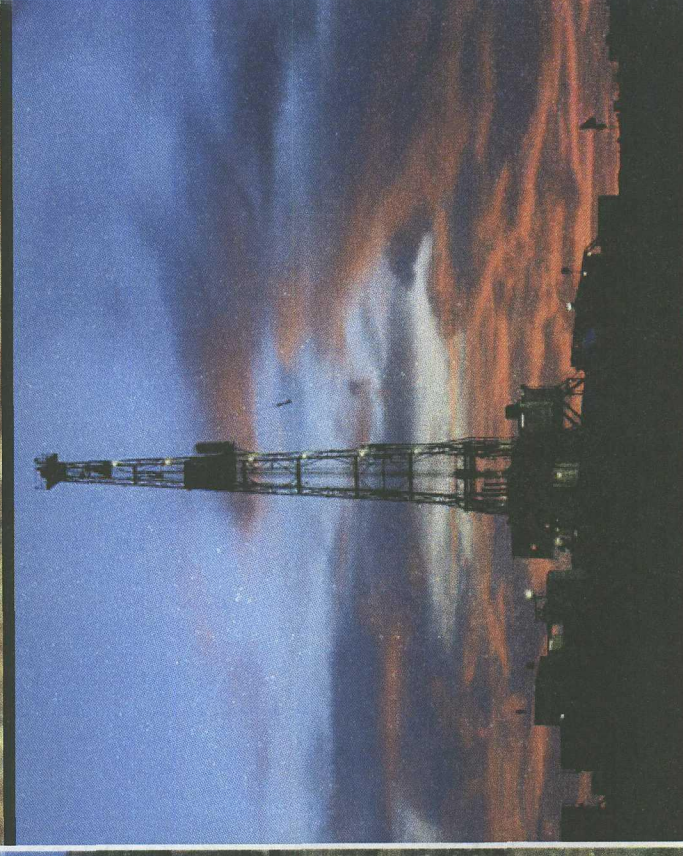
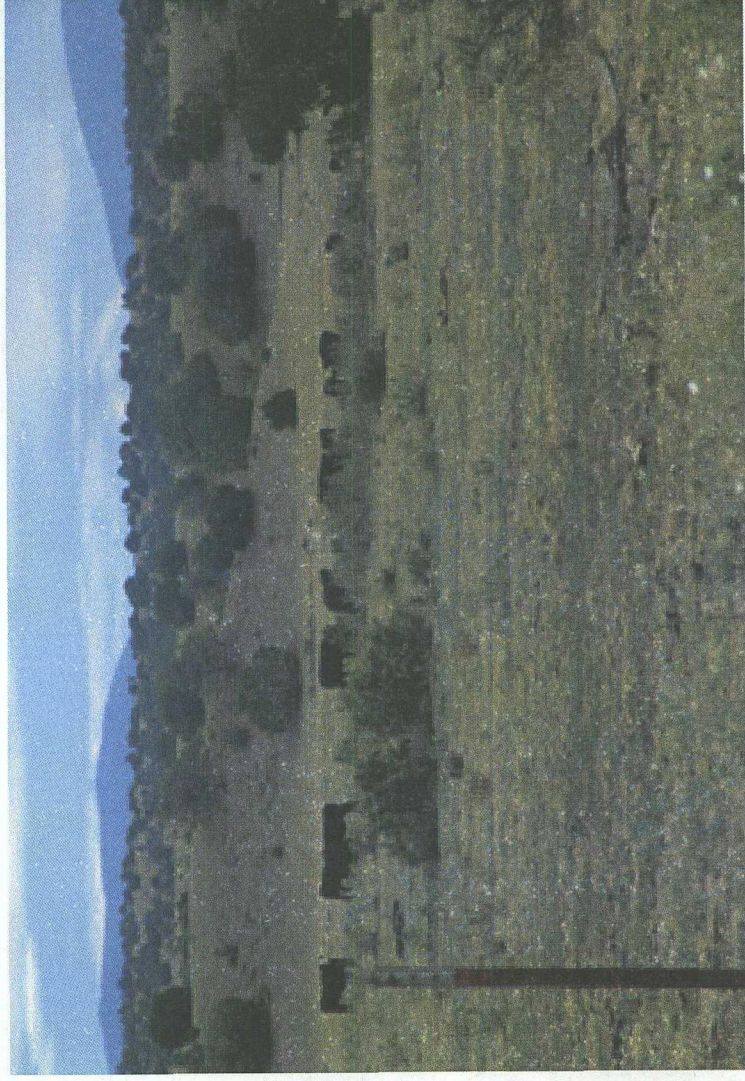


1 R - 2669

GENERAL
CORRESPONDENCE

May 20, 2011

Working Together for a better New Mexico



Today's Agenda

New Mexico Salt Water Disposal

Proposes

*Pseudo In-Situ Remediation
For A Large Produced Water Spill*

Northern Lea County, NM



Critical Elements and Players

- Large Produce Water Release-NMSWD
- Prairie Chicken Habitat Area- NMGF
- On State Trust Lands- NMSLO
- Unique Remediation Issues-NMOCD/SLO
- Local Interest- Public and Landowners

Goals regarding this site are:

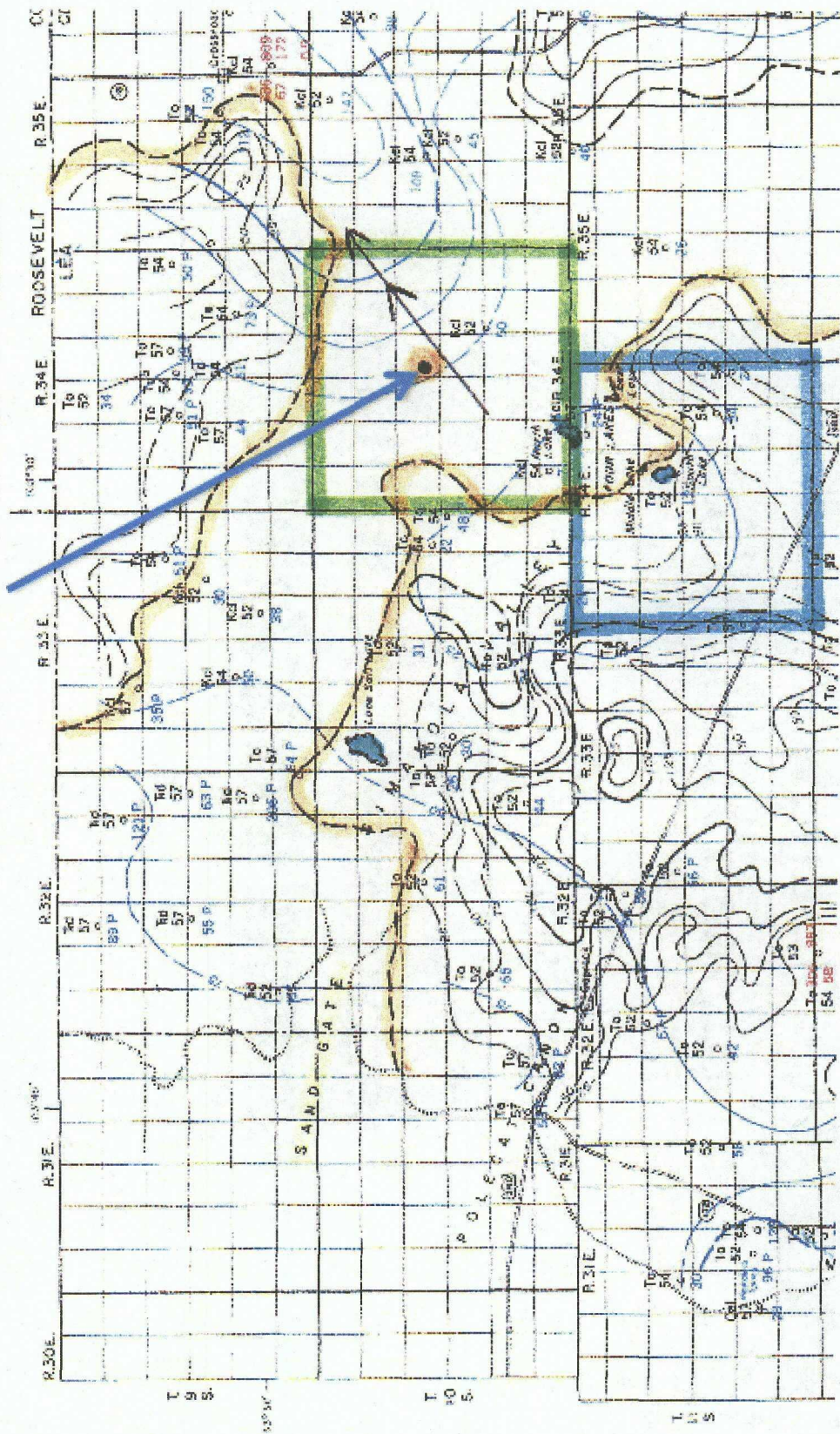
- A. Restoring the surface with as little surface disturbance as possible, in order to conserve natural resources and minimize collateral damage to protect wildlife habitat.***
- B. Define the depth and extent of the vadose zone and groundwater contamination, if present, and determine if the vadose zone is sufficient in its physiochemical composition to allow a surface agronomic type treatment of the oily soils and an ionic exchange method for the salt- contaminated areas.***
- C. Perform a cost effective remediation plan to accomplish the above concerns while ensuring that the goals of the NMSLO, OCD and G&F are carried out in a timely and conscientious manner.***

Why In-Situ rather than Dig & Haul?

- Disturbance Issues Concerning the LPC
- OCD Options Generally Not Cost Effective
- Pseudo In-Situ Plan will Remove More Source
- Site Conditions & Issues
 1. Lack of shallow groundwater under the site
 2. Access Issues

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

New Mexico Salt Water Leak Site



Site Groundwater Profile:

Layman's Description

2-5 ft Sandy top soil

5-10 ft Caliche

30-40 ft Fine sand, sandy loam, sandstone

Man-Made Produced Water-Zone

25-35 ft Yellow Clay (Top of Tucumcari Shale)

20-30 ft Clay & Limestone stringers

10-20 ft Limestone- Water Bearing Unit-Confined

Base of Lower Tucumcari Shale

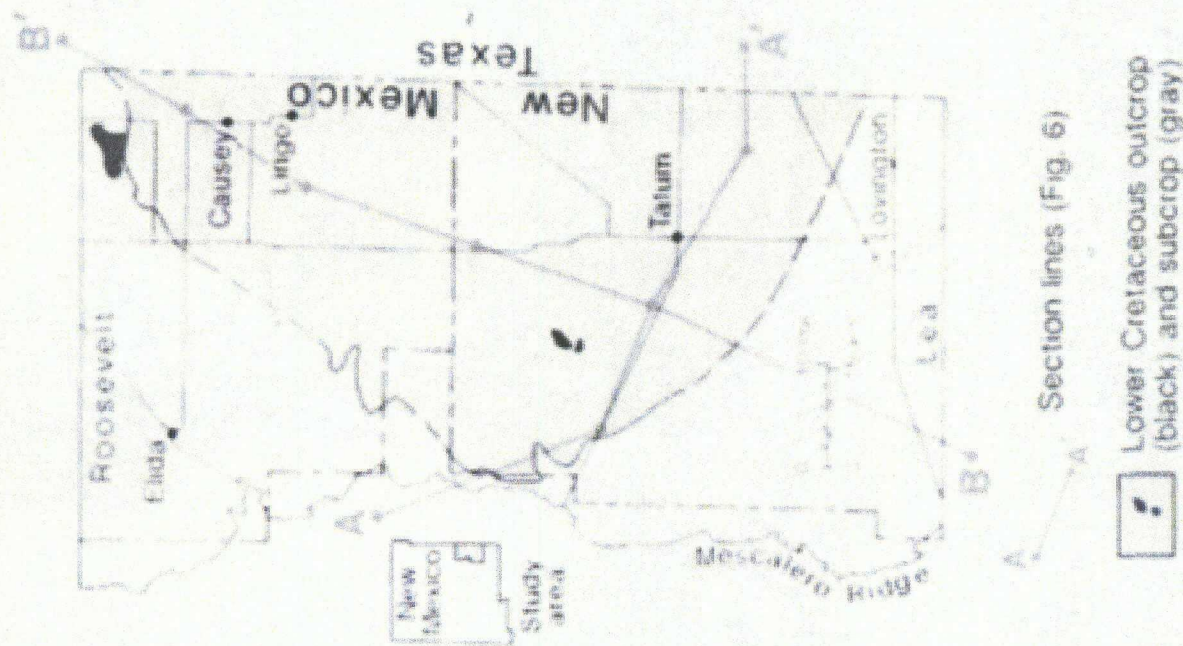


FIGURE 1—Lower Cretaceous outcrop and subcrop areas in the southern High Plains region of New Mexico. Refer to Fig. 7 for cross sections.

