BW - 18

MONITORING REPORTS

DATE:

2004

INVESTIGATION

eTECH
Environmental & Safety Solutions, Inc.

Report

Truckers Number 2 Brine Station
Subsurface Investigation

Prepared For:
Key Energy Services, Inc.
6 Desta Drive, Suite 4400
Midland, TX 79705

Issue Date: November 17, 2004
Project Number: 035-387-M

P.O. Box 8469 Midland ◦ TX ◦ 79708-8469 ◦ Tel: 432-563-2200 ◦ Fax: 432-563-2213

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Attachments

Summary

On November 8, 2004 Etech Environmental & Safety Solutions, Inc. (Etech) performed a subsurface investigation at the Truckers Number 2 Brine Station in Hobbs, New Mexico. The purpose of the investigation was to determine the vertical extent of chloride contamination in a drainage collection area located to the west of the brine pit.

The investigation involved the advancement of two (2) soil borings to a depth of thirty-two (32) feet below ground surface (bgs), sampling and field screening of soils and laboratory analyses of selected samples.

Following completion of the field activities and laboratory analyses, it has been determined that the majority of the vertical extent of the chloride contamination appears to be confined within the upper 6-10 feet of soils. However, soils contaminated with chlorides are slightly above the regulatory level of 250 mg/kg were found to a depth of 15 feet.

A review of the soil samples taken during the soil borings found the majority of the subsurface soils to be caliche. A tight, well-cemented sandstone formation was noted at approximately twenty to twenty-two (20-22) feet.

Introduction

On November 8, 2004 Etech Environmental & Safety Solutions, Inc. (Etech) performed a subsurface investigation at the Truckers Number 2 Brine Station in Hobbs, New Mexico. The site is operated by Key Energy Services, Inc. The purpose of the investigation was to determine the vertical extent of chloride contamination in a drainage collection area located to the west of the brine pit.

The scope of the investigation involved the following:

- Advance soil borings to a maximum depth of sixty (60) feet.
- Perform on-site screening of soil samples for chlorides
- Send selected samples for laboratory analyses for chlorides

The following summarizes the on-site activities and the results of the laboratory analyses.

Soil Borings

Two (2) soil borings sites were selected and labeled SB-4 and SB-5. This was done to keep the borings sequential with other borings performed in previous investigations. Each soil boring was advanced using air-rotary drilling rig. The sampling program called for split spoon samples to be taken every five (5) feet for the first twenty (20) feet then every ten (10) feet until total depth was reached. Grab samples of the drill cuttings were to be taken in two (2) foot intervals between split spoon samples.

SB-4 is located 33 feet west of the brine pit towards the southern quarter of the drainage collection area. The latitude and longitude of the boring is as follows:

Latitude: N32 42.071
Longitude: W103 09.340

SB-5 is located 27 feet west of the brine pit towards the northern quarter of the drainage collection area. The latitude and longitude of the boring is as follows:

Latitude: N32 42.082
Longitude: W103 09.342

A diagram showing the location of each boring is provided for review in Attachment A.

SB-4 was advanced to thirty (30) feet bgs. SB-5 was advanced to thirty-two (32) feet bgs. Soil borings were terminated at these depths when field screening indicated the chloride levels were below the 250 mg/kg objective for a sustained ten (10) foot interval. Once the borings were completed, they were backfilled to surface using bentonite chips.

The lithology of each boring was uniform. The soils throughout each boring were largely caliche. At twenty to twenty-two (20-22) feet bgs, a tight, well cemented, sandstone was encountered. This formation did slow the advancement of each boring and resulted in a reduced amount of sample recovery in the split spoon sample taken at that depth.

Field Screening & Analyses

Samples were screened on-site for chlorides. A portion of each sample was taken and a liquid extract created. The extract was then titrated for chlorides. The field screening indicated there were elevated levels of chlorides to approximately five to six (5-6) feet. At this point, the chloride levels significantly reduce until fifteen to seventeen (15-17) feet when they reach a point below the target level of 250 mg/kg. A copy of the field screening sheet is provided for review in Attachment B.

Based upon the data from the field screening, select samples were taken and analyzed for chlorides via EPA Method 300. The results of the analyses are listed in Table 1, presented below:

Table 1
Laboratory Analyses for Chlorides

Boring	Depth (Feet)	Chlorides (mg/kg)
Background	(Surface)	74.7
SB-4	6-7	1460
SB-4	10-11	382
SB-4	17-20	159
SB-5	5'	2770
SB-5	14-15	484
SB-5	24-25	116

The five (5) foot sample from SB-5 was subjected to additional analyses for cations and anions. This was done to give an overall picture of the soils general chemistry. The results of the analyses indicate there is a very high level of calcium (159,000) mg/kg. This would be expected given the nature of the soil. The exact amount of free calcium, or readily soluble calcium, is unknown. However, this information may be useful when selecting a method of mitigation. Copies of the analytical results are provided for review in Attachment C.

Quality Assurance & Quality Control

Field samples were individually bagged and labeled immediately after sampling. All sampling equipment used to take samples was decontaminated between each use. All samples subjected to field screening were placed in certified clean glass bottles prior to field screening. All equipment used for field screening was either single-use or decontaminated between each use. The drilling string was decontaminated between each boring.

