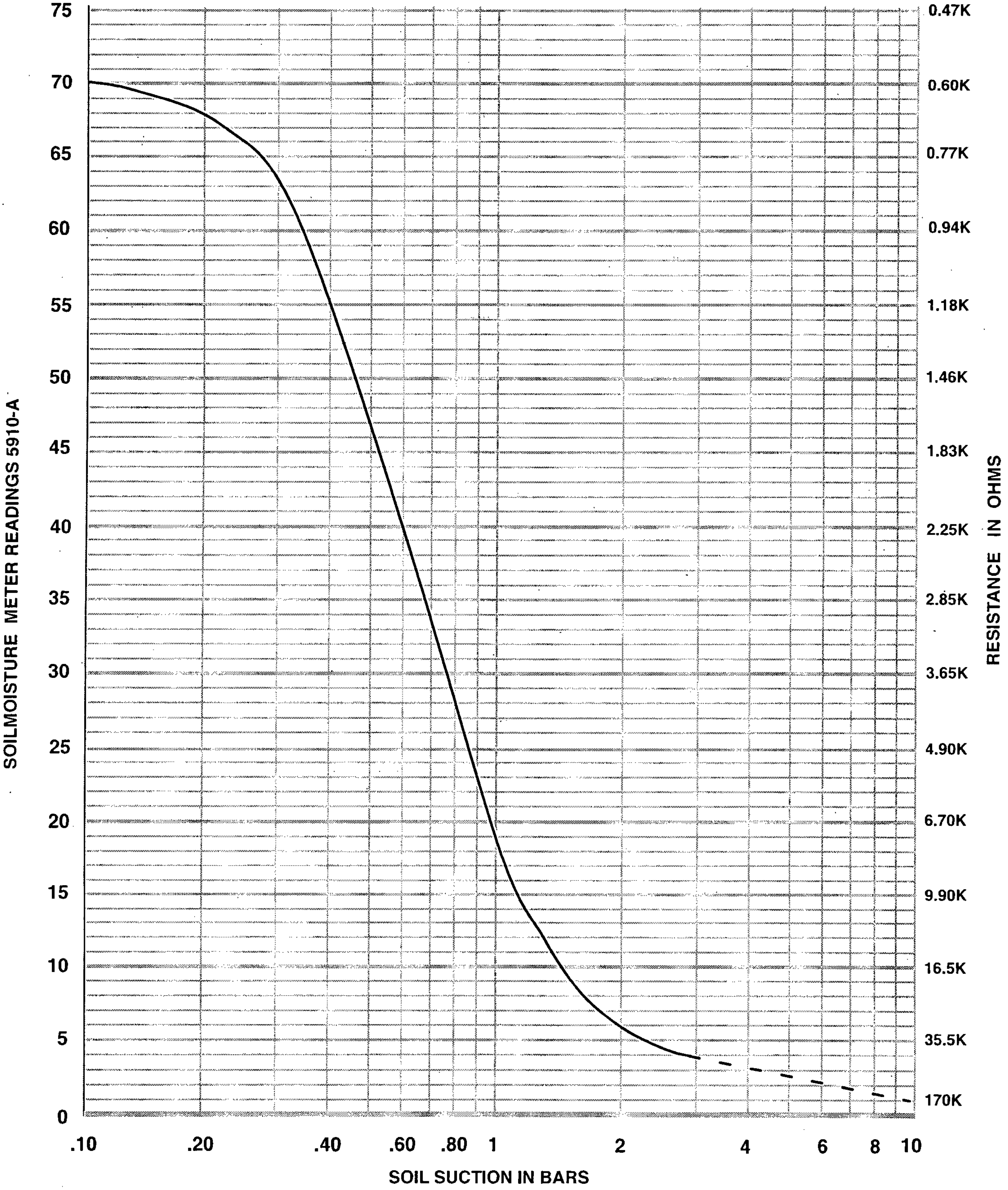


In the illustration to the left there are two approaches to installing Soilmoisture G-Blocks. First, there is the school of thought that blocks cannot be situated in the same hole and only placed in separate holes that are close in proximity, best represents the surrounding native soil conditions. The other school of thought is to make a slightly larger hole and that stacking blocks is acceptable, provided a bentonite (swelling clay) cap or heavy compacted clay "seals" each hole.