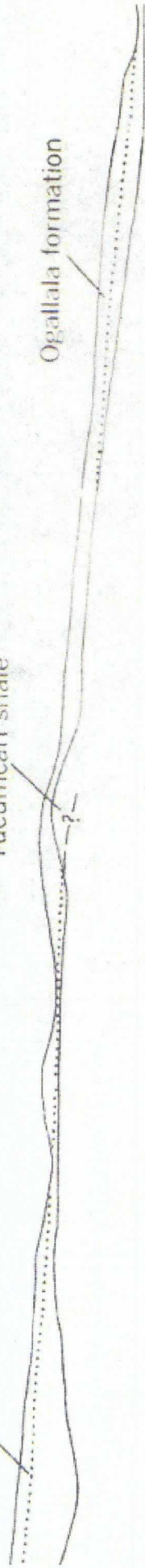
Age	Sys-tem	Group	Formation	Lithology
-100 m.y.	Lower Cretaceous	Washita Group	Duck Creek Formation	Yellow-brown to dark blue-gray shale with thin limestone and siltstone interbeds
			?	
			?	
		Fredericksburg Group	Kiamichi Formation	
			Comanche Peak Formation	Irregularly bedded argillaceous limestone with shell & clay interbeds
			Walnut Formation	Yellow to light-blue clay with some yellow sand
		Trinity Group	Antlers Formation	White to light-blue sand and sandstone with gravel lenses toward the base
-135 m.y.				

FIGURE 2—Composite stratigraphic section of Lower Cretaceous strata under the southern High Plains of New Mexico.

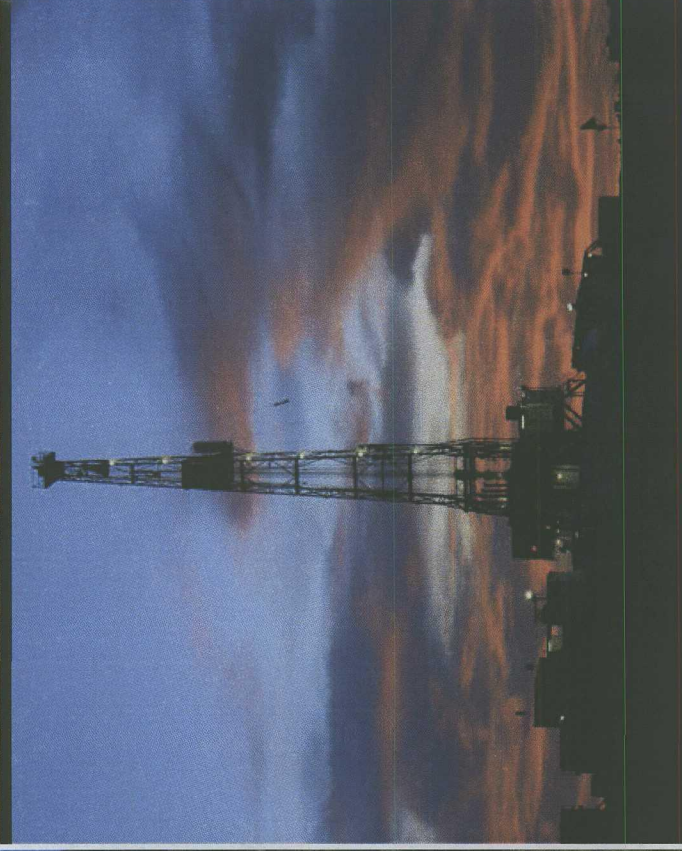
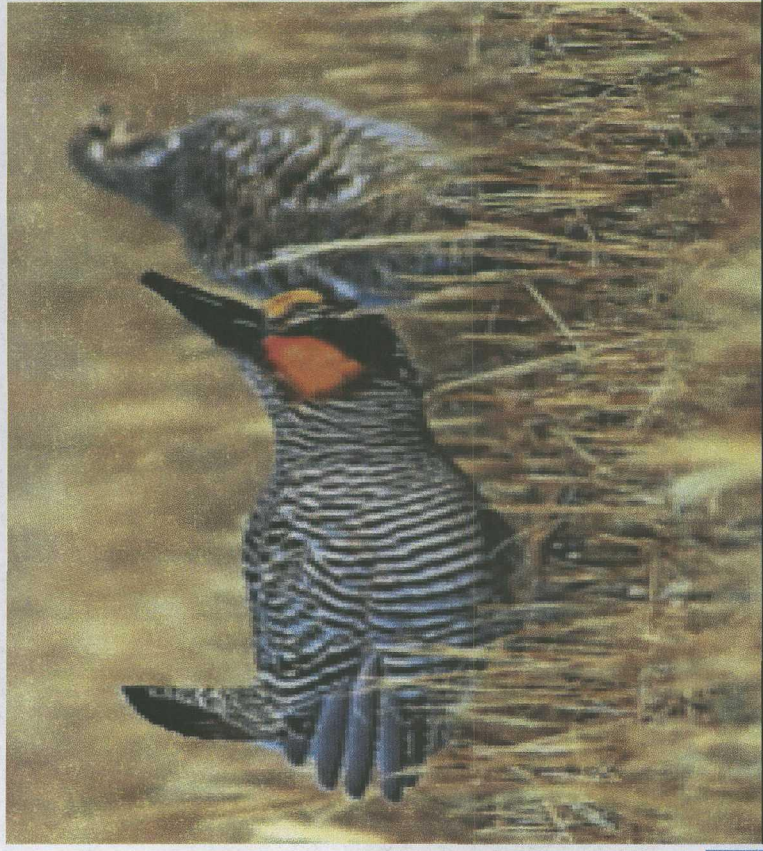
Water table in the deposits
of Cenozoic age

Tucumcari shale

Opallala formation



Working Together for a better New Mexico



NMSWD Site Investigation

Johnson Lease

Main Concerns Regarding This Site:

- Delineating lateral and vertical extent
- Determine impact on groundwater
- Develop remediation plan
 - Restores surfaces
 - Conserves natural resources

Preliminary Investigation

- Reconnaissance EM-38 survey
- Identified two separate leak sources
- Constructed 5 soil borings
 - 3 to a maximum depth of 15-ft
 - hydrocarbon an issue in surface
 - salinity most limiting factor
 - analysis summarized in Table 1

Scope of Field Investigation

- EM Survey to Evaluate Entire Soil Profile
 - EM-38 vertical dipole 0-5 ft profile
 - EM-31 vertical dipole 0-18 ft profile
- Four Shallow Borings to Correlate to EM-38
 - constructed to 5-ft
 - samples collected in 1 ft intervals
- Five Deep Borings to Delineate Vertical Extent
 - constructed from 100 to 110 feet
 - samples collected in 5- to 10-ft intervals

Surface Soil Impact

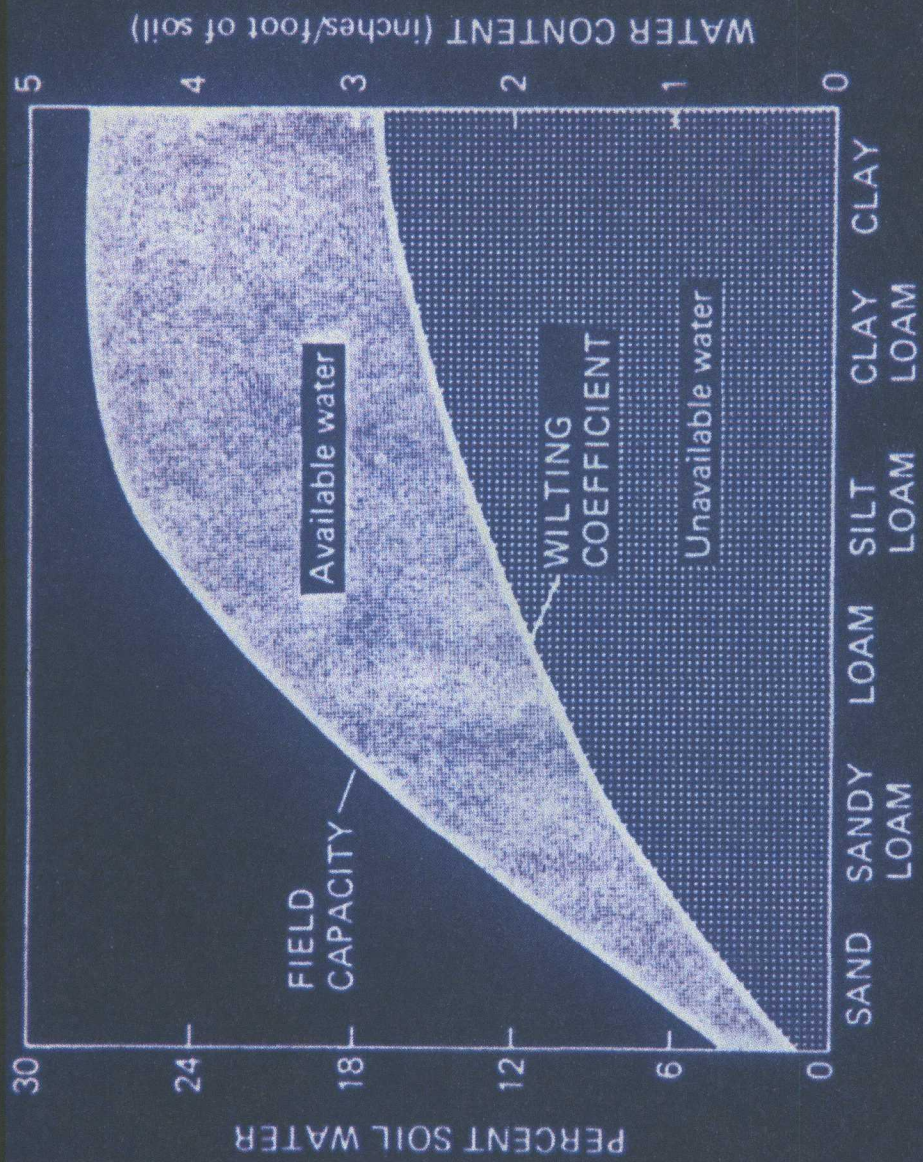
- EM-38 survey revealed 1.6 acre impacted soil requiring treatment to restore agronomic productivity.
- Proposed restoration:
 - Ion exchange amendment
 - Controlled leaching below root zone
 - Addition of organic matter to adsorb salt