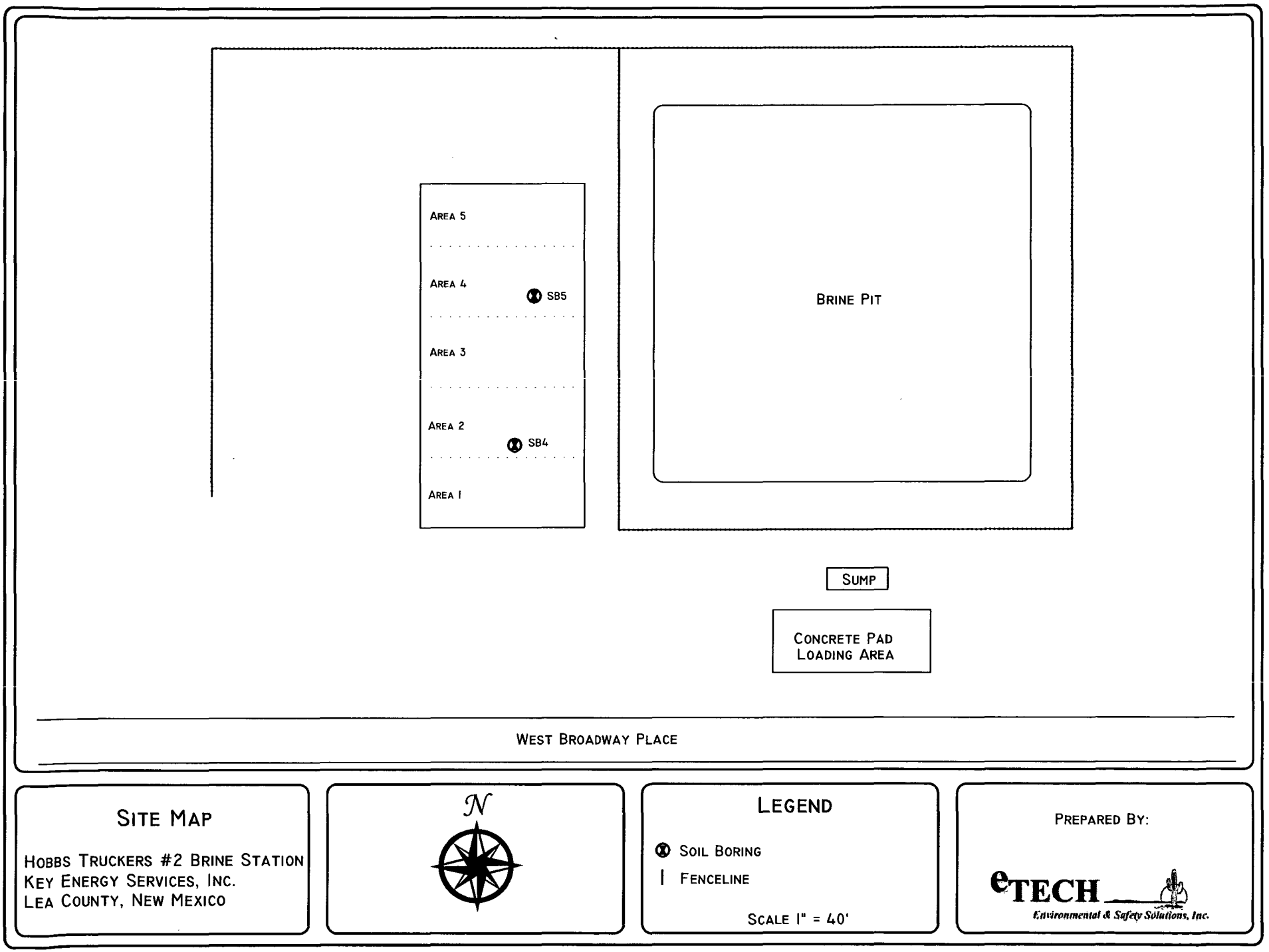
Conclusion

Following completion of the field activities and laboratory analyses, it appears the majority of the vertical extent of the chloride contamination appears to be confined within the upper 6-10 feet of soils. Chloride levels above the regulatory level of 250 mg/kg were found to depths of at least 11 feet in one boring and 15 feet in the other boring.

Prepared By:

Fred Holmes B.Sc.
Etech Environmental & Safety Solutions, Inc.

Attachment A
Site Diagram



SITE MAP

HOBBS TRUCKERS #2 BRINE STATION
KEY ENERGY SERVICES, INC.
LEA COUNTY, NEW MEXICO

N

LEGEND

- SOIL BORING
- FENCELINE

SCALE 1" = 40'

PREPARED BY:

eTECH
Environmental & Safety Solutions, Inc.

Attachment B
Field Screening Log

Field Analysis Sheet

Date: 11/9/2004 **Client:** Key Energy Services

Site: Hobbs Truckers #2 **Project Number:** 035-387

Technican: Jaime Craig **Contaminant:** Chlorides

Sample ID	Milliliters of Sample Used	Dilution	AgNO3 0.028(N)	Result (mg/kg)	Notations
SB4 6-7'	1	2	0.580	575.708	Sent to lab for Chlorides 300.0 Method
SB4 7-8'	1	2	0.500	496.3	
SB4 9-10'	1	2	0.510	506.226	
SB4 10-11'	1	2	0.300	297.78	Sent to lab for Chlorides 300.0 Method
SB4 12-13'	1	2	0.350	347.41	
SB4 14-15'	1	2	0.300	297.78	
SB4 15-17'	1	2	0.200	198.52	
SB4 17-18'	1	2	0.200	198.52	
SB4 17-20'	1	2	0.200	198.52	Sent to lab for Chlorides 300.0 Method
SB4 21-22'	1	2	0.200	198.52	
SB4 24-25'	1	2	0.100	99.26	
SB4 26-27'	1	2	0.150	148.89	
SB4 28-29'	1	2	0.100	99.26	
SB4 30'	1	2	0.100	99.26	
SB5 5'	1	2	1.200	1191.12	Sent to lab for Chlorides 300.0 Method
SB5 7-8'	1	2	0.900	893.34	
SB5 9-10'	1	2	0.700	694.82	
SB5 10-12'	1	2	0.600	595.56	
SB5 12-13'	1	2	0.500	496.3	
SB5 14-15'	1	2	0.400	397.04	Sent to lab for Chlorides 300.0 Method
SB5 15-17'	1	2	0.300	297.78	
SB5 17-18'	1	2	0.300	297.78	
SB5 19-20'	1	2	0.200	198.52	
SB5 22'	1	2	0.200	198.52	
SB5 24-25'	1	2	0.200	198.52	Sent to lab for Chlorides 300.0 Method
SB5 26-27'	1	2	0.200	198.52	
SB5 28-29'	1	2	0.200	198.52	
SB5 30-32'	1	2	0.100	99.26	
BACKGROUND	1	2	0.200	198.52	Sent to lab for Chlorides 300.0 Method

F = (ml $AgNO_3$)(N)(35450)/ml. sample used

Attachment C
Analytical Results

ENVIRONMENTAL LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Shane Estep

E Tech Environmental & Safety Solutions, Inc.

P.O. Box 8469

Midland, TX 79708-8469

Project: Hobbs Truckers #2 Brine Station

Project Number: 035-387

Location: None Given

Lab Order Number: 4K10003

Report Date: 11/15/04

E Tech Environmental & Safety Solutions, Inc.	Project: Hobbs Truckers #2 Brine Station	Fax: 563-2213
P.O. Box 8469	Project Number: 035-387	**Reported:**
Midland TX, 79708-8469	Project Manager: Shane Estep	11/15/04 15:08

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BG	4K10003-01	Soil	11/08/04 00:00	11/09/04 17:10
SB4 6-7'	4K10003-02	Soil	11/08/04 00:00	11/09/04 17:10
SB4 10-11'	4K10003-03	Soil	11/08/04 00:00	11/09/04 17:10
SB4 17-20'	4K10003-04	Soil	11/08/04 00:00	11/09/04 17:10
SB5 5'	4K10003-05	Soil	11/08/04 00:00	11/09/04 17:10
SB5 14-15'	4K10003-06	Soil	11/08/04 00:00	11/09/04 17:10
SB5 24-25'	4K10003-07	Soil	11/08/04 00:00	11/09/04 17:10

