

1R - 425-03

REPORTS

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Texerra

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2011 SEP 26 A 1: 26 627 Forest View Way Monument, Colorado 80132
Tel: 719-339-6791 E-mail: lpg@texerra.com

September 15th, 2011

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

RE: **Remediation Termination Request**
Rice Operating Company
Vacuum K-35-1 Boot, UL K, Sec 35, T17S, R35E
OCD Case Number 1R425-03

Sent via E-mail and U.S. Certified Mail Return Receipt No. 7011 0110 0000 6561 8838

Mr. Hansen:

Rice Operating Company (ROC) has made substantial progress in restoring groundwater quality and ground surface conditions at their Vacuum K-35-1 Boot site since NMOCD approved the Corrective Action Plan for this site dated February 28, 2007. The history of this project and the progress made are summarized in the attached report.

We believe that we have met State of New Mexico requirements for the protection of groundwater and the surface environment and therefore request remediation termination or similar regulatory closure status for this project.

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

We appreciate your consideration of this request.

Sincerely,



L. Peter Galusky, Jr. Ph.D.

Copy: Rice Operating Company

**Rice Operating Company
Vacuum K-35-1 Boot Remediation Project
NMOCD Case No. 1R425-03**

Corrective Action Plan Report and Termination Request

Background

The Vacuum K-35-1 Boot site is located approximately 2 miles ESE of Buckeye, NM, and approximately 3,000 ft south-southwest of the intersection of Buckeye Road and County Road 53 (Figure 1). The topography is gently sloping toward the southeast. Soils on the site are mapped (as KO) in the Lea County Soil Survey as belonging to the Kimbrough gravelly loam soil series. These are characterized by gravelly loam to a depth of approximately 6 inches, and this is underlain by several feet of calcium-indurated caliche. Groundwater occurs at a depth of approximately 56+/- feet in unconsolidated Tertiary alluvium of the Ogallala Formation.

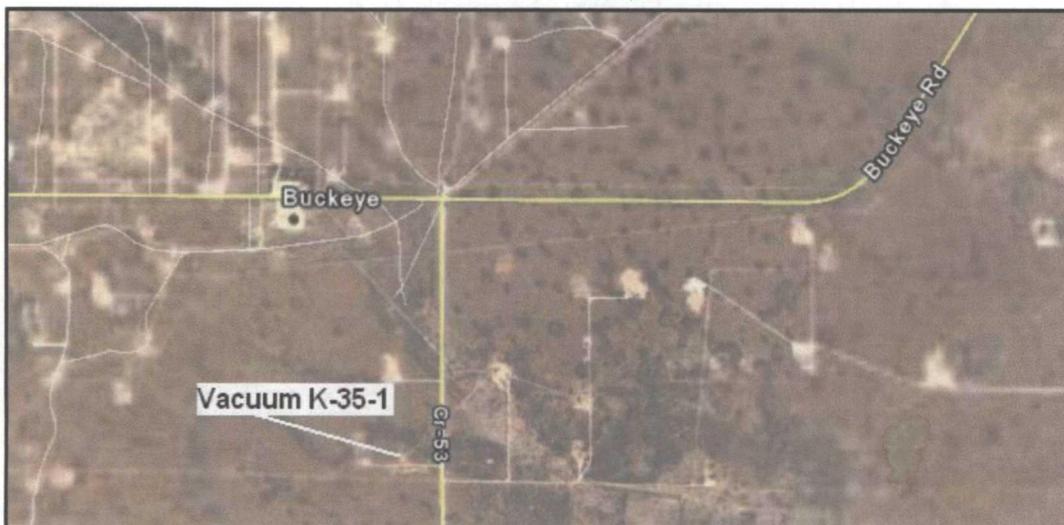


Figure 1 – Vacuum K-35-1 Boot location.

In October of 2004, ROC removed a junction box at the referenced site, in accordance with the OCD-approved Junction Box Upgrade Work Plan (Rev. July 2003). Subsequent soil investigation (using field titration methods) revealed chlorides ranging from approximately 500 ppm near the surface to approximately 7,000 ppm at 12 ft below ground surface beneath the former junction box (see Junction Box Disclosure Report, Figure 2). PID measure of hydrocarbon revealed insignificant levels (less than 10 ppm).