Ion Exchange Amendment

- Displaces sodium (Na^+) salt in soil with other active ions
- Active ions used in Desalt Plus TM include calcium (Ca^{+2}), potassium (K^+) and ammonium (NH_4^+)
- Applied in aqueous solution to move Na^+ out of profile, then flushed with more water to move salt out of the root zone

Controlled Leaching

- Exchange amendment added in a total of 4.3 inches of water (4.7 acre-inches)
- Additional 8.6 inches of water used to move salt deep into soil profile
- Surface 2-ft of soil wet to field capacity to facilitate augmented bioremediation of petroleum hydrocarbon adding 4.3 inches of water to profile



Available Water Capacities of Various Soil Textures

Texture	Water Per Ft. of Soil (in.)
Medium sand	0.9
Fine sand	1.1
Sandy loam	1.4
Fine sandy loam	1.8
Loam	2.0
Silt loam	2.1
Clay loam	2.0
Clay	1.4

Addition of Organic Matter

- Functions to manage salt in two ways:
 - physically adsorbs salt reducing its availability in soil solution
 - increases soils ability to hold water thereby diluting the concentration of salt in soil solution
- Also improves soil physical properties deteriorated by sodium

Cation Exchange Capacities (CEC) of Common Exchange Materials in Soils

Material	CEC meq/100g
Organic matter	100 - 300
Vermiculite	100 - 150
Montmorillonite	60 - 100
Chlorite	20 - 40
Illite	20 - 40
Kaolinite	2 - 16
Sesquioxides	0

Soil Type: Weswood silt loam
Plant Type: Corn, Bean, Sunflower
Treatment: 1% $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
Amendment: 40,000 lb/Ac Peat

Soil Type: Weswood silt loam
Plant Type: Corn, Bean, Sunflower
Treatment: 1% $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
Amendment: 80,000 lb/Ac Peat

Soil Type: Weswood silt loam
Plant Type: Corn, Bean, Sunflower
Treatment: 1% $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
Amendment: 40,000 lb/Ac Peat

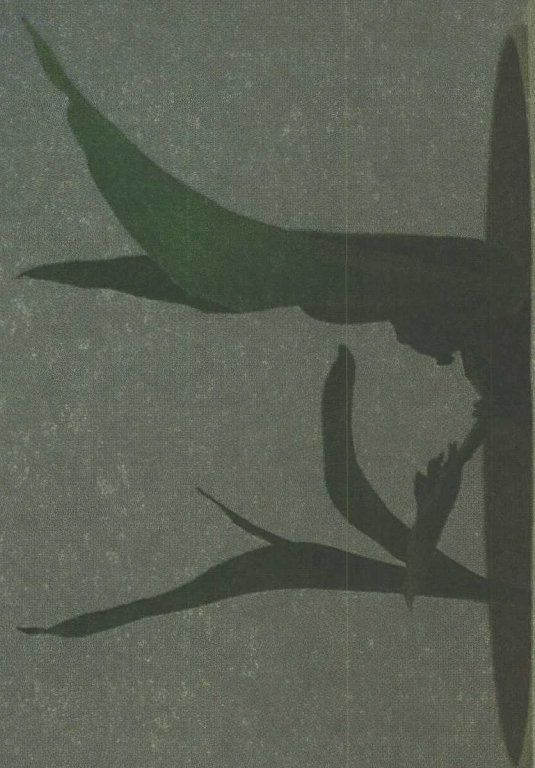
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Amendment: 40,000 lb/Ac Peat



Soil Type: Weswood silt loam
Plant Type: Corn, Bean, Sunflower
Treatment: 3,000 mg/kg NaCl
1% $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
Amendment: 40,000 lb/Ac Peat



Soil Type: Weswood silt loam
Plant Type: Corn, Bean, Sunflower
Treatment: 3,000 mg/kg NaCl
1% $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
Amendment: 80,000 lb/Ac Peat

Bore ID	Depth ft	Chemical Parameter†						
		Soil	Volatile Organics				TPH	
			Benzene	Ethyl Benzene	Toluene	Xylenes	GRO	DRO
West Source	0.5	3440	11.3	22.5	42.2	87.7	5460	32400
	5	4800	<0.025	<0.025	0.033	<0.025	<10	53.7
#1	0.5	282	NA	NA	NA	NA	NA	NA
	5	7750	NA	NA	NA	NA	NA	NA
	10	4245	NA	NA	NA	NA	NA	NA
#2	15	3182	NA	NA	NA	NA	NA	NA
	.5	113	NA	NA	NA	NA	NA	NA
	5	5115	NA	NA	NA	NA	NA	NA
	10	3510	NA	NA	NA	NA	NA	NA
	15	5250	NA	NA	NA	NA	NA	NA
#3	0.5	966	NA	NA	NA	NA	NA	NA
	5	495	NA	NA	NA	NA	NA	NA
	10	206	NA	NA	NA	NA	NA	NA
#4	15	118	NA	NA	NA	NA	NA	NA
	0.5	134	NA	NA	NA	NA	NA	NA
	5	3542	NA	NA	NA	NA	NA	NA
	10	5197	NA	NA	NA	NA	NA	NA

**TABLE 2 – SHALLOW BORINGS PASTE EC AND PASTE MOISTURE
NEW MEXICO SALT WATER DISPOSAL CO., INC
SB1, SB2, SB3 and SB4**

Boring ID	Depth Interval	Saturated Paste Parameter	
		EC	Moisture
	ft	mmhos/cm	%
SB1	0-1	39.9	27.1
	1-2	50.8	26.2
	2-3	55.0	37.1
	3-4	53.3	36.8
	4-5	No sample auger refusal	
SB2	0-1	0.62	26.0
	1-2	0.23	26.5
	2-3	0.17	34.7
	3-4	0.24	37.0
	4-5	0.32	37.6
SB3	0-1	40.9	37.5
	1-2	28.7	36.9
	2-3	28.7	40.8
	3-4	31.0	43.2
	4-5	No sample auger refusal	
SB4	0-1	19.6	26.3
	1-2	25.8	25.2
	2-3	19.7	36.1
	3-4	14.6	36.7

TABLE 4A – FIELD CHLORIDE, EC, TDS AND PID ANALYSES
NEW MEXICO SALT WATER DISPOSAL CO., INC
East Leak Source

Boring ID	Depth Interval	Chemical Parameter†		
		Chloride	EC	TDS
	ft	ppm	mmhos/cm	ppm
East Leak Source	5	6495	17.7	11328
	11-13	5654	12.8	8192
	14.5	5147	12.1	7744
	19.5	5981	11.8	7552
	28.3	6321	13.7	8760
	38.5	10699	18.5	11840
	47-48	7831	15.7	10048
	48.5	5317	14.0	8960
	57-58	631	0.79	506
	74-75	840	5.67	3629
	79-80	4010	4.87	3117
	85-86	2669	9.01	5766
	97-98	7621	16.9	10816

†TDS calculated from EC

TABLE 4B – FIELD CHLORIDE, EC, TDS AND PID ANALYSES
NEW MEXICO SALT WATER DISPOSAL CO., INC
Northwest Background

Boring ID	Depth Interval	Chemical Parameter [†]			
		Chloride	EC	TDS	PID
	ft	ppm	mmhos/cm	ppm	ppm
NW Background	0.5	74	0.02	12.8	0.0
	9.75	83	0.10	64.0	0.6
	20	50	0.18	115	1.0
	29.3	54	0.15	96	7.2
	40	58	0.19	122	1.0
	50	1145	3.17	2029	2.3
	60	334	1.01	646	1.0
	70	301	0.78	499	0.6
	80	390	0.27	173	0.6
	90	256	0.80	512	0.3
	100	325	0.57	365	0.9
	110	1145	NA	NA	NA

[†]NA refers to not analyzed; TDS calculated from EC

TABLE 4C – FIELD CHLORIDE, EC, TDS AND PID ANALYSES
NEW MEXICO SALT WATER DISPOSAL CO., INC
Northeast Background

Boring ID	Depth Interval	Chemical Parameter†			
		Chloride	EC	TDS	PID
	ft	ppm	mmhos/cm	ppm	ppm
NE Background	0.5	74	0.08	51.2	0.0
	10		No Sample		
	20	50	0.33	211	.1
	30		No Sample		
	40	1843	1.09	698	.2
	50	124	0.38	243	1.0
	60	130	0.19	122	.3
	70	112	0.36	230	.1
	80	108	0.27	173	.2
	90	65	0.70	448	0.6
	101	74	0.80	512	0.5

†NA refers to not analyzed; TDS calculated from EC

TABLE 4D – FIELD CHLORIDE, EC, TDS AND PID ANALYSES
NEW MEXICO SALT WATER DISPOSAL CO., INC
South Background

Boring ID	Depth Interval	Chemical Parameter†			
		Chloride	EC	TDS	PID
	ft	ppm	mmhos/cm	ppm	ppm
South Background	0.5	126	0.03	19.2	0.3
	9.7	139	0.13	83.2	0.0
	19.2	195	0.31	198	0.1
	29			No Sample	
	39.75	342	0.92	589	0.2
	49.33	2803	9.17	5869	0.0
	60-61	1006	1.83	1171	0.2
	69.5	1222	4.99	3194	0.1
	79.5	709	2.01	1286	0.0
	90	1201	0.80	512	0.1
	100	819	0.57	365	0.2

†TDS calculated from EC

TABLE 4E – FIELD CHLORIDE, EC, TDS AND PID ANALYSES
NEW MEXICO SALT WATER DISPOSAL CO., INC
West Leak Source

Boring ID	Depth Interval	Chemical Parameter†		
		Chloride	EC	TDS
	ft	ppm	mmhos/cm	ppm
West Leak Source	8-10	4823	9.48	6067
	18-20	3507	9.06	5798
	28-30	3060	7.21	4614
	38-40	6128	7.62	4877
	50	3575	10.2	6528
	60	No Sample		
	70	909	NA	NA
	80	437	NA	NA
	90	243	NA	NA
	100	103	1.27	3629
	110	137	1.31	3117
				1.1

†NA refers to not analyzed; TDS calculated from EC

TABLE 5 - LABORATORY CONFIRMATION ANALYSES
NEW MEXICO SALT WATER DISPOSAL CO., INC

Deep Boring Soil Samples

Parameter*	Analytical Results by Source and Depth, mg/kg***									
	East Leak 90 ft	East Leak 98 ft	NE Bkgd 40 ft	NE Bkgd 90 ft	NE Bkgd 101 ft	S Bkgd 79.5 ft	West Leak 10 ft	West Leak 100 ft	West Leak 110 ft	
Inorganic										
Chloride, CL	7360	7360	NA	NA	<16	NA	NA	NA	NA	
Chloride, ELI	NA	10200	434	<10	12	781	6650	79	206	
Organics										
TPH**										
GRO C6-C10	<10.0	<10.0	NA	NA	<10.0	NA	NA	NA	NA	
DRO >C10-C28	<10.0	<10.0	NA	NA	<10.0	NA	NA	NA	NA	
Volatiles										
Benzene	<0.050	<0.050	NA	NA	<0.050	NA	NA	NA	NA	
Toluene	0.128	0.128	NA	NA	<0.050	NA	NA	NA	NA	
Ethyl Benzene	<0.050	<0.050	NA	NA	<0.050	NA	NA	NA	NA	
Total Xylenes	<0.050	<0.050	NA	NA	<0.050	NA	NA	NA	NA	

Notes:

*CL refers to Cardinal Laboratories; ELI refers to Energy Laboratories Inc.