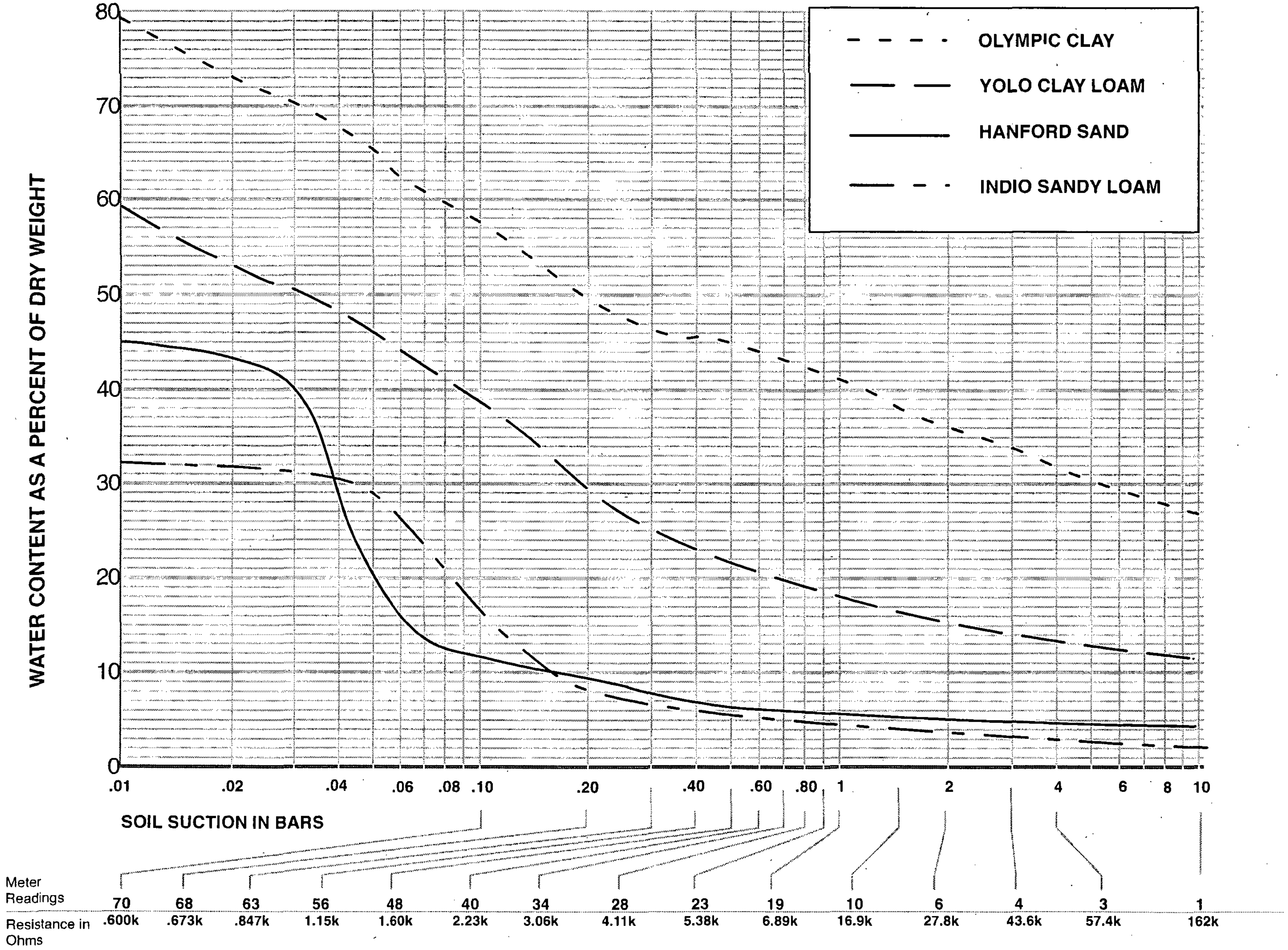
Steps

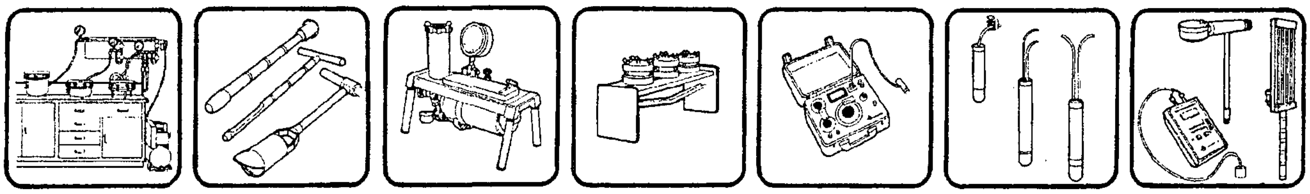
a. Auger a hole slightly larger than the Soilmoisture G-Blocks to be installed.
b. Soak blocks prior to installation for at least ten minutes.
c. Prepare a small slurry of native soil and water.
d. Pour slurry into hole.
e. Using a broom handle or long pole gently push blocks into the slurry at the bottom of the hole.
f. Cover blocks with native soil backfill tamping lightly as you refill hole.
g. Cap hole with a Bentonite seal or other highly compacted clay plug.
h. Four to six hours later the hole will be ready for the first reading.