The old, wooden junction box was removed and soils beneath it were excavated to a depth of approximately 12 feet. The excavated soil was blended on site and then backfilled into the excavation to a depth of 4 feet below ground surface. At 4 feet depth, a compacted clay barrier was installed to inhibit further downward migration of any remaining chlorides above this level. The excavation was then backfilled with native material (Figures 3 & 4).

**RICE OPERATING COMPANY
JUNCTION BOX DISCLOSURE REPORT**

BOX LOCATION

SWD SYSTEM	JUNCTION	UNIT	SECTION	TOWNSHIP	RANGE	COUNTY	BOX DIMENSIONS - FEET		
							Length	Width	Depth
Vacuum	K-35-1 boot	K	35	17S	35E	Lea	no box—eliminated		

LAND TYPE: BLM _____ STATE X FEE LANDOWNER _____ OTHER _____

Depth to Groundwater 54 feet NMOCD SITE ASSESSMENT RANKING SCORE: 10

Date Started 9/29/2004 Date Completed 10/25/2004 NMOCD Witness no

Soil Excavated 400 cubic yards Excavation Length 30 Width 30 Depth 12 feet

Soil Disposed 0 cubic yards Offsite Facility n/a Location n/a

FINAL ANALYTICAL RESULTS: Sample Date 10/12/2004 Sample Depth 12 ft

Procure 5-point composite sample of bottom and 4-point composite sample of excavation sidewalls. TPH and chloride laboratory test results completed by using an approved lab and testing procedures pursuant to NMOCD guidelines.

CHLORIDE FIELD TESTS

Sample Location	PID ppm	GRO mg/kg	DRO mg/kg	Chloride mg/kg
4-WALL COMP.	1.1	<10.0	63.5	10400
BOTTOM COMP.	9.6	12.9	90.4	9190
REMED. BACKFILL	6.0	25	435	9860

LOCATION	DEPTH (ft)	ppm	
vertical at junction box	4	479	
	5	779	
	6	749	
	7	869	
	8	2489	
	9	4978	
	10	5587	
	11	5338	
	12	6807	
	20 ft North of junction	4	5248
		5	1229
		6	2369
7		9327	
8		14605	
9		13645	
10		10826	
11		12206	
4-wall comp.	n/a	9267	
bottom comp.	12	9926	
backfill comp.	n/a	9177	

General Description of Remedial Action: This junction box contained a boot.
 The junction was eliminated and the box was removed. The site was remediated using a backhoe while PID and chloride field tests were conducted at regular intervals. Although PID readings were relatively low, the soils exhibited physical signs of slight hydrocarbon impact. Chloride field tests revealed concentrations that did not relent with depth or breadth throughout the 30 x 30 x 12 ft deep excavation. The excavated soil was blended on site and then backfilled into the excavation to 4 ft BGS. At 4 ft, a compacted clay barrier was installed to inhibit further downward migration of remaining chloride impact. The remaining spoils were backfilled on top of the clay and contoured to the surrounding surface. Remaining hydrocarbon is expected to naturally attenuate. An identification plate was placed on the surface of the backfilled site to mark the former location of the junction box and the clay below. NMOCD was notified of potential groundwater impact at this site on 11/29/2004.
 enclosures: chloride graphs, photos, lab results, PID field screenings, cross-section, clay test

I HEREBY CERTIFY THAT THE INFORMATION ABOVE IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

SITE SUPERVISOR Rob Elam SIGNATURE not available COMPANY Curt's Environmental—Odessa, TX