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P.O. Box 8469	Project Number: 035-387	**Reported:**
Midland TX, 79708-8469	Project Manager: Shane Estep	11/15/04 15:08

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB5 5' (4K10003-05) Soil									
Carbonate Alkalinity	**8.00**	0.100	mg/kg	1	EK41102	11/10/04	11/10/04	EPA 310.2M	
Bicarbonate Alkalinity	**52.0**	2.00	"	"	"	"	"	"	
Hydroxide Alkalinity	ND	0.100	"	"	"	"	"	"	
% Moisture	**18.0**		%	"	EK41201	11/11/04	11/12/04	% calculation	
Sulfate	**557**	5.00	mg/kg	10	EK41207	11/10/04	11/11/04	EPA 9038	

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P.O. Box 8469	Project Number: 035-387	**Reported:**
Midland TX, 79708-8469	Project Manager: Shane Estep	11/15/04 15:08

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB5 5' (4K10003-05) Soil									
Calcium	**159000**	1000	mg/kg dry	100000	EK41011	11/10/04	11/10/04	EPA 6010B	
Magnesium	**1940**	1.00	"	1000	"	"	"	"	
Potassium	**207**	5.00	"	100	"	"	"	"	
Sodium	**2980**	10.0	"	1000	"	"	"	"	

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P.O. Box 8469	Project Number: 035-387	**Reported:**
Midland TX, 79708-8469	Project Manager: Shane Estep	11/15/04 15:08

Anions by EPA Method 300.0

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BG (4K10003-01) Soil									
Chloride	**74.7**	10.0	mg/kg	1	EK41213	11/11/04	11/11/04	EPA 300.0	
SB4 6-7' (4K10003-02) Soil									
Chloride	**1460**	500	mg/kg	50	EK41213	11/11/04	11/11/04	EPA 300.0	
SB4 10-11' (4K10003-03) Soil									
Chloride	**382**	100	mg/kg	10	EK41213	11/11/04	11/11/04	EPA 300.0	
SB4 17-20' (4K10003-04) Soil									
Chloride	**159**	20.0	mg/kg	2	EK41213	11/11/04	11/11/04	EPA 300.0	
SB5 5' (4K10003-05) Soil									
Chloride	**2770**	500	mg/kg	50	EK41213	11/11/04	11/11/04	EPA 300.0	
SB5 14-15' (4K10003-06) Soil									
Chloride	**484**	200	mg/kg	20	EK41213	11/11/04	11/11/04	EPA 300.0	
SB5 24-25' (4K10003-07) Soil									
Chloride	**116**	10.0	mg/kg	1	EK41213	11/11/04	11/11/04	EPA 300.0	

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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 EK41102 - Water Extraction										
Blank (EK41102-BLK1)				Prepared & Analyzed: 11/10/04						
Carbonate Alkalinity	ND	0.100	mg/kg							
Bicarbonate Alkalinity	ND	2.00	"							
Hydroxide Alkalinity	ND	0.100	"							
Duplicate (EK41102-DUP1)	**Source: 4K10003-05**			Prepared & Analyzed: 11/10/04						
Carbonate Alkalinity	8.00	0.100	mg/kg		8.00			0.00	20	
Bicarbonate Alkalinity	52.0	2.00	"		52.0			0.00	20	
Hydroxide Alkalinity	0.00	0.100	"		0.00				20	
Reference (EK41102-SRM1)				Prepared & Analyzed: 11/10/04						
Carbonate Alkalinity	0.0500		mg/kg	0.0500		100	80-120			
Batch EK41201 - General Preparation (Prep)										
Blank (EK41201-BLK1)				Prepared: 11/11/04 Analyzed: 11/12/04						
% Moisture	0.0		%							
Duplicate (EK41201-DUP1)	**Source: 4K11002-01**			Prepared: 11/11/04 Analyzed: 11/12/04						
% Moisture	15.0		%		15.0			0.00	20	
Batch EK41207 - Water Extraction										
Blank (EK41207-BLK1)				Prepared: 11/10/04 Analyzed: 11/11/04						
Sulfate	ND	2.50	mg/kg							
Calibration Check (EK41207-CCV1)				Prepared & Analyzed: 11/11/04						
Sulfate	48.1		mg/kg	50.0		96.2	80-120			

E Tech Environmental & Safety Solutions, Inc.	Project: Hobbs Truckers #2 Brine Station	Fax: 563-2213
P.O. Box 8469	Project Number: 035-387	**Reported:**
Midland TX, 79708-8469	Project Manager: Shane Estep	11/15/04 15:08

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 EK41207 - Water Extraction										
Duplicate (EK41207-DUP1)	**Source: 4K10003-05**			Prepared: 11/10/04 Analyzed: 11/11/04						
Sulfate	565	5.00	mg/kg		557			1.43	20	

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P.O. Box 8469	Project Number: 035-387	**Reported:**
Midland TX, 79708-8469	Project Manager: Shane Estep	11/15/04 15:08

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 EK41011 - 6010B/No Digestion										
Blank (EK41011-BLK1)				Prepared & Analyzed: 11/10/04						
Calcium	ND	0.0100	mg/kg wet							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Calibration Check (EK41011-CCV1)				Prepared & Analyzed: 11/10/04						
Calcium	2.00		mg/kg	2.00		100	85-115			
Magnesium	2.17		"	2.00		108	85-115			
Potassium	1.76		"	2.00		88.0	85-115			
Sodium	1.76		"	2.00		88.0	85-115			
Duplicate (EK41011-DUP1)	**Source: 4K10003-05**			Prepared & Analyzed: 11/10/04						
Calcium	161000	1000	mg/kg dry		159000			1.25	20	
Magnesium	1970	1.00	"		1940			1.53	20	
Potassium	210	5.00	"		207			1.44	20	
Sodium	3050	10.0	"		2980			2.32	20	
Duplicate (EK41011-DUP2)	**Source: 4K09013-01**			Prepared & Analyzed: 11/10/04						
Calcium	18600	100	mg/kg wet		17100			8.40	20	
Magnesium	390	0.100	"		383			1.81	20	
Sodium	853	10.0	"		785			8.30	20	

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P.O. Box 8469	Project Number: 035-387	**Reported:**
Midland TX, 79708-8469	Project Manager: Shane Estep	11/15/04 15:08