**TPH refers to total petroleum hydrocarbon; GRO refers to gas range organics; DRO refers to diesel range organics

***NA refers to not analyzed



New Mexico Salt Water Disposal Company

October, 2010 Brine Spill

1RP-2669

Remediation Plan

RECEIVED

Form C-141
Revised October 10, 2003

State of New Mexico
Energy Minerals and Natural Resources
Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

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

Release Notification and Corrective Action REVISED

OPERATOR ☒ Initial Report ☐ Final Report

Name of Company: New Mexico Salt Water Disp. Co.
Contact: James B. Read
Address: P. O. Box 1518, Roswell, NM 88202
Telephone No.: 575-622-3770 ext. 310
Facility Name: Pipeline
Facility Type: Pipeline

Surface Owner: State of New Mexico Mineral Owner: NEEDBY WELL NUMBER STATE 001
APL # 30.025.01814.00.00

LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the North/South Line	Feet from the East/West Line	County	Lea
M	15	10S	34E	330	330	West	Lea

Latitude Longitude

NATURE OF RELEASE

Type of Release: Produced Water
Volume of Release: + 1200 bbls
Volume Recovered: 1200 bbls

Source of Release: Tank
Date and Hour of Occurrence: Weekend
Was Immediate Notice Given? ☒ Yes ☐ No ☐ Not Required
Occured: 10/03/2010 P.M.

By Whom? James B. Read
Date and Hour: 10/04/2010
Was a Watercourse Reached? ☐ Yes ☒ No
If YES, Volume Impacting the Watercourse.

If a Watercourse was Impacted, Describe Fully.*

Describe Cause of Problem and Remedial Action Taken.*

Leak in Pipeline probably due to weather in area. Rain, lightening and increment weather in area.

Drain pipeline, recovered water.

Describe Area Affected and Cleanup Action Taken.*

Water immediately recovered and drain pipeline. Determining lateral and vertical extent of impacted soil. Will submit remediation plan to OCD for approval and further action.

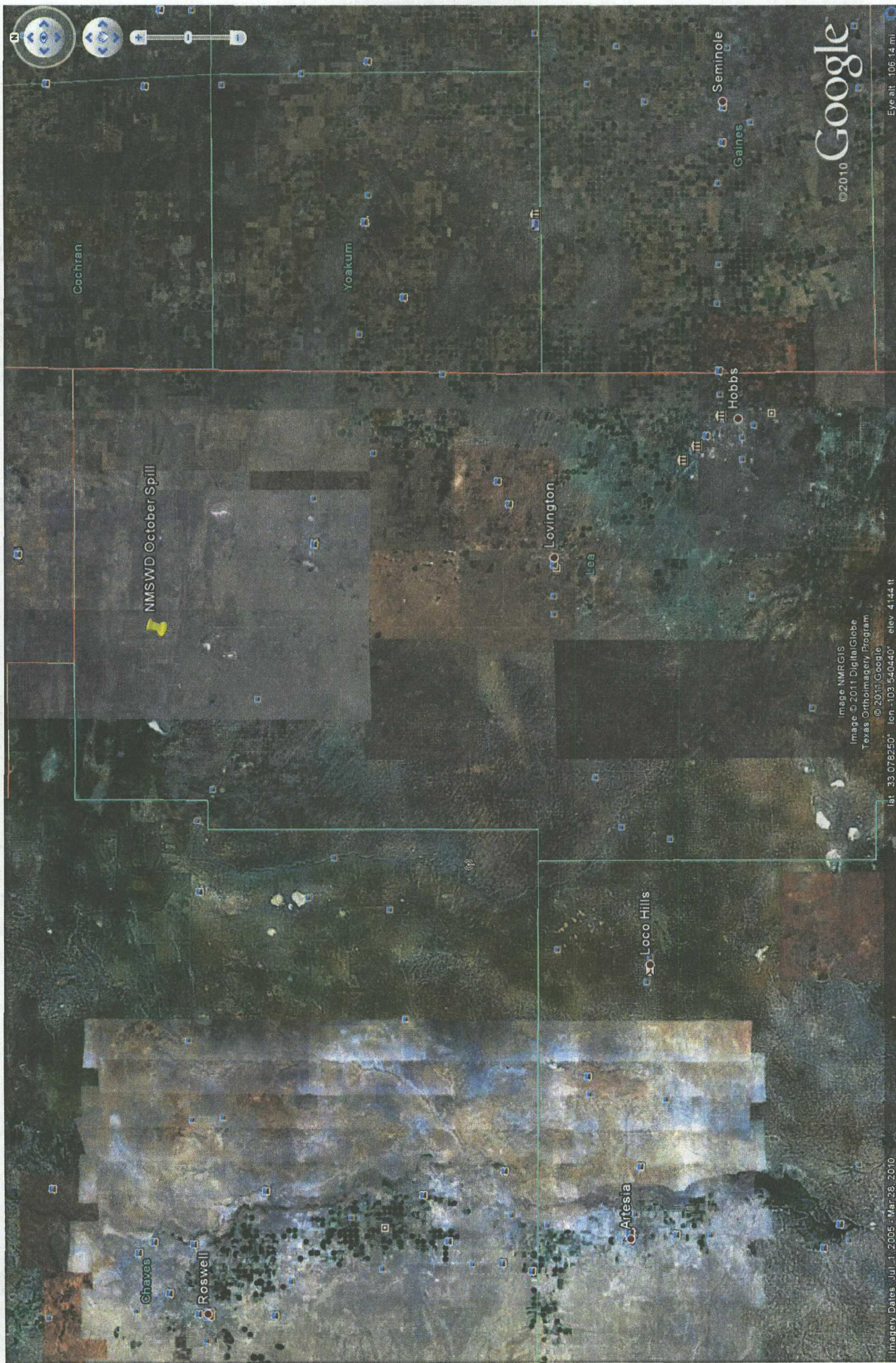
I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger 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.

OIL CONSERVATION DIVISION

Signature: James B. Read ENV. ENGIN. EE
Printed Name: James B. Read Approved by James B. Read
Title: Agent
Approval Date: 10/28/10 Expiration Date: 12/28/10

E-mail Address: jbro@brightok.net
Date: 10/22/2010 Phone: 575-622-3770
Conditions of Approval: DELIVERABLE TO CLEAN-UP SUBMIT FINAL Attached ☐
C-141 BY 12/29/10. 11RP-12-10-2669

* Attach Additional Sheets if Necessary



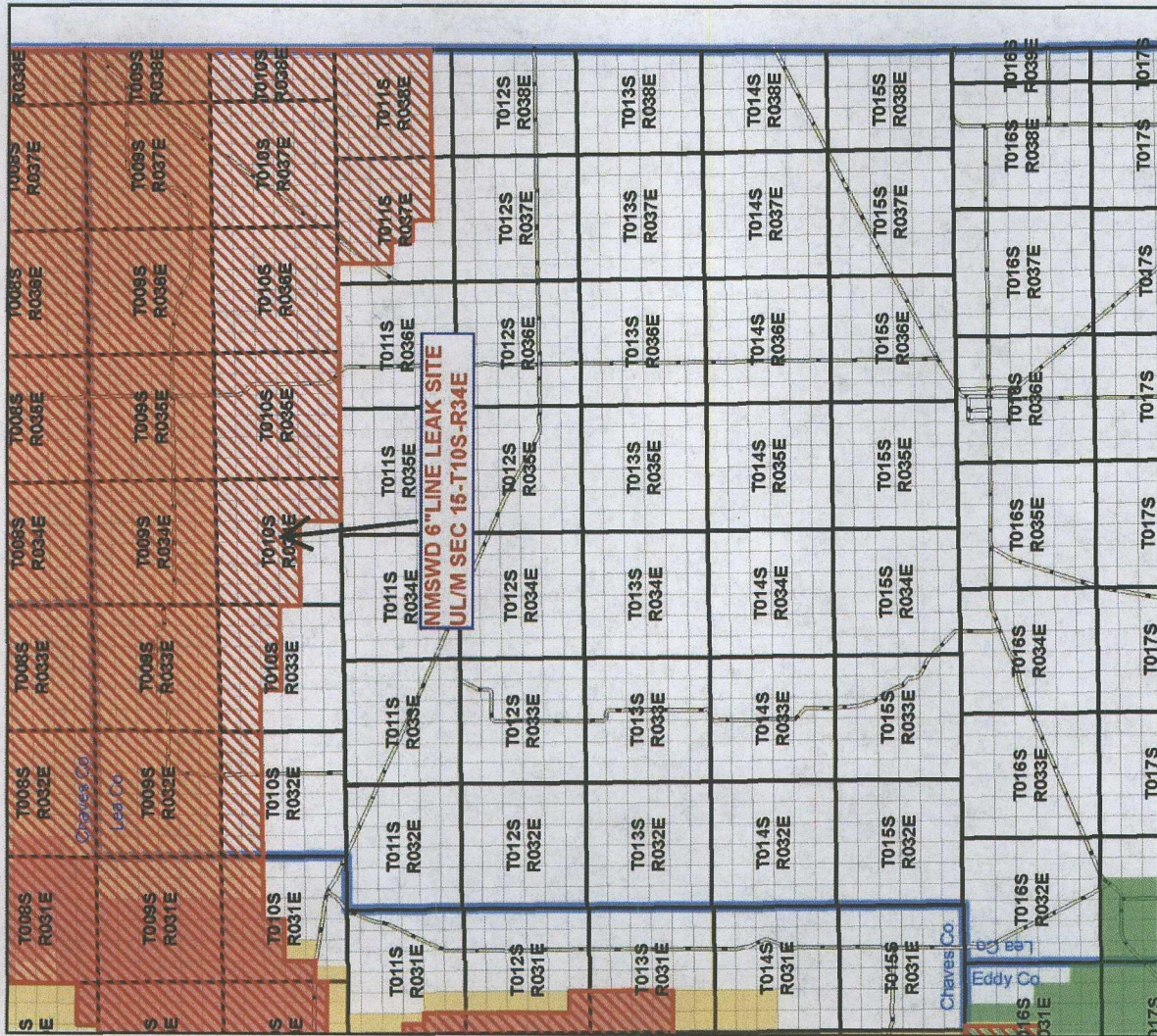
NMSWD October Spill

Google
©2010

lat: 33.078250° lon: -103.540440° elev: 4144 ft

Image NMRGIS
Image ©2011 DigitalGlobe
Texas Orthoimagery Program
© 2010 Google

Imagery Dates: Jul 1, 2005; Mar 28, 2010



LPC Timing Area 2011

Northern Map

This Timing Restriction Map
only applies to Carlsbad FO

LPC Timing

- NM Townships
- NM Sections
- Major Roads
- NM Counties

RMPA ZONES

- Core Management Area
- Primary Population Area
- Hidden Evaluation Areas
- Sparse & Scattered Population Area
- Isolated Population Area