Figure 2 – Junction Box Disclosure Report

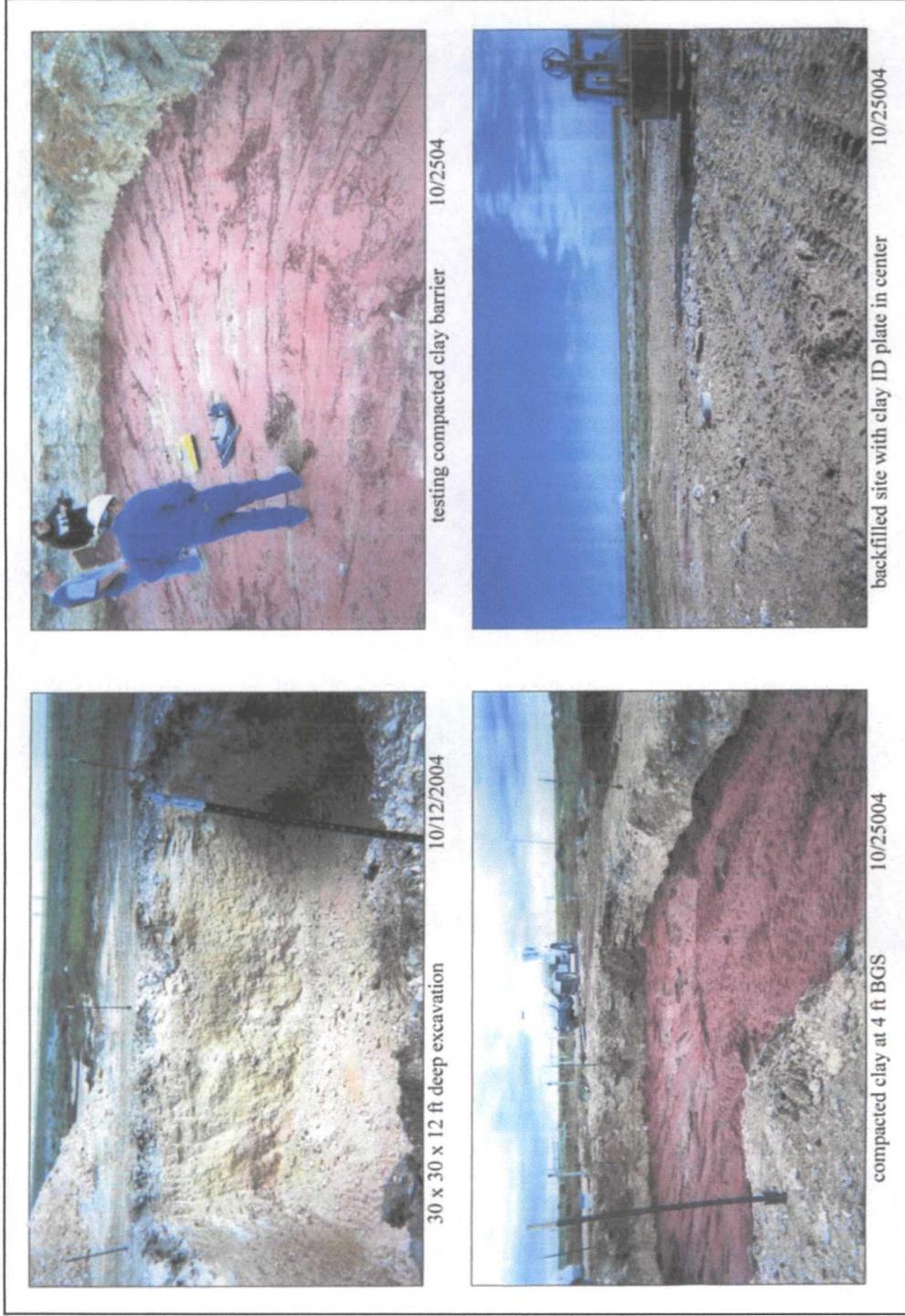


Figure 3 – Photographs of clay liner installation following junction box removal in 2004.