Anions by EPA Method 300.0 - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EK41213 - General Preparation (Subcontract)										
Blank (EK41213-BLK1)				Prepared & Analyzed: 11/11/04						
Chloride	ND	10.0	mg/kg							
LCS (EK41213-BS1)				Prepared & Analyzed: 11/11/04						
Chloride	31.8		mg/L	30.0		106	90-110			
Matrix Spike (EK41213-MS1)	**Source: 4K10003-01**			Prepared & Analyzed: 11/11/04						
Chloride	97.1		mg/L	30.0	74.7	74.7	80-120			S-08
Matrix Spike Dup (EK41213-MSD1)	**Source: 4K10003-01**			Prepared & Analyzed: 11/11/04						
Chloride	106		mg/L	30.0	74.7	104	80-120	8.76	20	

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Notes and Definitions

S-08	Value outside Laboratory historical or method prescribed QC 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: 11/15/04

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: Eric Weaver / Shane Estep
Company Name Etech Environmental & Safety Solutions
Company Address: P.O. Box 8469
City/State/Zip: Midland, TX 79708
Fred 631-3757
Telephone No: 432/563-2200 **Fax No:** 432/563-2213
Sampler Signature: Jaime Cruz

Project Name: Hobbs Truckers #2 Brine Stn
Project #: ~~00~~ 035-387
Project Loc:
PO #:

4K10003

LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers plastic bag	Preservative: Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Matrix: Water	Sludge	Soil	Other (specify):	Analyze For: TCLP: 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.	TOTAL: Chlorides 300.0 ppm			RUSH TAT (Pre-Schedule)	Standard TAT
-01	BG	11.8.04		1						✓				✓												✓				✓
-02	SB4 6-7'	11.8.04		1						✓				✓												✓				✓
-03	SB4 10-11'	11.8.04		1						✓				✓												✓				✓
-04	SB4 17-20'	11.8.04		1						✓				✓												✓				✓
-05	SB5 5'	11.8.04		1						✓				✓			✓	✓								✓				✓
-06	SB5 14-15'	11.8.04		1						✓				✓												✓				✓
-07	SB5 24-25'	11.8.04		1						✓				✓												✓				✓

Special Instructions:
11.9.04

Relinquished by:	Date	Time	Received by:	Date	Time
Jaime Cruz	~~11.8.04~~	1710			
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
			Jaime McMurray	11-09-04	1710

Sample Containers Intact? (Y) N
Temperature Upon Receipt: 21.5 C
Laboratory Comments:

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

Client: E Tech Env.

Date/Time: 11-10-04 @ 0850

Order #: 4K10003

Initials: JMM

Sample Receipt Checklist

Temperature of container/cooler?	(Yes)	No	21.5 C
Shipping container/cooler in good condition?	Yes	No	N/A
Custody Seals intact on shipping container/cooler?	Yes	No	Not present N/A
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	No Label - written on bag
Container labels legible and intact?	Yes	No	No Label - written on bag
Sample Matrix and properties same as on chain of custody?	(Yes)	No	
Samples in proper container/bottle?	(Yes)	No	
Samples properly preserved?	Yes	(No)	SO4 + ALK should be @ 4°C
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: - Fred Holmes Date/Time: 11-10-04 @ 0930 Contacted by: Roland Tuttle

Regarding: temperature for SO4 + Alkalinity (CO_3/HCO_3) in soil

Corrective Action Taken: Informed Client SO4 + Alkalinity (CO_3/HCO_3) in soil should be @ 4°C
Client wishes to continue with analysis

* Jeanne spoke with Fred 11-10-04 @ 0830 to confirm method for chloride on SBS @ 5' is 300.0.
Fred said to run 300.0 on chloride and the rest of anions per regular anion analytical methods

UNLOCK YOUR POTENTIAL™

September 27, 2004

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

Re: Hobbs Trucker's #2 Brine Station Soil Sampling Work Plan

Dear Mr. Price:

Enclosed for your files you will find the Hobbs Trucker's #2 Brine Station Soil Sampling Work Plan for your review.

If you have any questions or wish to discuss any items contained in this report, please let me know.

Sincerely,

Jason Henry
Corporate Environmental Specialist

Enclosure

cc: Mr. Paul Sheeley
New Mexico Oil Conservation District
1625 N. French Drive
Hobbs, New Mexico 88240

Mr. Pete Turner
Key Energy Services, Inc.
418 S. Grimes
Hobbs, New Mexico 88240

Hobbs Trucker's #2 Brine Station Soil Sampling Work Plan

September 28, 2004

Prepared by:
Key Energy Services, Inc.
6 Desta Drive
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Background and Objectives

On August 19, 2004, an inspection of Key Energy Services, Inc. (Key) Trucker's #2 Brine Station (site) was performed by New Mexico Oil Conservation Division (NMOCD) personnel. The following concerns were noted:

- Brine spills along the west side of the Brine Storage Pit
- Loading trucks on gravel along the west side of Brine Storage Pit
- Sump construction at pump house

Remediation Activities

To address these concerns, Key is in the process of repairing the concrete loading slab and concrete sump at the site so that loading of trucks can be conducted on the slab. Once the slab and sump have been repaired and put back in operation, Key is proposing to excavate approximately six (6) inches of the soil in the vicinity of the brine spills present where the trucks have been loading (shaded area, Figure 1). Confirmation soil samples will be collected from the base of each excavation area and submitted to Cardinal Laboratories in Hobbs, New Mexico for Chloride analysis in accordance with EPA Method 300.0. Further excavating and sampling will be conducted if the analytical results from the initial sampling event indicate that Chloride concentrations are in excess of 250 mg/kg. All excavated soil will be disposed of at Sundance Services in Eunice, New Mexico. Backfilling of the excavated area with clean caliche will commence upon confirmation that Chloride levels in soil are below 250 mg/kg. Excavating and sampling activities are tentatively planned to begin on October 5, 2004. NMOCD personnel will

be notified at least 48 hours prior to any soil sampling event that is scheduled to take place at the site.

Also, the lined sump on the north side of the pump house was removed and the material was disposed of at Sundance Services during the week of 9/20/04. A plastic storage tank will be put into service in place of the sump.

