1R - 425-38

WORKPLANS

Date:

10-12-10

Texerra

75 Wuthering Hts Drive Colorado Springs, CO 80921
Tel: 719-339-6791 E-mail: lpg@texerra.com

October 12th, 2010

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: Corrective Action Plan (CAP)
Rice Operating Company
Vacuum M-5 Junction Box, Unit M Sec 5 T18S R35E
NMOCD Case Number - 1R425-38

Sent via Email and U.S. Certified Mail Return Receipt No. 7006 0100 0001 2438 4026

Mr. Hansen,

The record of groundwater chloride concentrations immediately down-gradient of the Rice Operating Company (ROC) VAC M-5 Jct. site indicates that the past operations of this facility have caused, at most, a slight to moderate impact on groundwater quality. Please refer to the site location map (Figure 1), soil chloride data (Figures 2 & 3) and groundwater monitoring data (Table 1).

Since we do not presently have an up-gradient monitor well for this location we do not know if the moderately elevated levels of groundwater chlorides (which have averaged 361 ppm over the past seven sampling quarter) is due entirely or in part to chloride leakage from the former junction box at M-5. However, we do know that there are residual chlorides in the soil beneath this location which have presumably been contributed from the former junction box. Therefore, it is likely that at least some portion of the elevated groundwater chlorides may have been contributed from the former junction box at M-5.

We have estimated the residual soil chloride mass contributed by the former junction box (meaning those chlorides above the estimated natural background levels) to be approximately 15,300 lbs (Table 2). We have also employed a simple spreadsheet model (provided to you as an e-mail attachment) to illustrate how these residual soil chlorides would be expected to decline over time (Figures 4a & 4b) and to estimate how these would affect the chloride concentration in the groundwater immediately beneath the site (Figures 5a & 5b) under existing conditions and with the anticipated effects of an installed sub-surface installation barrier; (model inputs are given in Table 3). This modeling effort indicates that under existing conditions groundwater chloride concentrations would be expected to gradually diminish in the coming years, dropping below 250 mg/kg after about 50 years into the future (Figure 5a). However, the effect of a sub-surface infiltration barrier would accelerate this anticipated decline considerably (Figure 5b).

Texerra therefore recommends and proposes the following Corrective Action Plan to protect groundwater and to move this project toward "remediation termination" status:

1) Remove the upper (approximately) four feet of chloride impacted soils across the area affected by past operations of the M-5 junction box (approximately 50x65 ft) and dispose of these in an NMOCD approved facility.
2) Install and properly seat a 20-mil plastic infiltration barrier at this depth encompassing the area impacted by the former junction box (as shown in Figure 3), and backfill with clean fill dirt with a chloride concentration below 500 mg/kg and a PID (field) reading below 100 ppm.
3) Prepare the surface soils over and surrounding the site and seed to a native vegetation mix.

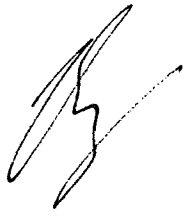
A synthetic liner installed below the root zone will inhibit downward migration of water, slowing the movement of chloride through the vadose zone. Plants capture water through their roots, thereby reducing the volume of water infiltrating below the root zone. This natural 'infiltration barrier' will also help protect groundwater.

Upon completion of these Plan work elements, we anticipate that ROC will submit a written report which will request "remediation termination" or similar regulatory closure status.

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.

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

Sincerely,



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

Attachments: Figures and Tables and (via e-mail) Excel model

Copy: Rice Operating Company

Figure 1 – VAC M-5 location.