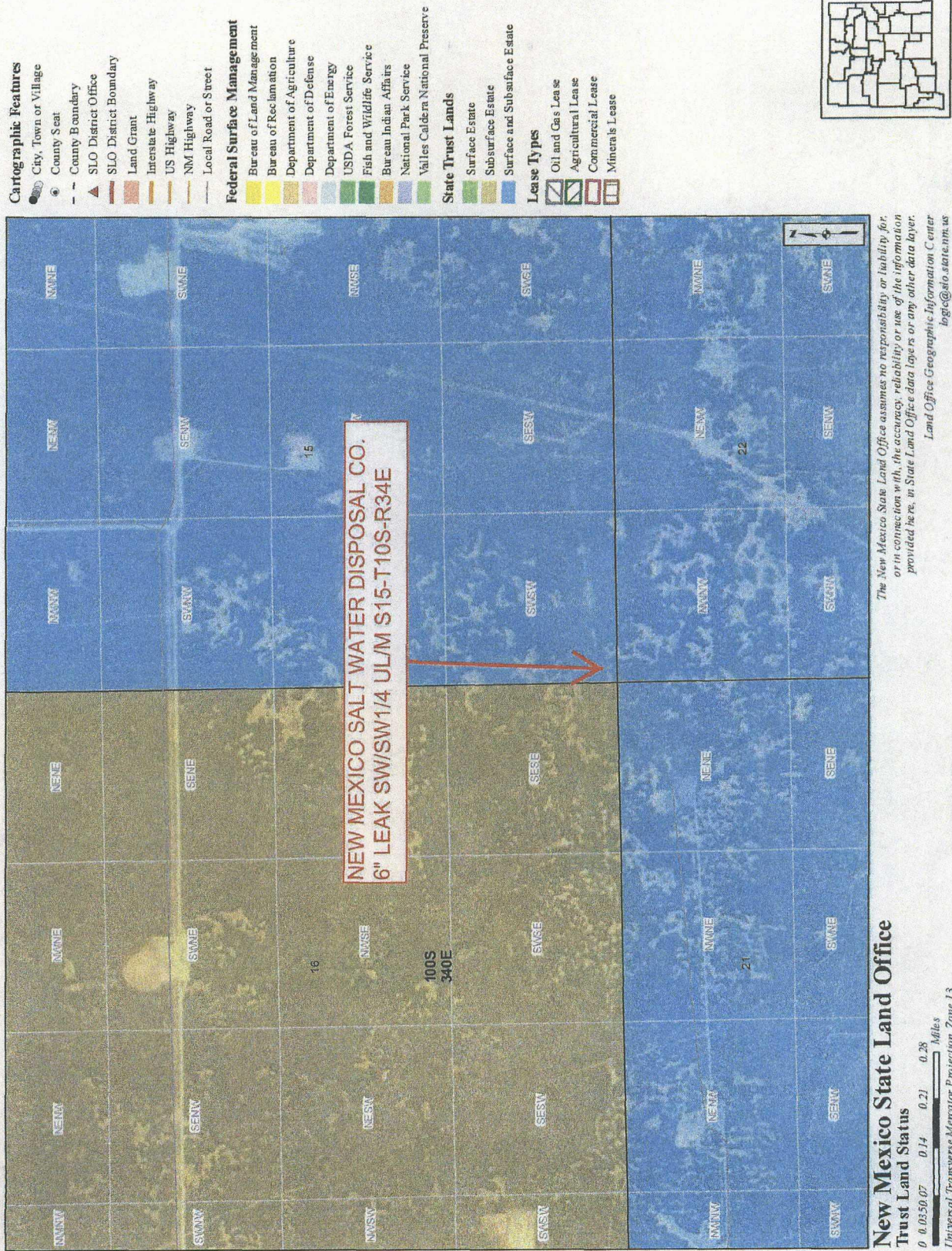


Figure 1. New Mexico Salt Water Disposal Co. Leak Site

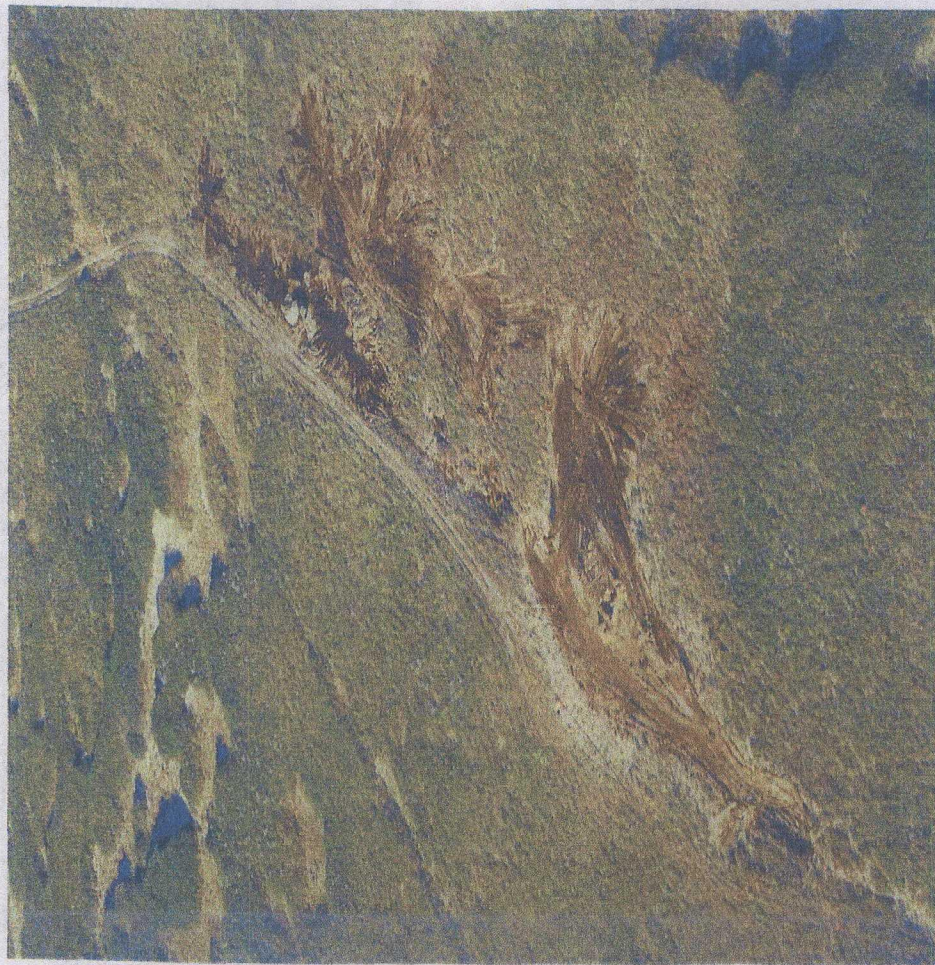


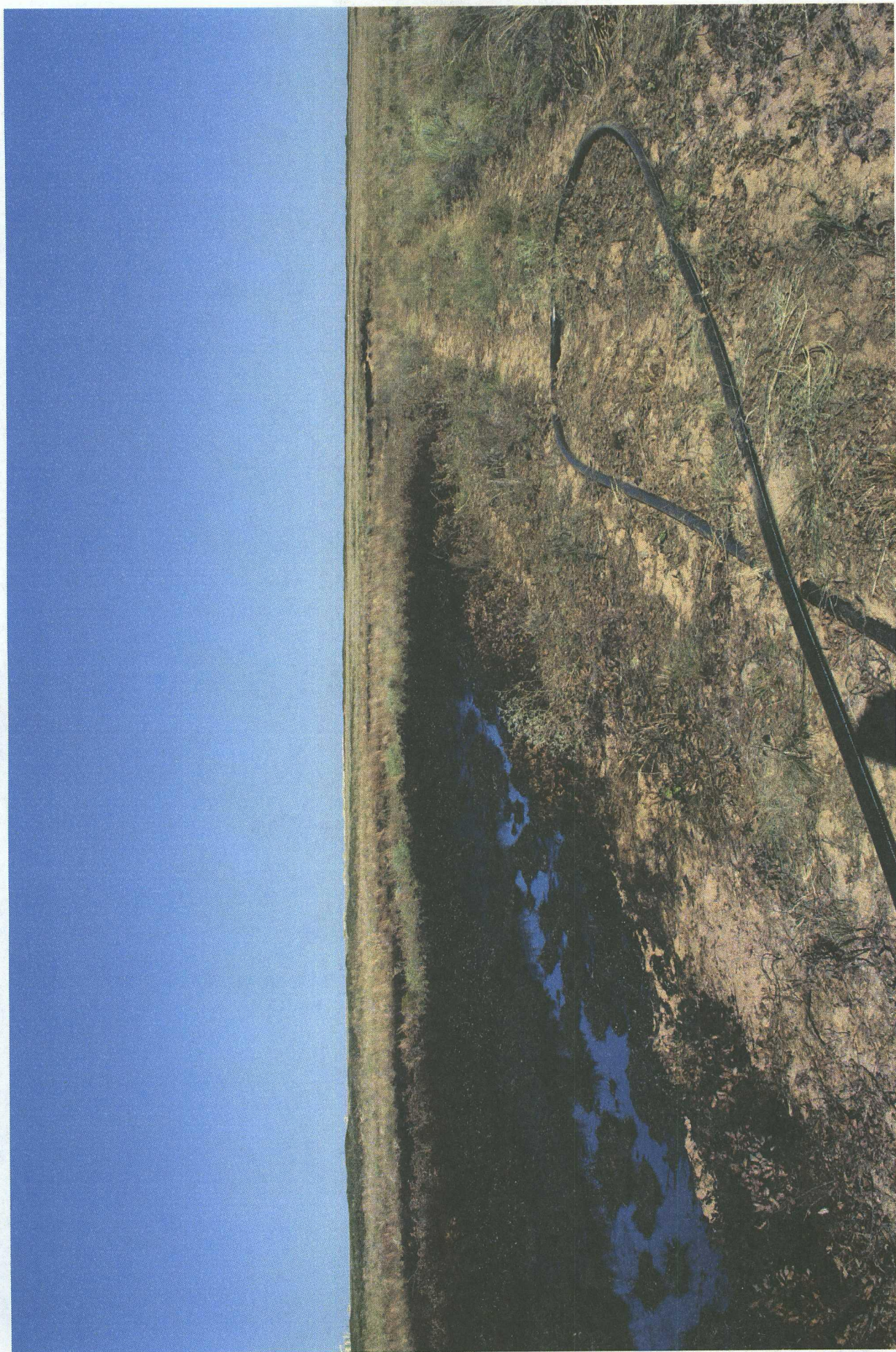
Figure 3. Aerial View of Stained Soil



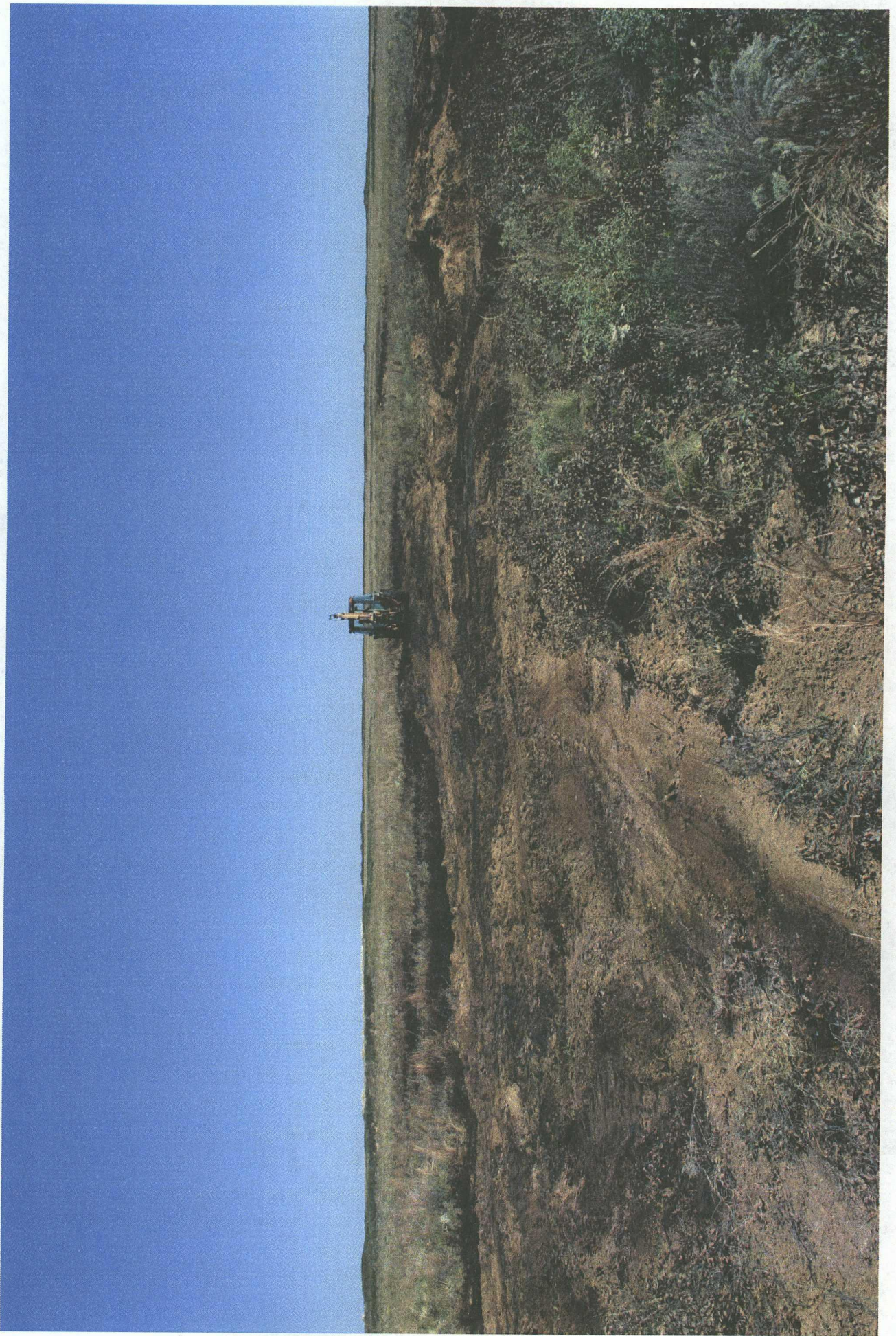






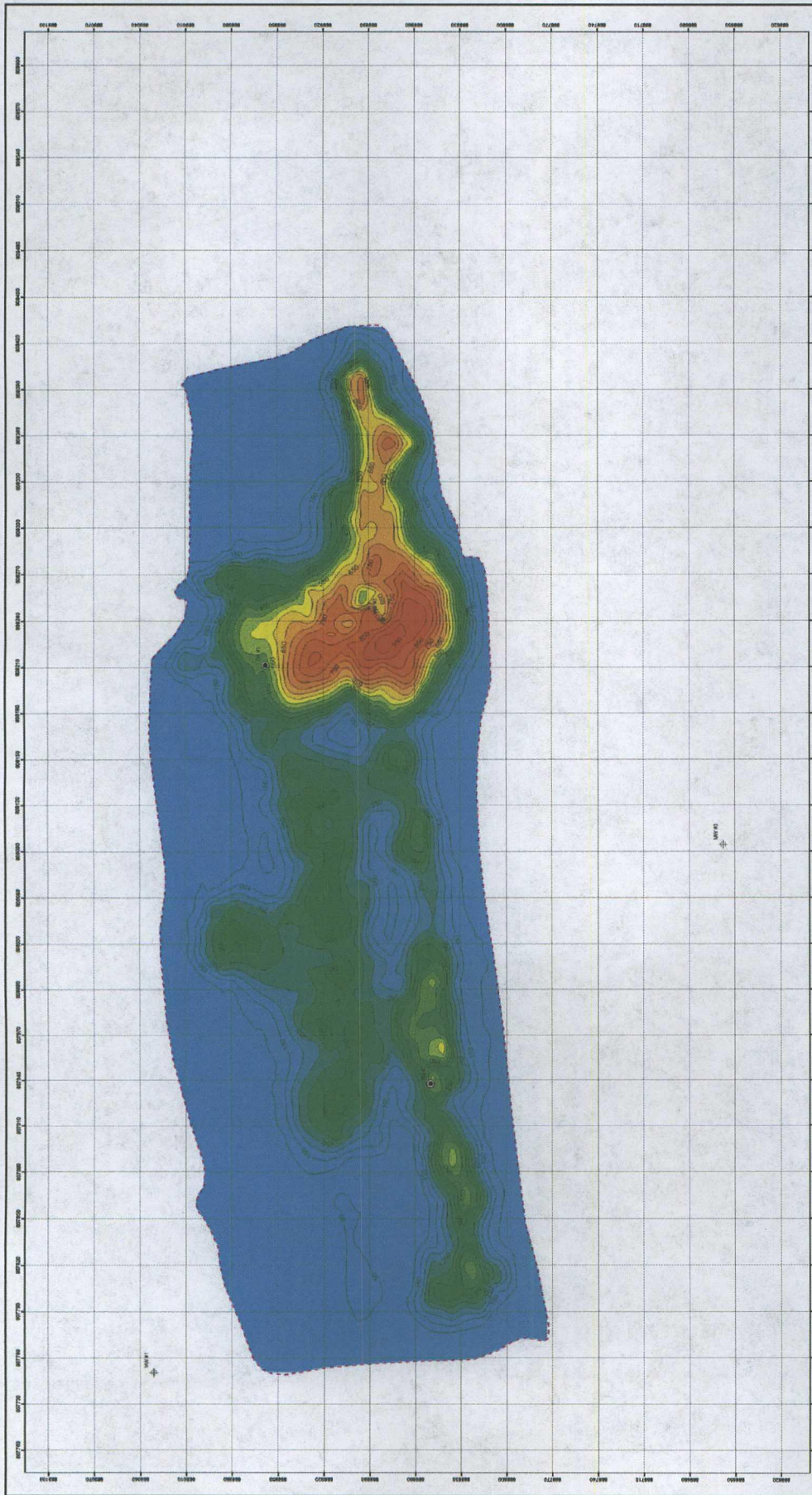












LEGEND

- BORE HOLE
- ⊕ MONITOR WELL
- EM38 SURVEY BOUNDARY

NOTES:

1. MAP PROJECTION PRESENTED IN NAD 1983, NEW MEXICO STATE PLANE EAST ZONE 3001.
2. DEPTH OF INVESTIGATION IS 6" TO 9".

SCALE MEASURED IN MILLISEMENS PER METER

0 10 20 30 40 50 60 70 80 90 100