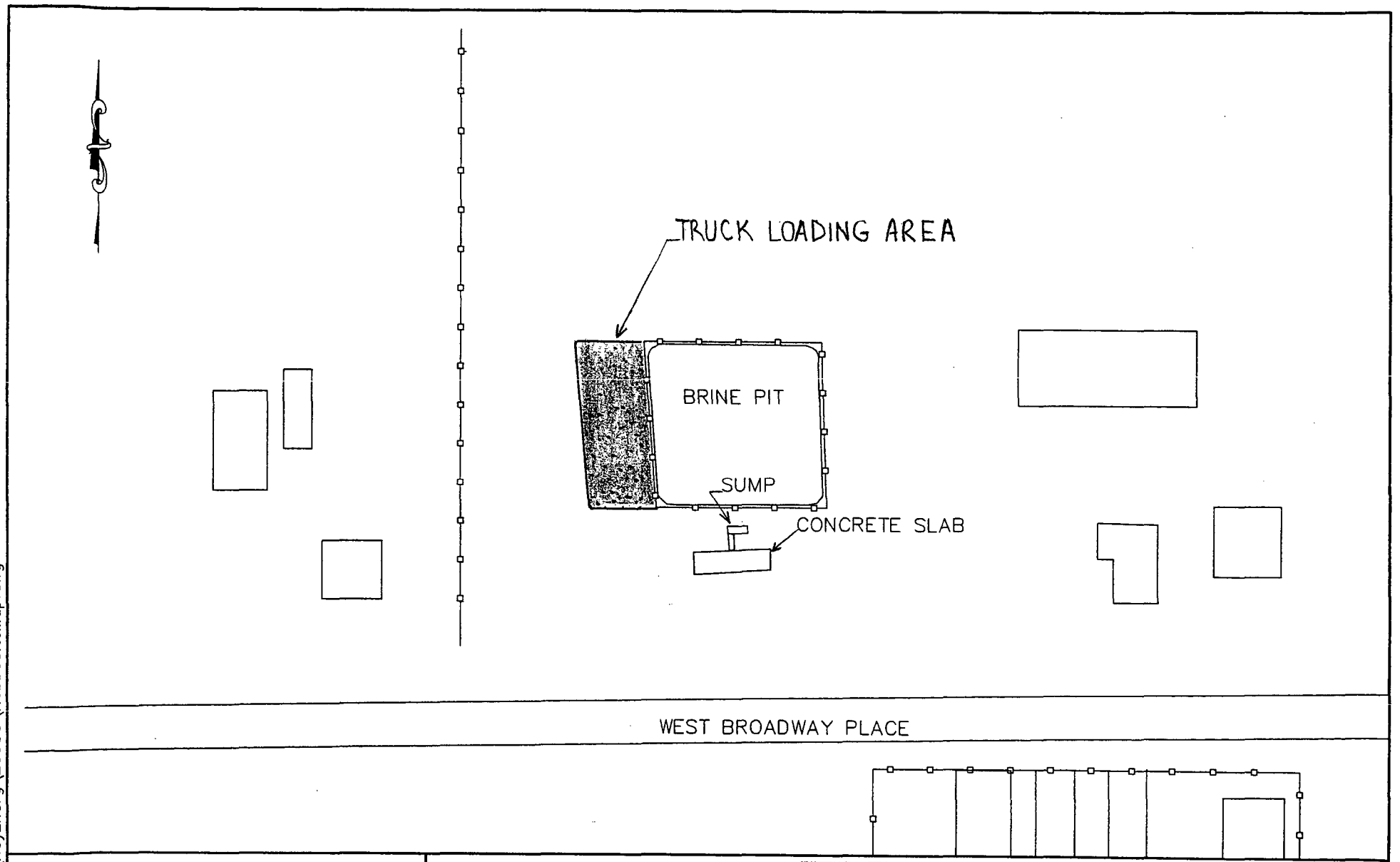
Confirmation Soil Sampling Procedures

Soil sampling activities will be conducted as outlined in Section 5 of *Guidelines for Remediation of Leaks, Spill and Releases.* A copy of this document is provided as Attachment A. Confirmation samples will be collected from the area that borders the brine storage pit on the west side. Following initial excavating activities, the area will be measured and divided into sections that are as close to equal as practicable in square footage measurements. A four (4)-point composite soil sample will then be collected within each section for laboratory analysis of Chloride concentrations. Any additional soil sampling events, if required, will follow this procedure.

Reporting

Following confirmation sampling, a brief letter report will be prepared for submittal to NMOCD. This report will document the investigation activities and the results of the confirmation sample analytical testing.

FIGURE 1



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0 50 100
SCALE IN FEET

KEY ENERGY

KEY ENERGY SALTWATER FACILITY SITE MAP
HOBBS, NEW MEXICO
FIGURE 1

ATTACHMENT A

Guidelines for Remediation of Leaks, Spills, and Releases

GUIDELINES

FOR

REMEDIATION

OF

LEAKS, SPILLS AND RELEASES

(AUGUST 13, 1993)

New Mexico Oil Conservation Division
1220 S. ST. FRANCIS DR.
Santa Fe, New Mexico 87505

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INTRODUCTION

The following document is to be used as a **guide** on all federal, state and fee lands when remediating contaminants resulting from leaks, spills and releases of oilfield wastes or products. The New Mexico Oil Conservation Division (OCD) requires that corrective actions be taken for leaks, spills or releases of any material which has a reasonable probability to injure or be detrimental to public health, fresh waters, animal or plant life, or property or unreasonably interfere with the public welfare or use of the property. These guidelines are intended to provide direction for remediation of soils and fresh waters contaminated as a result of leaks, spills or releases of oilfield wastes and products in a manner that assures protection of fresh waters, public health and the environment.

Fresh waters (to be protected) includes the water in lakes, playas, surface waters of all streams regardless of the quality of the water within any given reach, and all underground waters containing 10,000 milligrams per liter (mg/l) or less of total dissolved solids (TDS) except for which, after notice and hearing, it is found that there is no present or reasonably foreseeable beneficial use which would be impaired by contamination of such waters. The water in lakes and playas shall be protected from contamination even though it may contain more than 10,000 mg/l of TDS unless it can be shown that hydrologically connected fresh ground water will not be adversely affected.

Procedures may deviate from the following guidelines if it can be shown that the proposed procedure will either remediate, remove, isolate or control contaminants in such a manner that fresh waters, public health and the environment will not be impacted. Specific constituents and/or requirements for soil and ground water analysis and/or remediation may vary depending on site specific conditions. Deviations from approved plans will require OCD notification and approval.

****** Note:** **Notification to OCD of leaks, spills and releases does not relieve an operator of responsibility for compliance with any other federal, state or local law and/or regulation regarding the incident. Other agencies (ie. BLM, Indian Tribes, etc) may also have guidelines or requirements for remediation of leaks spills and releases.**

I. NOTIFICATION OF LEAK, SPILL OR RELEASE

Leaks, spills and releases of any wastes or products from oilfield operations are required to be reported to the OCD pursuant to OCD Rule 116 (Appendix A) or New Mexico Water Quality Control Commission (WQCC) Regulation 1-203 (Appendix B). Appendix C contains the phone numbers and addresses for reporting incidents to the OCD district and Santa Fe offices. Notification will include all information required under the respective rule or regulation. Below is a description of some of the information required:

A. RESPONSIBLE PARTY AND LOCAL CONTACT

The name, address and telephone number of the person/persons in charge of the facility/operation as well as the owner and/or operator of the facility/operation and a local contact.