Vacuum K-35-1 boot

30 x 30 x 12 ft

Excavation Cross-Section

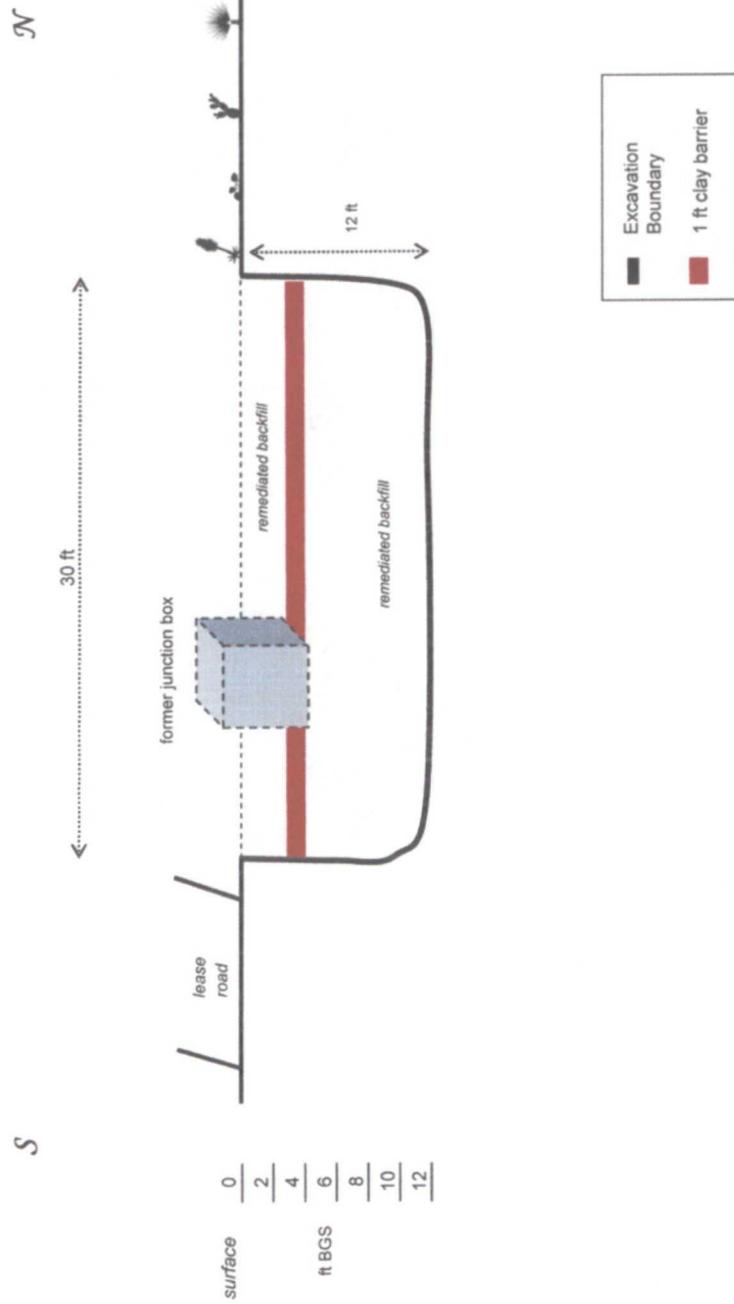


Figure 4 – Excavation cross section and design schematic of clay liner.

Site Investigation and Characterization

ROC initiated further soil characterization work as well as the installation of groundwater monitor wells in June of 2006, per the NMOCD approved Investigation and Characterization Plan of May 18th, 2006 for this project. Harrison and Cooper, Inc. of Lubbock, Texas performed the drilling work on June 22nd and 23rd, 2006, with an additional monitor well installed on October 17th, 2006. L. Peter Galusky, Jr. of Texerra was present to mark the desired locations of soil borings and monitor wells and to log drill cuttings. Field titration of soil chlorides was performed by ROC personnel who also took representative samples for subsequent laboratory analysis. The approximate locations of soil borings are given in Figure 5.