1 INCH = 30 FEET

0 15 30 60 90 120 FEET

N

WHOLE EARTH ENVIRONMENTAL

GEOPHYSICAL SUBSURFACE INVESTIGATION SURVEY

NMSWD JOHNSON SPILL

CROSSROADS, NEW MEXICO

EM-38 Salinity Contour Map

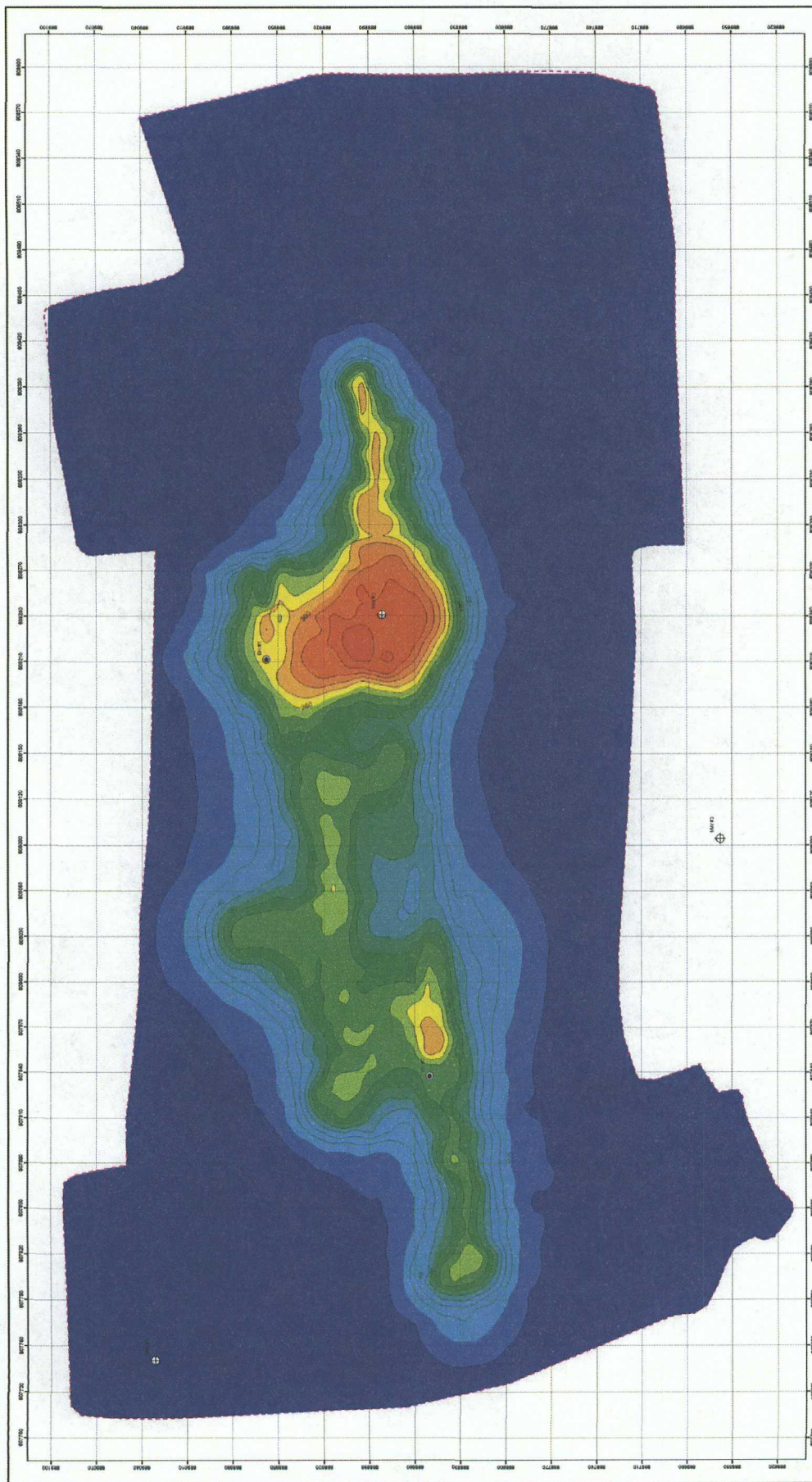
JAN. 2011

EMC

EARTH MEASUREMENT CORP.

Environmental & Engineering Geophysics

10866 KATY HOCKLEY RD.
CYPRESS, TEXAS 77433
281-439-5700
www.emcgeophysics.com



WHOLE EARTH ENVIRONMENTAL

GEOPHYSICAL SUBSURFACE INVESTIGATION SURVEY

NMSWD JOHNSON SPILL

CROSSROADS, NEW MEXICO

EM-31 Saninity Contour Map

JAN. 2011

EMC

EARTH MEASUREMENT CORP.