Soil Boring Log
Rice Operating Company
VAC SWD System **M-5 Jct**

Identification:	**Average of SB-1 through SB-5**
Location:	See map.
Date:	2/2/2009
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	50 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field Avg Soil Chloride Conc (ppm)
-5	585		1,201
-10	784		1,201
-15	1,244		1,201
-20	1,450		1,201
-25	1,315	912	1,201
-30	1,313		1,201
-35	1,354		1,201
-40	1,324		1,201
-45	1,438		1,201
-50	1,207	1,540	1,201
avg	1,201		

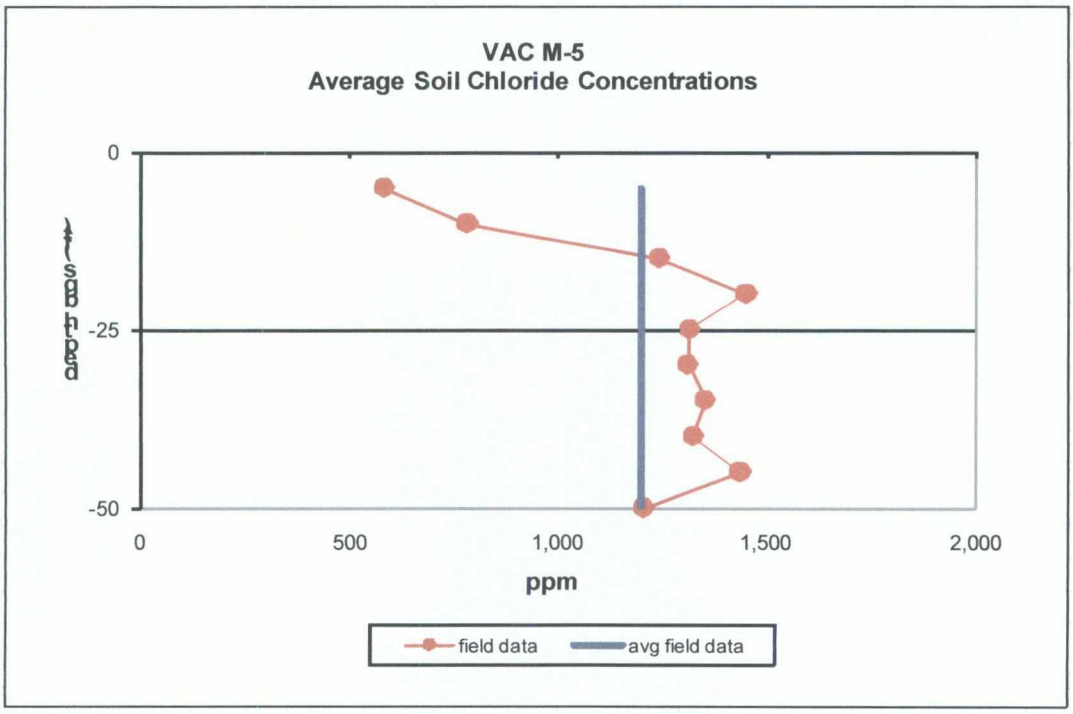


Figure 2 – VAC M-5 Jct. soil chloride concentrations averaged over the affected area.