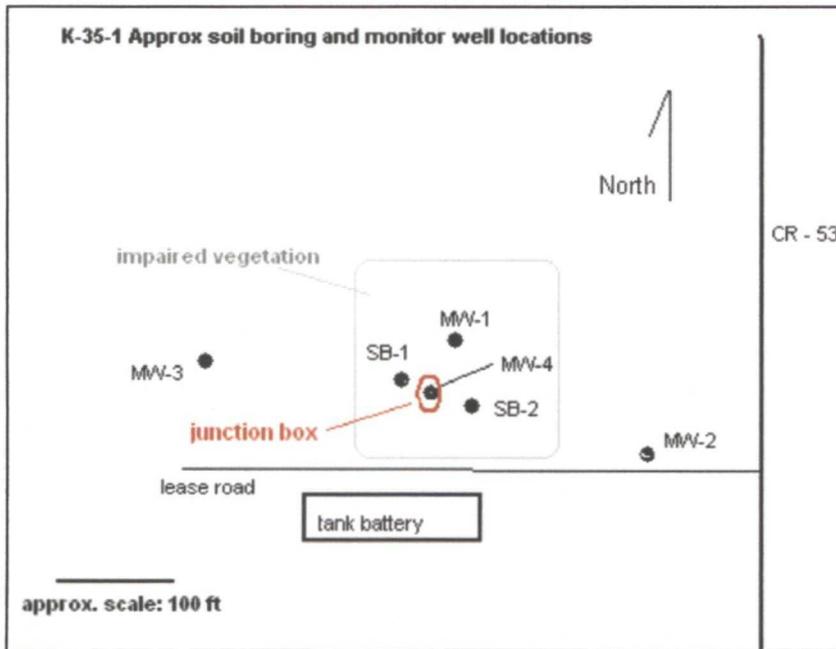


Figure 5 – Approximate locations of soil borings. (“MW” indicates that a monitor well was installed in the respective soil boring).

Elevated soil chloride concentrations were found near the surface and with depth in samples taken at the former boot and approximately 50 ft down-gradient (southeast) of the former junction box (Figure 6). More distant soil samples (taken at MW-2 and MW-3) had chloride levels below 125 ppm throughout their depth. It is of note that all of the affected soils were located within the area of impaired vegetation.

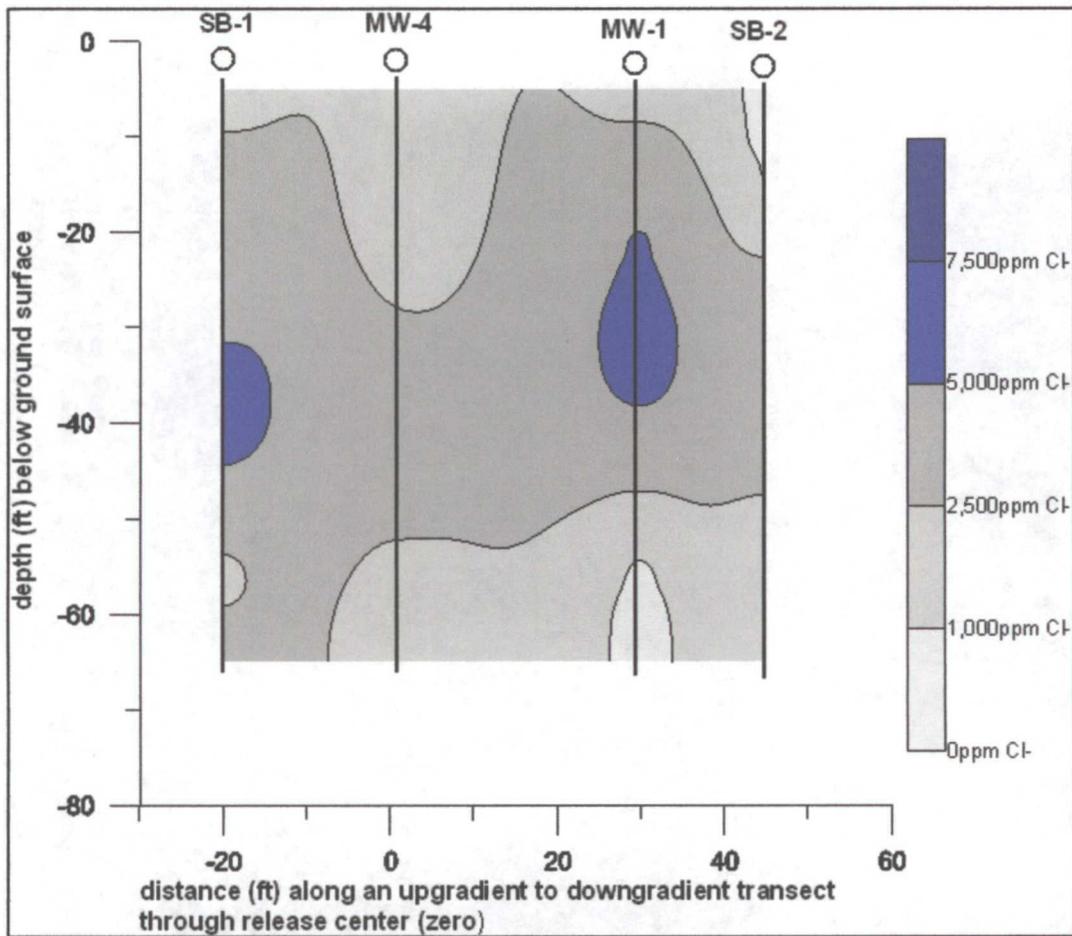


Figure 6 – Interpolated soil chloride concentrations in a vertical slice along an up-gradient to down-gradient transect across the former boot (from SB-1 to SB-2).