Environmental & Engineering Geophysics

10886 KATY HOCKLEY RD.
CYPRESS, TEXAS 77433
281-425-5700
www.earthmeasurement.com

LEGEND

- BORE HOLE
- ⊕ MONITOR WELL
- - - - - EM31 SURVEY BOUNDARY

NOTES:

1. MAP PROJECTION PRESENTED IN NAD 1983, NEW MEXICO STATE PLANE EAST ZONE 3001.
2. DEPTH OF INVESTIGATION IS 6' TO 16'.

SCALE MEASURED IN MILLISECONDS PER METER

180
160
140
120
100
80
60
40
20
0



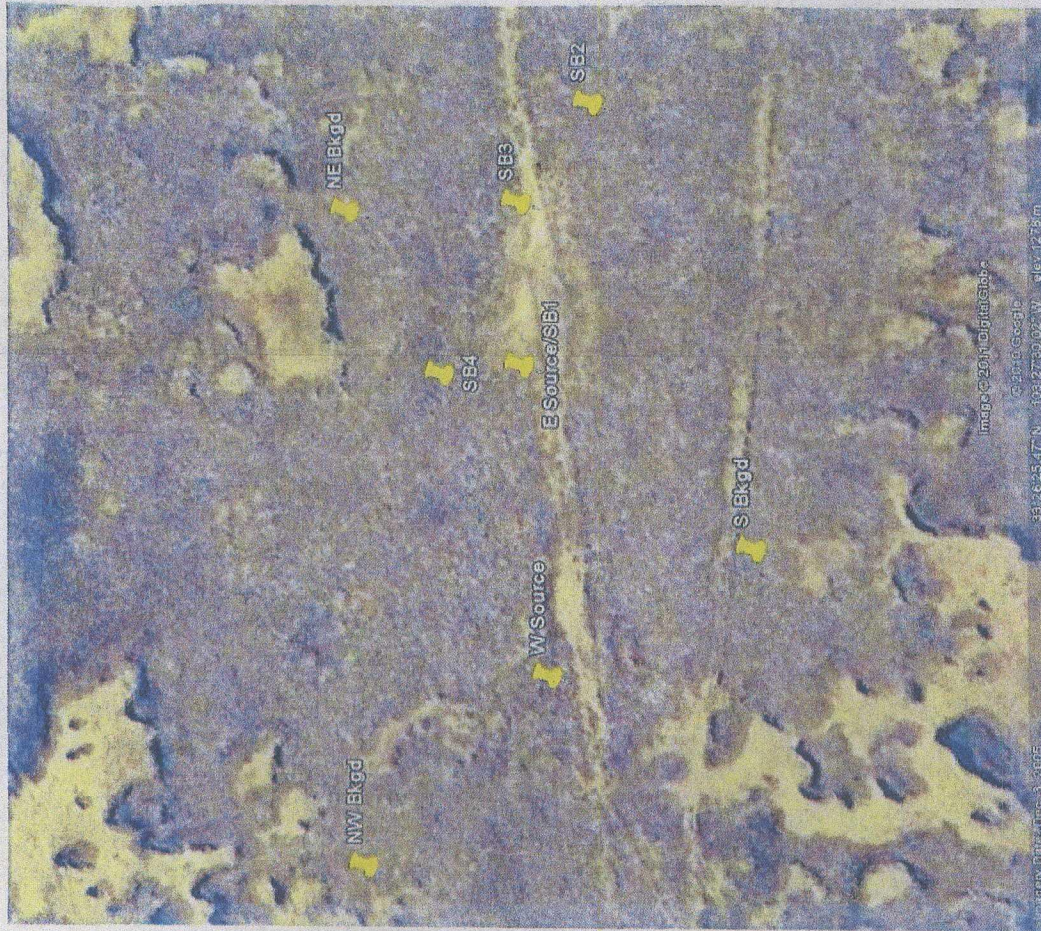


Figure 6. Soil Boring Locations Map



EAST LEAK SOURCE WELL

 Bullseye ENGINEERING ASSOCIATES				Log of Boring East 2" Monitor Well			
Whole Earth Environmental, Inc. 2103 Arbor Cove Katy, TX 77494 Contact: Mike Griffin Job#: CROSSRD DRL 10		Drill Start Drill End Boring Location Site Location Auger Type		12/06/10 (07:00) 12/08/10 (13:30) East side of spill NMSWD, Crossroads 3/4" Hollow		Logged By Mont Bates	
Depth in Feet	GRAPHIC	USCS	Sample	DESCRIPTION			
0					East 2" MW 4'x4'x5' Well Cover 2'x2' Concrete Pad Bentonite Seal 2" Sch. 40 PVC Casing Silica sand pack 2" Sch. 40 PVC 0.020 slot screen Bentonite Seal		
5		SP		Olty sand, loose, tan, damp			
10		CL		Caliche, firm, tan, reddish tan, damp			
15		CL		Caliche, hard, grayish white, dry			
20				Caliche, firm, tan, dry			
25							
30							
35		SP		Sand, loose, tan, dry			
40		CL		Sandy clay, loose, reddish tan, damp			
45		GW		Sandy gravel, loose, tan, wet			
50		SS		Sandstone, firm, tan, wet			
55		CL		Clay, stiff, tan, damp			
60				Clay, stiff, yellowish tan, damp			
65		CL					
70							
75				Clay, stiff, gray, damp			
80							
85		CL					
90				Free phase oil at 92'			
95							
100				Total Depth 97'			

NORTHWEST BACKGROUND WELL

Zachry ENGINEERING ASSOCIATES		Log of Boring West Background Well	
Whole Earth Environmental, Inc. 2103 Arbor Cove Katy TX 77494 Contact: Mike Griffin Job#: CROSSRD DRL 10		Drill Start : 12/08/10 (14:00) Drill End : 12/09/10 (16:30) Boring Location : NW of spill 200'± Site Location : NMSWD, Crossroads Auger Type : 3 1/2" Hollow	Logged By : Mort Bates
Depth in Feet	GRAPHIC	USCS	DESCRIPTION
0	SP		Sand, loose, tan, dry
5			Caliche, firm, white, dry
10			
15			
20	SP		
25			
30			
35			Sandstone, firm, reddish tan, dry
40			
45			
50	SS		Sandstone, firm, yellow, dry
55	SS		Sandstone, hard, yellowish tan, dry
60	SS		Sandstone, firm, yellowish tan, wet
65			Clay, stiff, yellowish brown, moist
70	CL		
75			
80			Clayey sand, stiff grayish black, damp
85			
90			
95	SC		
100			
105			
110			
115			
Total Depth 110'			

West Background Well

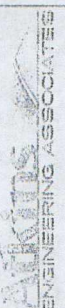
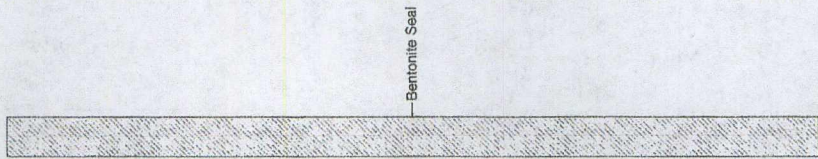
4"x4"x5' Well Cover
2'x2' Concrete Pad

Bentonite Seal
2" Sch. 40 PVC Casing

Slits sand pack
2" Sch. 40 PVC 0.020 slot screen

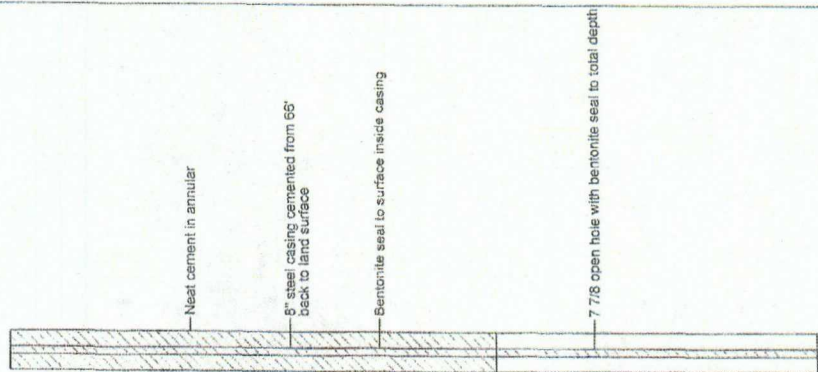
Bentonite Seal

NORTHEAST BACKGROUND BORING

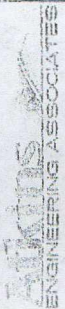
 ENGINEERING ASSOCIATES				Log of Boring East Background Well			
Whole Earth Environmental, Inc. 2103 Arbor Cove Katy TX 77494 Contact: Mike Griffin Job#: CROSSRD.DRL.10		Drill Start : 12/11/10 (10:30) Drill End : 12/14/10 (16:30) Boring Location : NE of sp# 20074 Site Location : NMSWD, Crossroads Auger Type : 3 1/2" Hollow	Logged By : Mort Baas				
Depth in Feet	GRAPHIC	USCS	Sample	DESCRIPTION	East Background Well		
0		SP		Sand, loose, tan, dry			
5				Caliche, hard, tan and white, dry			
10							
15							
20							
25							
30							
35		SS		Sandstone, firm, tan, dry			
40		SS		Sandstone, firm, damp			
45				Clay, stiff, yellow, damp			
50							
55		CL					
60							
65							
70							
75							
80		CL		Clay, stiff, gray, damp			
85							
90							
95		CL		Clay, stiff, dark gray, damp			
100							
105							
Total Depth 100'							

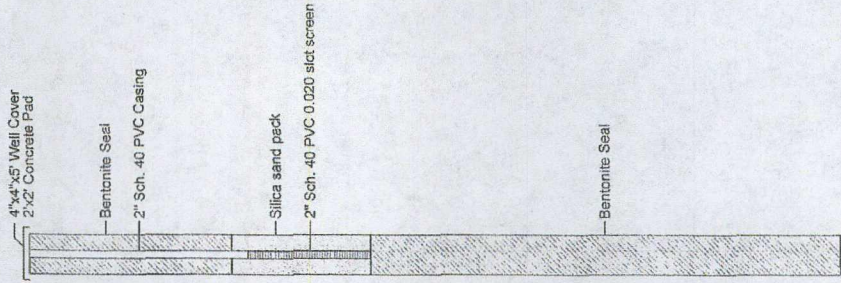
WEST LEAK SOURCE BORING

ENGINEERING ASSOCIATES		Log of Boring West Side Leak Test Hole			
Whole Earth Environmental, Inc. 2103 Arbor Cove Katy, TX 77494 Contact: Mike Griffin Job#: CROSSRD DRL 10		Drill Start : 12/12/10 (11:30) Drill End : 12/30/10 (15:00) Boring Location : West side of leak area Site Location : NMSWD, Crossroads Auger Type : Air rotary	Logged By : Mont Bates		
Depth in Feet	GRAPHIC	USCS	Sample	DESCRIPTION	West Side Leak Test Hole
0		SP		Poorly graded sand, loose, tan and black, damp	
5				Caliche, firm, tan, dry	
10					
15					
20					
25					
30					
35		SP		Poorly graded sand, loose, tan, damp	
40					
45		SS		Sandstone, firm, tan, damp	
50		SS		Sandstone, firm, yellowish tan, wet	
55		GW		Sand and gravel, loose, yellow, wet	
60		CL		Sandy clay, soft, yellowish tan, wet	
65		CL		Clay, stiff, yellow, moist	
70		CL		Clay, stiff, yellowish brown, dry	
75		CL			
80		LS		Limestone with clay, firm, gray, dry	
85		LS		Limestone, hard, gray, dry	
90					
95					
100		CL		Clay, firm, gray, dry	
105					
110					
115					
Total Depth 110'					



SOUTH BACKGROUND WELL

Log of Boring Down Gradient Well			
		Drill Start : 12/15/10 (07:30) Drill End : 12/15/10 (12:00) Boring Location : South of well 2007A Site Location : NMSWD, Crossroads Auger Type : 3/4 Hollow	
Whole Earth Environmental, Inc. 2103 Arbor Cove Katy TX 77494 Contact: Mike Griffin Job#: CROSSRD DRL10		Logged By : Mark Bates	
Depth in Feet	GRAPHIC	USCS	DESCRIPTION
0			Down Gradient Well
5	SP		Sand, loose, tan, dry
10			Caliche, firm, white, dry
15			Caliche, hard, white, dry
25			
30			Clayey sand, loose, tan to yellow, dry
35	SC		
40			
45			
50	SC		Clayey sand, loose, tan to yellow, moist
55			Clayey sand, firm, yellow, wet
60			
65	SC		
70			
75			
80			
85			Clay, stiff, grayish black, damp
90	CL		
95			
100			
105			Total Depth 100'