B. FACILITY

The name and address of the facility or operation where the incident took place and the legal location listed by quarter-quarter, section, township and range, and by distance and direction from the nearest town or prominent landmark so that the exact site location can be readily located on the ground.

C. TIME OF INCIDENT

The date, time and duration of the incident.

D. DISCHARGE EVENT

A description of the source and cause of the incident.

E. TYPE OF DISCHARGE

A description of the nature or type of discharge. If the material leaked, spilled or released is anything other than crude oil, condensate or produced water include its chemical composition and physical characteristics.

F. QUANTITY

The known or estimated volume of the discharge.

G. SITE CHARACTERISTICS

The relevant general conditions prevailing at the site including precipitation, wind conditions, temperature, soil type, distance to nearest residence and population centers and proximity of fresh water wells or watercourse (ie. any river, lake, stream, playa, arroyo, draw, wash, gully or natural or man-made channel through which water flows or has flowed).

H. IMMEDIATE CORRECTIVE ACTIONS

Any initial response actions taken to mitigate immediate threats to fresh waters, public health and the environment.

II. INITIAL RESPONSE ACTIONS

Upon learning of a leak, spill or release of any material which has a reasonable probability to injure or be detrimental to public health, fresh waters, animal or plant life, or property or unreasonably interfere with the public welfare or use of the property, the responsible party (RP) should take the following immediate actions unless the actions could create a safety hazard which would result in a threat to personal or public injury:

A. SOURCE ELIMINATION AND SITE SECURITY

The RP should take the appropriate measures to stop the source of the leak, spill or release and limit access to the site as necessary to reduce the possibility of public exposure.

B. CONTAINMENT

Once the site is secure, the RP should take steps to contain the materials leaked, spilled or released by construction of berms or dikes, the use of absorbent pads or other containment actions to limit the area impacted by the event and prevent potential fresh water contaminants from migrating to watercourses or areas which could pose a threat to public health and safety.

C. SITE STABILIZATION

After containment, the RP should recover any products or wastes which can be physically removed from the surface within the containment area. The disposition of all wastes or products removed from the site must be approved by the OCD.

III. SITE ASSESSMENT

Prior to final closure (Section VIII), soils into which nonrecoverable products or wastes have infiltrated and which have a reasonable probability to injure or be detrimental to public health, fresh waters, animal or plant life, or property or unreasonably interfere with the public welfare or use of the property should be assessed for their potential environmental impacts and remediated according to the procedures contained in the following sections. Assessment results form the basis of any required remediation. Sites will be assessed for severity of contamination and potential environmental and public health threats using a risk based ranking system.

The following characteristics should be determined in order to evaluate a sites potential risks, the need for remedial action and, if necessary, the level of cleanup required at the site:

A. GENERAL SITE CHARACTERISTICS

1. Depth To Ground Water

The operator should determine the depth to ground water at each site. The depth to ground water is defined as the vertical distance from the lowermost contaminants to the seasonal high water elevation of the ground water. If the exact depth to ground water is unknown, the ground water depth can be estimated using either local water well information, published regional ground water information, data on file with the New Mexico State Engineer Office or the vertical distance from adjacent ground water or surface water.

2. Wellhead Protection Area

The operator should determine the horizontal distance from all water sources including private and domestic water sources. Water sources are defined as wells, springs or other sources of fresh water extraction. Private and domestic water sources are those water sources used by less than five households for domestic or stock purposes.

3. Distance To Nearest Surface Water Body

The operator should determine the horizontal distance to all downgradient surface water bodies. Surface water bodies are defined as perennial rivers, streams, creeks, irrigation canals and ditches, lakes, ponds and playas.

B. SOIL/WASTE CHARACTERISTICS

Soils/wastes within and beneath the area of the leak, spill or release should be evaluated to determine the type and extent of contamination at the site. In order to assess the level of contamination, observations should be made of the soils at the surface and samples of the impacted soils should be taken in the leak, spill or release area. Observations should note whether previous leaks, spills or releases have occurred at the site. Additional samples may be required to completely define the lateral and vertical extent of contamination. Soil samples should be obtained according to the sampling procedures in Sections V.A. and V.B. This may be accomplished using a backhoe, drill rig, hand auger, shovel or other means.

Initial assessment of soil contaminant levels is not required if an operator proposes to determine the final soil contaminant concentrations after a soil removal or remediation pursuant to section VI.A.

Varying degrees of contamination described below may co-exist at an individual site. The following sections describe the degrees of contamination that should be documented during the

assessment of the level of soil contamination:

1. Highly Contaminated/Saturated Soils

Highly contaminated/saturated soils are defined as those soils which contain a free liquid phase or exhibit gross staining.

2. Unsaturated Contaminated Soils

Unsaturated contaminated soils are defined as soils which are not highly contaminated/saturated, as described above, but contain benzene, toluene, ethylbenzene and xylenes (BTEX) and total petroleum hydrocarbons (TPH) or other potential fresh water contaminants unique to the leak, spill or release. Action levels and sampling and analytical methods for determining contaminant concentrations are described in detail in Sections IV. and V.

**** **(NOTE: Soils contaminated as a result of spills, leaks or releases of non-exempt wastes must be evaluated for all RCRA Subtitle C hazardous waste characteristics. The above definitions apply only to oilfield contaminated soils which are exempt from federal RCRA Subtitle C hazardous waste provisions and nonexempt oilfield contaminated soils which are characteristically nonhazardous according to RCRA Subtitle C regulations. Any nonexempt contaminated soils which are determined to be characteristically hazardous cannot be remediated using this guidance document and will be referred to the New Mexico Environment Department Hazardous Waste Program.)**

C. GROUND WATER QUALITY

If ground water is encountered during the soil/waste characterization of the impacted soils, a sample should be obtained to assess the incidents potential impact on ground water quality. Ground water samples should be obtained using the sampling procedures in Section V.C. Monitor wells may be required to assess potential impacts on ground water and the extent of ground water contamination, if there is a reasonable probability of ground water contamination based upon the extent and magnitude of soil contamination defined during remedial activities.

IV. SOIL AND WATER REMEDIATION ACTION LEVELS

A. SOILS

The sections below describe the OCD's recommended remediation action levels for soils contaminated with petroleum hydrocarbons. Soils contaminated with substances other than petroleum hydrocarbons may be required to be remediated based

upon the nature of the contaminant and it's potential to impact fresh waters, public health and the environment.

1. Highly Contaminated/Saturated Soils

All highly contaminated/saturated soils should be remediated insitu or excavated to the maximum extent practicable. These soils should be remediated using techniques described in Section VI.A to the contaminant specific level listed in Section IV.A.2.b.