The center of mass of groundwater chlorides, sampled in June of 2006, was clearly located beneath the former junction box, MW-4 (Figure 7).

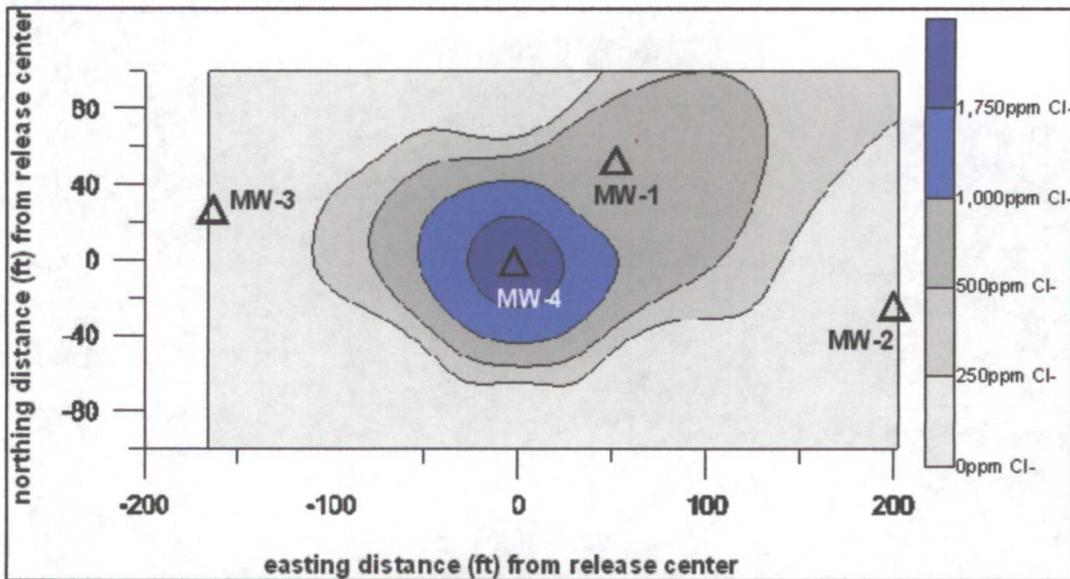


Figure 7 – Interpolated groundwater chloride concentrations sampled June 2006 (plan-view).

Corrective Action Plan

The results of the ICP and subsequent groundwater monitoring were used to develop a Corrective Action Plan (CAP) that entailed two primary elements:

- 1- Groundwater remedy: The withdrawal of high-chloride groundwater to reduce chloride impact on the affected aquifer.
- 2- Soil remedy: The restoration of the ground surface to facilitate natural re-vegetation and the development of a natural, evaporative barrier to inhibit future leaching of residual soil chlorides into groundwater.

These corrective elements formed the basis of the CAP of February 28th, 2007, which was subsequently approved by NMOCD.

Results of Corrective Actions - Groundwater

A recovery well (RW-1) was installed approximately 35 ft down-gradient (southeast) of the former junction box location, MW-4 (Figures 8 & 9).