NEW 5201F1 SOILMOISTURE G-BLOCK RELATIONSHIPS



The relationship between Soilmoisture meter readings and impedance in Ohms is based on a 350 mV step pulse having a frequency of approximately 60 cycles/second. The impedance values in Ohms, as shown, represent a signal/response relationship and that may vary with alternative sources of signal excitation.


WATER CONTENT AS A PERCENT OF DRY WEIGHT
80
70
60
50
40
30
20
10
0
.01
.02
.04
.06
.08
.10
.20
.40
.60
.80
1
2
4
6
8
10
SOIL SUCTION IN BARS
OLYMPIC CLAY
YOLO CLAY LOAM
HANFORD SAND
INDIO SANDY LOAM
Meter Readings
70
68
63
56
48
40
34
28
23
19
10
6
4
3
1
Resistance in Ohms
.600k
.673k
.847k
1.15k
1.60k
2.23k
3.06k
4.11k
5.38k
6.89k
16.9k
27.8k
43.6k
57.4k
162k



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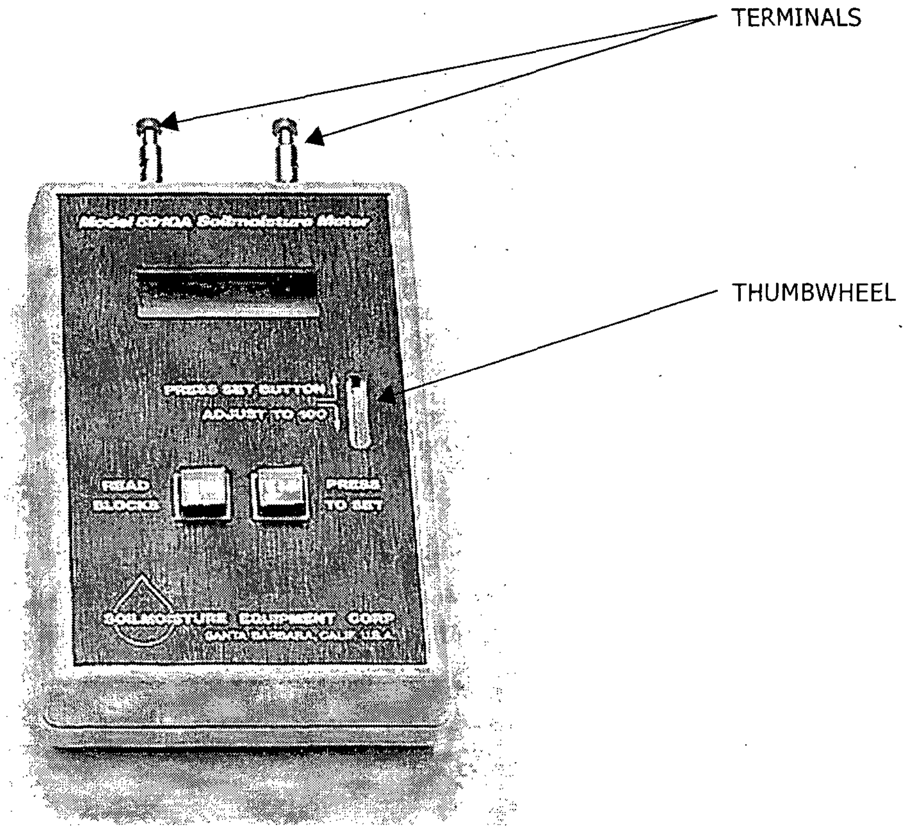
e-mail: sales@soilmoisture.com · Web: http://www.soilmoisture.com

SOILMOISTURE EQUIPMENT CORP.

TEST PROCEDURE
SOIL MOISTURE METER 5910A

1. PRESS THE "PRESS TO SET" BUTTON AND ADJUST THUMBWHEEL TO GET A READING OF 100 ON LCD.
2. PUT A SHORT ACROSS TERMINALS AND PRESS "READ BLOCKS" BUTTON.
3. READING ON LCD MUST BE 102 (+/- 2)
4. PUT A RESISTANCE OF 2,870 Ω ACROSS TERMINALS AND PRESS "READ BLOCKS" BUTTON
5. READING ON LCD MUST BE 35 ON LCD (+/- 2)



6. IF ABOVE TEST DOES NOT MEET THE REQUIRED RESULTS, THE METER NEEDS TO BE RECALIBRATED AT SOILMOISTURE EQUIPMENT CORP.
7. REQUEST A RMA FOR RETURNING THE METER BY CALLING 805-964-3525 EXT 248

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