12-21-2010 C:\Users\perry\Documents\South Background Well Log.dwg



Google

Eye alt: 22.58 mi

© 2010 Google
Image © 2011 Google
Image MGRIS

lat: 33.431259° lon: -103.648665° elev: 4298 ft

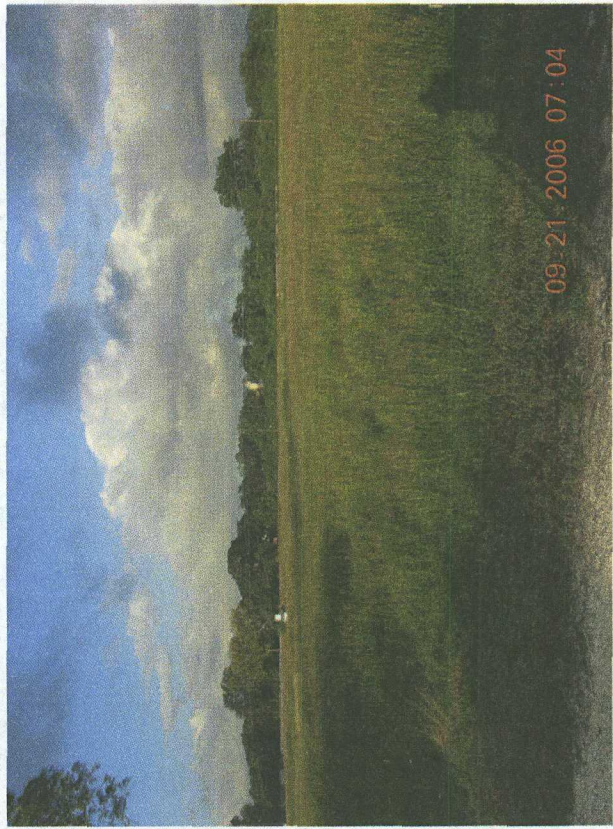
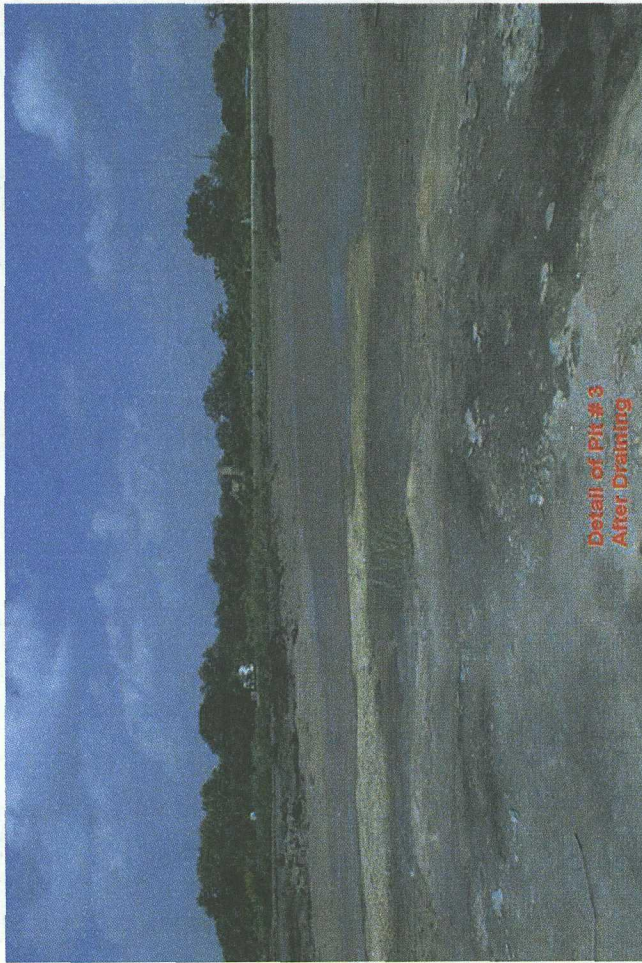
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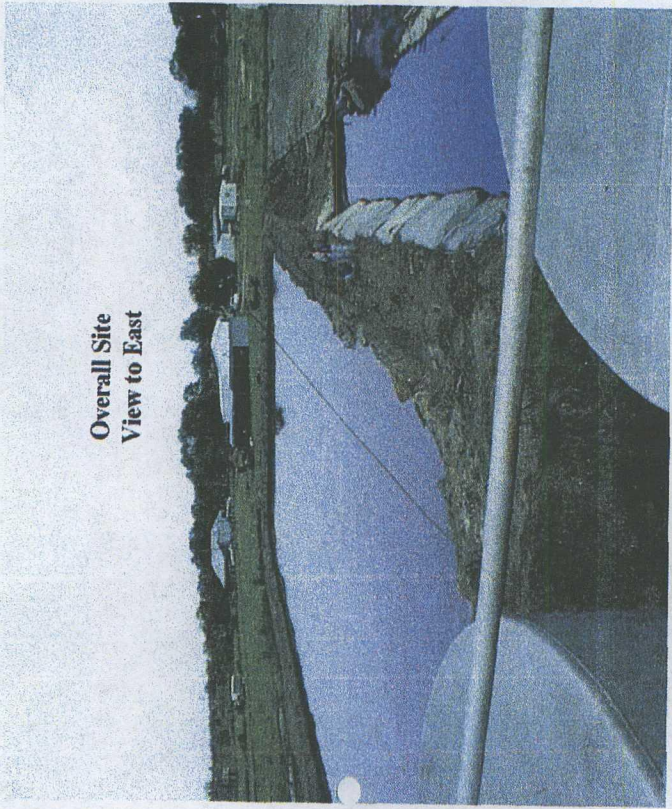
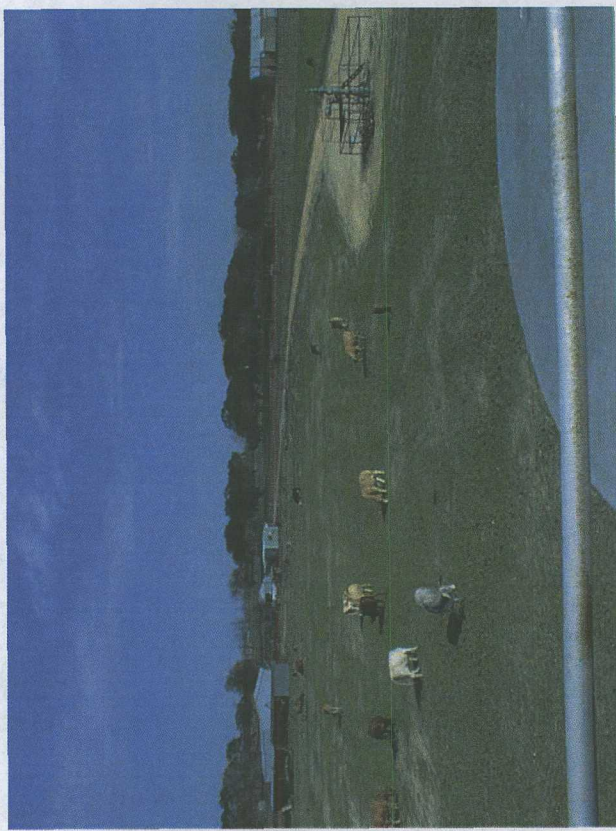
5.07 mi

Tower Rd

E 2nd St

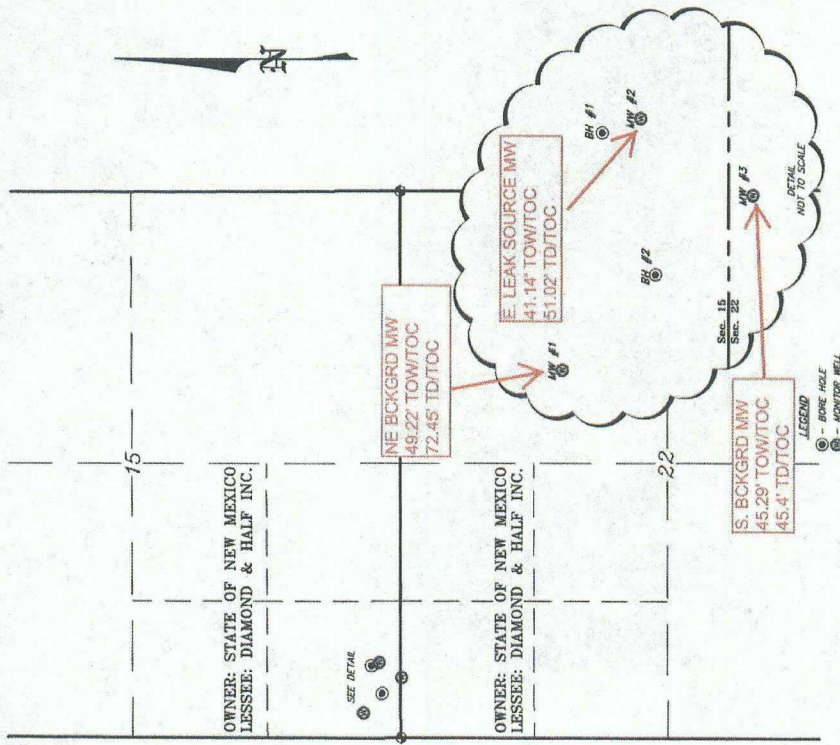
Disposal Option Distances				
Total Affected Area	70,000 Sq. Ft.			
Significantly Impacted Area	40,000 Sq. Ft.			
Excavate All to 4'	10,370 Cu. Yds.			
Excavate Significant to 4'	5,926 Cu. Yds.			
Distance to Gandy/Marley	43.04 Miles			
Truckloads All	519	44,634 Miles	9,000 Gal. Diese	
Truckloads Significant	296	25,505 Miles		
Earth Circumference		24,901 Miles		





Overall Site
View to East

SECTIONS 15&22, TOWNSHIP 10 SOUTH, RANGE 34 EAST, N.M.P.M.,
LEA COUNTY, NEW MEXICO.



ALL COORDINATES ARE BASED ON NAD83

NAME	NORTHING	EASTING	LATITUDE	LONGITUDE	ELEVATION IND. SIZE P.C.	ELEVATION FROM B.M.
MW #1	N889031.293	E807750.318	N33°26'26.84"	W103°27'35.95"	4212.2'	4208.5'
MW #2	N888681.297	E808241.038	N33°26'25.31"	W103°27'30.17"	4207.9'	4208.4'
MW #3	N888657.623	E808094.439	N33°26'23.11"	W103°27'31.92"	4208.5'	4208.6'
BH #1	N888927.642	E808211.471	N33°26'26.07"	W103°27'30.91"	4207.1'	4208.5'
BH #2	N888848.976	E807937.402	N33°26'26.03"	W103°27'33.76"	4207.3'	4207.3'

I HEREBY CERTIFY THAT THIS PLAT WAS PREPARED
FROM FIELD NOTES OF AN ACTUAL SURVEY AND
MEETS OR EXCEEDS ALL REQUIREMENTS FOR LAND
SURVEYS AS SPECIFIED BY THIS STATE.

GARY L. JONES N.M. P.S. No. 7977
TEXAS P.L.S. No. 5074

BASIN SURVEYS P.O. BOX 1786 - HOBBS, NEW MEXICO

W.O. Number: 23995 Drawn By: K. GOOD

Date: 01-17-2011 Disk: KJC - 23995MM.DWG

WHOLE EARTH ENVIRONMENTAL, INC.

REF: MONITOR WELLS & BORE HOLES

MONITOR WELLS LOCATED IN

SECTIONS 15&22, TOWNSHIP 10 SOUTH, RANGE 34 EAST,
N.M.P.M., LEA COUNTY, NEW MEXICO.

Survey Date: 01-10-2011 Sheet 1 of 1 Sheets