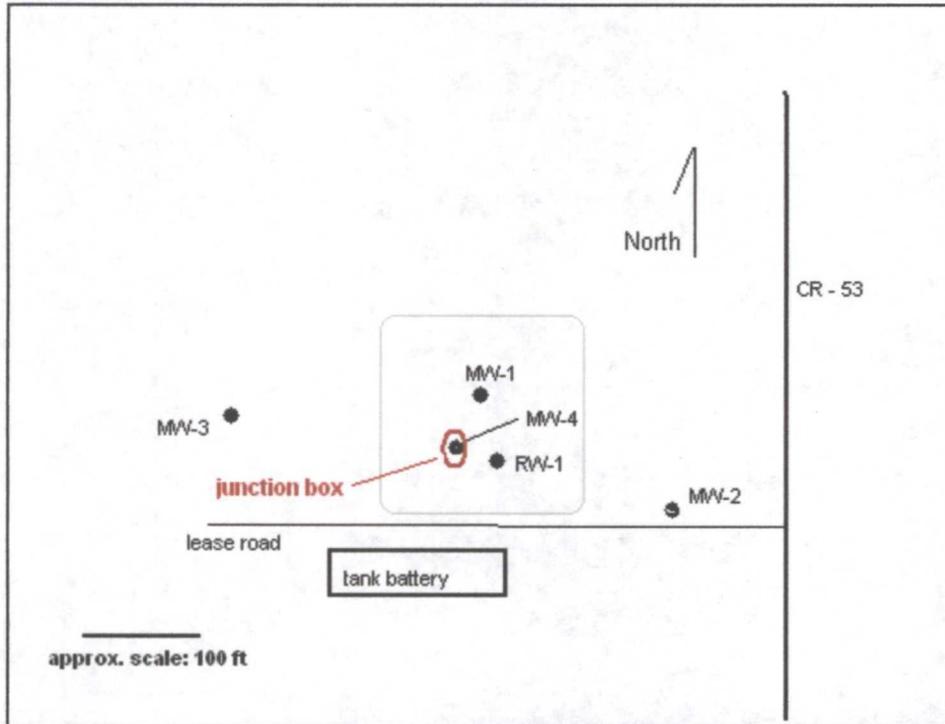


Figure 8 – Approximate monitor well (MW) and Recovery well (RW-1) locations.

The rationale for locating the recovery well slightly down-gradient from the former junction box and center of groundwater chloride mass was to ensure that all of the water entrained into this well was high in chlorides. That is, pumping would cause low-chloride up-gradient water to sweep chlorides from beneath the former junction box. (If water were to have been pumped from MW-4 it is likely that it would have been diluted with clean, up-gradient water. This would have resulted in inefficient removal of chlorides.)



Figure 9 – Groundwater recovery well (RW-1) installed at Vacuum K-35-1 boot. The groundwater pump in this well is powered by solar-generated electricity. Recovered groundwater is stored in temporary tankage and subsequently used for SWD system maintenance.

Approximately 16,000 bbls of chloride impacted groundwater have been removed since pumping began in the spring of 2008, and over this time the chloride concentrations in the affected wells has declined dramatically (Figure 10, Table 1). Of particular note is that the groundwater chloride concentrations from the entire affected area (MW-4, MW-1 and RW-1) have all declined to less than 500 mg/kg and are trending to decline toward the up-gradient background concentration of 150 +/- mg/kg (MW-3).