2. Unsaturated Contaminated Soils

The general site characteristics obtained during the site assessment (Section III.A.) will be used to determine the appropriate soil remediation action levels using a risk based approach. Soils which are contaminated by petroleum constituents will be scored according to the ranking criteria below to determine their relative threat to public health, fresh waters and the environment.

a. Ranking Criteria

Depth To Ground Water	Ranking Score
<50 feet	20
50 - 99	10
>100	0

Wellhead Protection Area

<1000 feet from a water source, or;	
<200 feet from private domestic water source	
Yes	20
No	0

Distance To Surface Water Body

<200 horizontal feet	20
200 - 1000 horizontal feet	10
>1000 horizontal feet	0

b. Recommended Remediation Action Level

The total ranking score determines the degree of remediation that may be required at any given site. The total ranking score is the sum of all four individual ranking criteria listed in Section IV.A.2.a. The table below lists the remediation action level that may be required for the appropriate total ranking score.

(NOTE: The OCD retains the right to require remediation to more stringent levels than those proposed below if warranted by site specific conditions (ie. native soil type, location relative to population centers and future use of the site or other appropriate site specific conditions.)

	Total Ranking Score		
	>19	10 - 19	0 - 9
Benzene(ppm)*	10	10	10
BTEX(ppm)*	50	50	50
TPH(ppm)**	100	1000	5000

* A field soil vapor headspace measurement (Section V.B.1) of 100 ppm may be substituted for a laboratory analysis of the Benzene and BTEX concentration limits.

** The contaminant concentration for TPH is the concentration above background levels.

B. GROUND WATER

Contaminated ground water is defined as ground water of a present or foreseeable beneficial use which contains free phase products, dissolved phase volatile organic constituents or other dissolved constituents in excess of the natural background water quality. Ground water contaminated in excess of the WQCC ground water standards or natural background water quality will require remediation.

V. SOIL AND WATER SAMPLING PROCEDURES

Below are the sampling procedures for soil and ground water contaminant investigations of leaks, spills or releases of RCRA Subtitle C exempt oil field petroleum hydrocarbon wastes. Leaks, spills or releases of non-exempt RCRA wastes must be tested to demonstrate that the wastes are not characteristically hazardous according to RCRA regulations. Sampling for additional constituents may be required based upon the nature of the contaminant which was leaked, spilled or released.

A. HIGHLY CONTAMINATED OR SATURATED SOILS

The following method is used to determine if soils are highly contaminated or saturated:

1. Physical Observations

Study a representative sample of the soil for observable free petroleum hydrocarbons or immiscible phases and gross staining. The immiscible phase may range from a free hydrocarbon to a sheen on any associated aqueous phase. A soil exhibiting any of these characteristics is considered highly contaminated or saturated.

B. UNSATURATED CONTAMINATED SOILS

The following methods may be used for determining the magnitude of contamination in unsaturated soils:

1. Soil Sampling Procedures for Headspace Analysis

A headspace analysis may be used to determine the total volatile organic vapor concentrations in soils (ie. in lieu of a laboratory analysis for benzene and BTEX but not in lieu of a TPH analysis). Headspace analysis procedures should be conducted according to OCD approved industry standards or other OCD-approved procedures. Accepted OCD procedures are as follows:

a) Fill a 0.5 liter or larger jar half full of sample and seal the top tightly with aluminum foil or fill

a one quart zip-lock bag one-half full of sample and seal the top of the bag leaving the remainder of the bag filled with air.

b) Ensure that the sample temperature is between 15 to 25 degrees Celsius (59-77 degrees Fahrenheit).

c) Allow aromatic hydrocarbon vapors to develop within the headspace of the sample jar or bag for 5 to 10 minutes. During this period, the sample jar should be shaken vigorously for 1 minute or the contents of the bag should be gently massaged to break up soil clods.

d) If using a jar, pierce the aluminum foil seal with the probe of either a PID or FID organic vapor meter (OVM), and then record the highest (peak) measurement. If using a bag, carefully open one end of the bag and insert the probe of the OVM into the bag and re-seal the bag around the probe as much as possible to prevent vapors from escaping. Record the peak measurement. The OVM must be calibrated to assume a benzene response factor.

2. Soil Sampling Procedures For Laboratory Analysis

a. Sampling Procedures

Soil sampling for laboratory analysis should be conducted according to OCD approved industry standards or other OCD-approved procedures. Accepted OCD soil sampling procedures and laboratory analytical methods are as follows:

i) Collect samples in clean, air-tight glass jars supplied by the laboratory which will conduct the analysis or from a reliable laboratory equipment supplier.

ii) Label the samples with a unique code for each sample.

iii) Cool and store samples with cold packs or on ice.

iv) Promptly ship sample to the lab for analysis following chain of custody procedures.

v) All samples must be analyzed within the holding times for the laboratory analytical method specified by EPA.

b. Analytical Methods

All soil samples must be analyzed using EPA methods, or by other OCD approved methods and must

be analyzed within the holding time specified by the method. Below are laboratory analytical methods commonly accepted by OCD for analysis of soil samples analyzed for petroleum related constituents. Additional analyses may be required if the substance leaked, spilled or released has been anything other than petroleum based fluids or wastes.

i) Benzene, toluene, ethylbenzene and xylene

- EPA Method 602/8020

ii) Total Petroleum Hydrocarbons

- EPA Method 418.1, or;
- EPA Method Modified 8015

C. GROUND WATER SAMPLING

If an investigation of ground water quality is deemed necessary, it should be conducted according to OCD approved industry standards or other OCD-approved procedures. The following methods are standard OCD accepted methods which should be used to sample and analyze ground water at RCRA Subtitle C exempt sites (Note: The installation of monitor wells may not be required if the OCD approves of an alternate ground water investigation or sampling technique):

1. Monitor Well Installation/Location

One monitor well should be installed adjacent to and hydrologically down-gradient from the area of the leak, spill or release to determine if protectable fresh water has been impacted by the disposal activities. Additional monitor wells, located up-gradient and down-gradient of the leak, spill or release, may be required to delineate the full extent of ground water contamination if ground water underlying the leak, spill or release has been found to be contaminated.

2. Monitor Well Construction

a) Monitor well construction materials should be:

i) selected according to industry standards;

ii) chemically resistant to the contaminants to be monitored; and

iii) installed without the use of glues/adhesives.

b) Monitor wells should be constructed according to OCD approved industry standards to prevent migration of contaminants along the well casing. Monitor wells should be constructed with a minimum of fifteen

(15) feet of well screen. At least five (5) feet of the well screen should be above the water table to accommodate seasonal fluctuations in the static water table.

3. Monitor Well Development

When ground water is collected for analysis from monitoring wells, the wells should be developed prior to sampling. The objective of monitor well development is to repair damage done to the formation by the drilling operation so that the natural hydraulic properties of the formation are restored and to remove any fluids introduced into the formation that could compromise the integrity of the sample. Monitoring well development is accomplished by purging fluid from the well until the pH and specific conductivity have stabilized and turbidity has been reduced to the greatest extent possible.

4. Sampling Procedures

Ground water should be sampled according to OCD accepted standards or other OCD approved methods. Samples should be collected in clean containers supplied by the laboratory which will conduct the analysis or from a reliable laboratory equipment supplier. Samples for different analyses require specific types of containers. The laboratory can provide information on the types of containers and preservatives required for sample collection. The following procedures are accepted by OCD as standard sampling procedures:

a) Monitor wells should be purged of a minimum of three well volumes of ground water using a clean bailer prior to sampling to ensure that the sample represents the quality of the ground water in the formation and not stagnant water in the well bore.

b) Collect samples in appropriate sample containers containing the appropriate preservative for the analysis required. No bubbles or headspace should remain in the sample container.

c) Label the sample containers with a unique code for each sample.

d) Cool and store samples with cold packs or on ice.

e) Promptly ship sample to the lab for analysis following chain of custody procedures.

f) All samples must be analyzed within the holding times for the laboratory analytical method specified by EPA.

5. Ground Water Laboratory Analysis

Samples should be analyzed for potential ground water contaminants contained in the waste stream, as defined by the WQCC Regulations. All ground water samples must be analyzed using EPA methods, or by other OCD approved methods and must be analyzed within the holding time specified by the method. Below are OCD accepted laboratory analytical methods for analysis of ground water samples analyzed for petroleum related constituents. Additional analyses may be required if the substance leaked, spilled or release has been anything other than a petroleum based fluid or waste.

a. Analytical Methods

i.) Benzene, Toluene, Ethylbenzene and Xylene

- EPA Method 602/8020

ii.) Major Cations and Anions

- Various EPA or standard methods

iii.) Heavy Metals

- EPA Method 6010, or;
- Various EPA 7000 series methods

iv.) Polynuclear Aromatic Hydrocarbons

- EPA Method 8100

VI. REMEDIATION

The following discussion summarizes recommended techniques for remediation of contaminated soil and ground water as defined in Section IV.A. and IV.B. OCD approval for remediation of an individual leak, spill or release site is not required if the company is operating under an OCD approved spill containment plan. All procedures which deviate from the companies spill containment plan must be approved by OCD.

A. SOIL REMEDIATION

When RCRA Subtitle C exempt or RCRA nonhazardous petroleum contaminated soil requires remediation, it should be remediated and managed according to the criteria described below or by other OCD approved procedures which will remove, treat, or isolate contaminants in order to protect fresh waters, public health and the environment.

In lieu of remediation, OCD may accept an assessment of risk which demonstrates that the remaining contaminants will not pose a threat to present or foreseeable beneficial use of fresh waters, public health and the environment.

1. Contaminated Soils

Highly contaminated/saturated soils and unsaturated contaminated soils exceeding the standards described in Section IV.A. should be either:

a) Excavated from the ground until a representative sample from the walls and bottom of the excavation is below the contaminant specific remediation level listed in Section IV.A.2.b or an alternate approved remediation level, or;

b) Excavated to the maximum depth and horizontal extent practicable. Upon reaching this limit a sample should be taken from the walls and bottom of the excavation to determine the remaining levels of soil contaminants, or;

c) Treated in place, as described in Section VI.A.2.b.ii. - Treatment of Soil in Place, until a representative sample is below the contaminant specific remediation level listed in Section IV.A.2.b, or an alternate approved remediation level, or;

d) Managed according to an approved alternate method.

2. Soil Management Options

All soil management options must be approved by OCD. The following is a list of options for either on-site

treatment or off-site treatment and/or disposal of contaminated soils:

a. Disposal

Excavated soils may be disposed of at an off-site OCD approved or permitted facility.

b. Soil Treatment and Remediation Techniques

i. Landfarming

Onetime applications of contaminated soils may be landfarmed on location by spreading the soil in an approximately six inch lift within a bermed area. Only soils which do not contain free liquids can be landfarmed. The soils should be disced regularly to enhance biodegradation of the contaminants. If necessary, upon approval by OCD, moisture and nutrients may be added to the soil to enhance aerobic biodegradation.

In some high risk areas an impermeable liner may be required to prevent leaching of contaminants into the underlying soil.

Landfarming sites that will receive soils from more than one location are considered centralized sites and must be approved separately by the OCD prior to operation.

ii. Insitu Soil Treatment

Insitu treatment may be accomplished using vapor venting, bioremediation or other approved treatment systems.

iii. Alternate Methods

The OCD encourages alternate methods of soil remediation including, but not limited to, active soil aeration, composting, bioremediation, solidification, and thermal treatment.

B. GROUND WATER REMEDIATION

1. Remediation Requirements

Ground water remediation activities will be reviewed and approved by OCD on a case by case basis prior to commencement of remedial activities. When contaminated ground water exceeds WQCC ground water standards, it

should be remediated according to the criteria described below.

a. Free Phase Contamination

Free phase floating product should be removed from ground water through the use of skimming devices, total-fluid type pumps, or other OCD-approved methods.

b. Dissolved Phase Contamination

Ground water contaminated with dissolved phase constituents in excess of WQCC ground water standards can be remediated by either removing and treating the ground water, or treating the ground water in place. If treated waters are to be disposed of onto or below the ground surface, a discharge plan must be submitted and approved by OCD.

c. Alternate Methods

The OCD encourages other methods of ground water remediation including, but not limited to, air sparging and bioremediation. Use of alternate methods must be approved by OCD prior to implementation.

VII. TERMINATION OF REMEDIAL ACTION

Remedial action may be terminated when the criteria described below have been met:

A. SOIL

Contaminated soils requiring remediation should be remediated so that residual contaminant concentrations are below the recommended soil remediation action level for a particular site as specified in Section IV.A.2.b.

If soil action levels cannot practicably be attained, an evaluation of risk may be performed and provided to OCD for approval showing that the remaining contaminants will not pose a threat to present or foreseeable beneficial use of fresh water, public health and the environment.

B. GROUND WATER

A ground water remedial action may be terminated if all recoverable free phase product has been removed, and the concentration of the remaining dissolved phase contaminants in the ground water does not exceed New Mexico WQCC water quality standards or background levels. Termination of remedial action will be approved by OCD upon a demonstration of completion of remediation as described in above.

VIII. FINAL CLOSURE

Upon termination of any required remedial actions (Section VII.) the area of a leak, spill or release may be closed by backfilling any excavated areas, contouring to provide drainage away from the site, revegetating the area or other OCD approved methods.

IX. FINAL REPORT

Upon completion of remedial activities a final report summarizing all actions taken to mitigate environmental damage related to the leak, spill or release will be provided to OCD for approval.