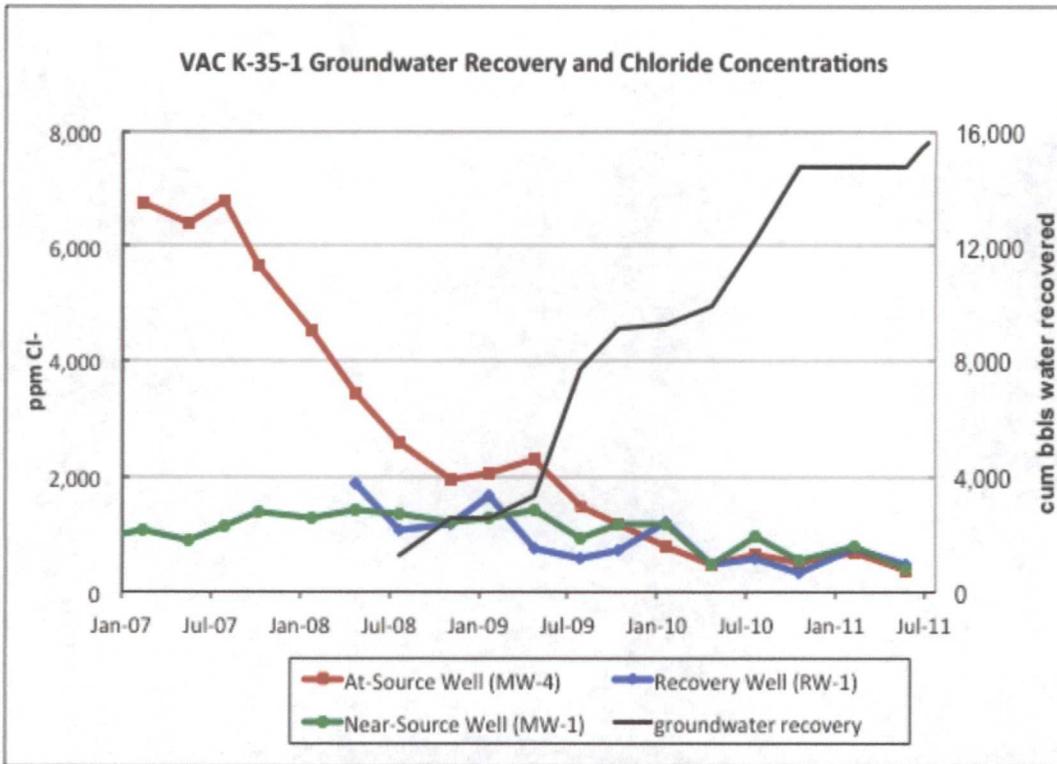


Figure 10 – Cumulative groundwater removal (right axis) and groundwater chloride concentrations (left axis).

Vacuum Field SWD System K-35-1 Monitor Well Water Analyses						
Chloride Concentration (ppm)						
Date	MW-1 (near source)	MW-2 (downgradient well)	MW-3 (upgradient)	MW-4 (at source)	RW-1	cum water hailed (bbls)
6/28/06	508	32	140			
8/8/06	578					
10/19/06	859	26	165			
2/21/07	1,080	29	178	6,770		
5/22/07	908	25	128	6,390		
8/7/07	1,150	27	134	6,790		
10/16/07	1,400	28	112	5,670		
1/30/08	1,300	88	88	4,550		
4/30/08	1,440	32	84	3,450	1,880	
7/30/08	1,360	32	76	2,580	1,070	1,269
11/10/08	1,220	28	76	1,960	1,200	2,551
1/29/09	1,280	28	76	2,080	1,680	2,551
5/1/09	1,420	28	84	2,300	750	3,319
8/4/09	940	28	72	1,500	580	7,724
10/20/09	1,200	28	100	1,200	730	9,135
1/27/10	1,180	32	128	800	1,220	9,286
4/28/10	460	32	152	460	490	9,896
7/29/10	980	32	184	650	570	12,261
10/26/10	560	32	164	520	332	14,779
2/16/11	800	32	128	680	750	14,779
6/1/11	396	32	148	380	476	14,779
6/30/11						15,381
7/15/11						15,591

Table 1 – Tabular data summarized in Figure 10, above.

Results of Corrective Actions – Soil and Ecological Restoration

Over the past three years ROC has sifted soils and removed rock, graded and blended soils, seeded the site to natural vegetation, watered the site and fenced the area to protect the new growth. The results of this work are evident in comparing the before photograph (October 2006) with the after photograph (January 2011), in Figure 11.



Figure 11 – View south toward VAC K-35-1 junction box in October 2006 (upper photograph) and January 2011 (bottom photograph).

Conclusions and Justification for Termination

ROC has labored for several years to protect and restore groundwater quality and surface vegetation. The source of the original junction box was removed in 2004. Site assessment efforts over the next two years determined the nature and extent of soil and groundwater contamination, with residual chlorides being determined to be the contaminant of concern. A Corrective Action Plan was then developed and implemented following its approval by NMOCD. Groundwater chloride concentrations have dropped since pumping was initiated in 2008 from approximately 7,000 mg/kg in the affected area to less than 400 mg/kg in June of this year, with the trend being steadily downward. Near-surface soils were improved through rock removal, grading and blending to the point that a lush stand of native grasses was restored.

Taken together, the results of these remedies and the steadily improving trends in groundwater quality and surface vegetation indicate that the site has been effectively restored to productive use and there no longer exists a future threat to groundwater quality. It is also apparent that further withdrawals of groundwater for negligible potential benefit may not represent the optimum use of this resource. We therefore believe, and submit for NMOCD's consideration, that this project merits remediation termination or similar regulatory closure status.