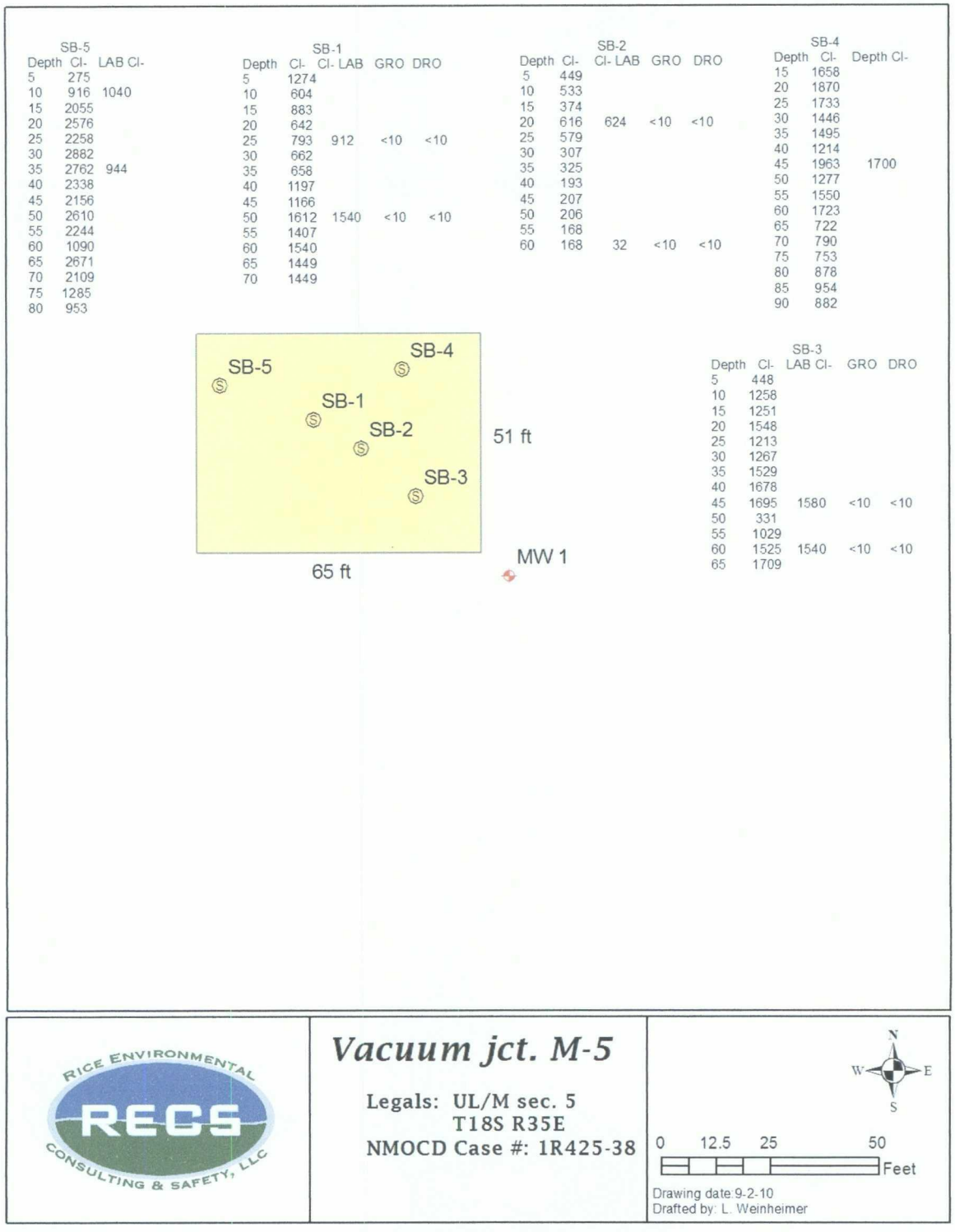


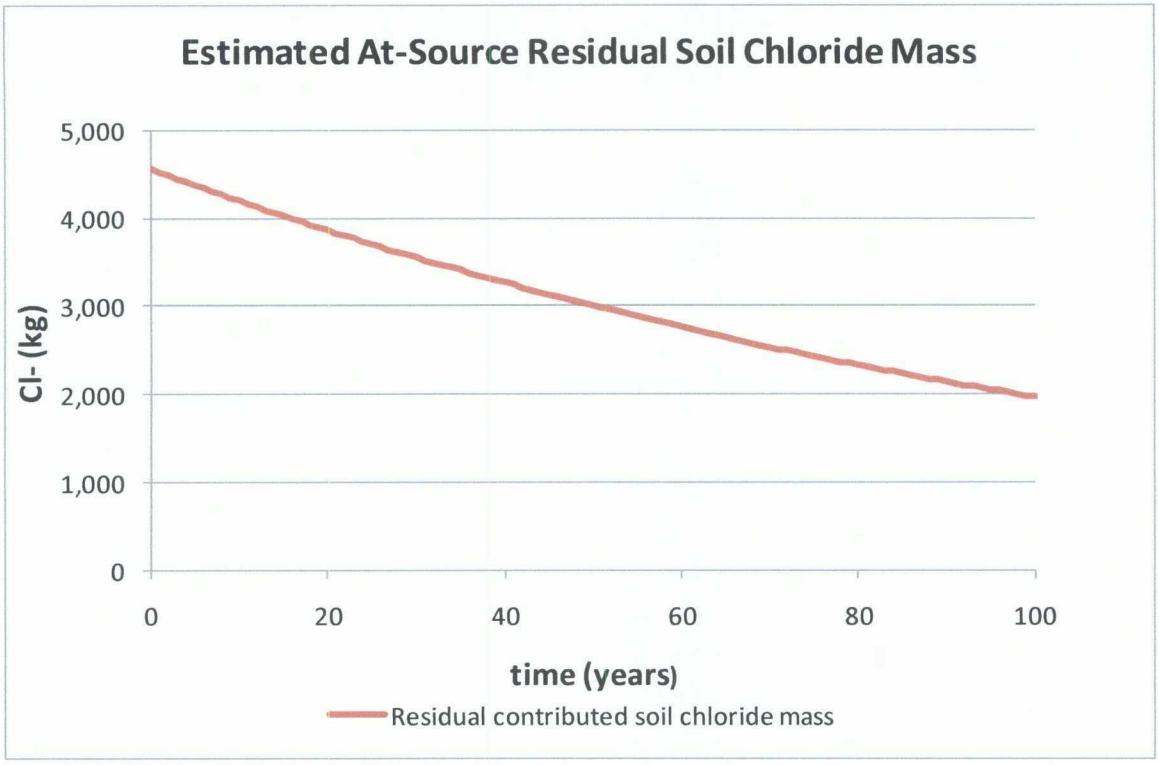
Figure 3– VAC M-5 Jct. measured soil chloride concentrations and aerial "footprint" of proposed subsurface infiltration barrier.

Sample Date	Cl	TDS	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Sulfate
3/3/2009	**352**	972	<0.001	<0.001	<0.001	<0.003	47
4/29/2009	**368**	851	<0.001	<0.001	<0.001	<0.003	44
8/7/2009	**416**	1,090	<0.001	<0.001	<0.001	<0.003	47
10/22/2009	**380**	1,030	<0.001	<0.001	<0.001	<0.003	45
2/11/2010	**332**	929	<0.001	<0.001	<0.001	<0.003	54
4/26/2010	**344**	1,020	<0.001	<0.001	<0.001	<0.003	56
8/5/2010	**336**	945	<0.001	<0.001	<0.001	<0.003	51
Average	**361**	**977**					**49**

Table 1 – Measured groundwater chloride concentrations in a near-source monitor well (MW-1) approximately 55 ft down-gradient from former junction box location.

Soil Chloride Calculator			
Estimated Mass of Contributed, Residual Soil Chloride			
Rice Operating Company			
Site:	**VAC M-5 Jct.**		
This estimate prepared by:	L. Peter Galusky, Jr.		
Date:	10/12/2010		
Inputs in Blue Font			Notes
length of affected area (ft)		**65**	measured/estimated
width of affected area (ft)		**50**	measured/estimated
affected area (sq ft)		**2,551**	calculated
affected depth (ft)		**50**	measured/estimated
depth to water table (ft)		**105**	estimated
avg Cl- conc of affected soil (ppm)		**1,200**	measured/estimated
est. natural background Cl- conc (ppm)		**120**	estimated
unsat zone mass density (lbs/cu yd)		**3,000**	estimated
Cl- conc attributed to source (ppm)		**1,080**	calculated
volume of affected soil (cu yds)		**4,725**	calculated
total mass of affected soils (lbs)		**14,173,611**	calculated
mass of contributed residual soil chloride (lbs)		**15,308**	calculated

Table 2 – Estimated mass of contributed, residual soil chlorides beneath the former M-5 Jct location.



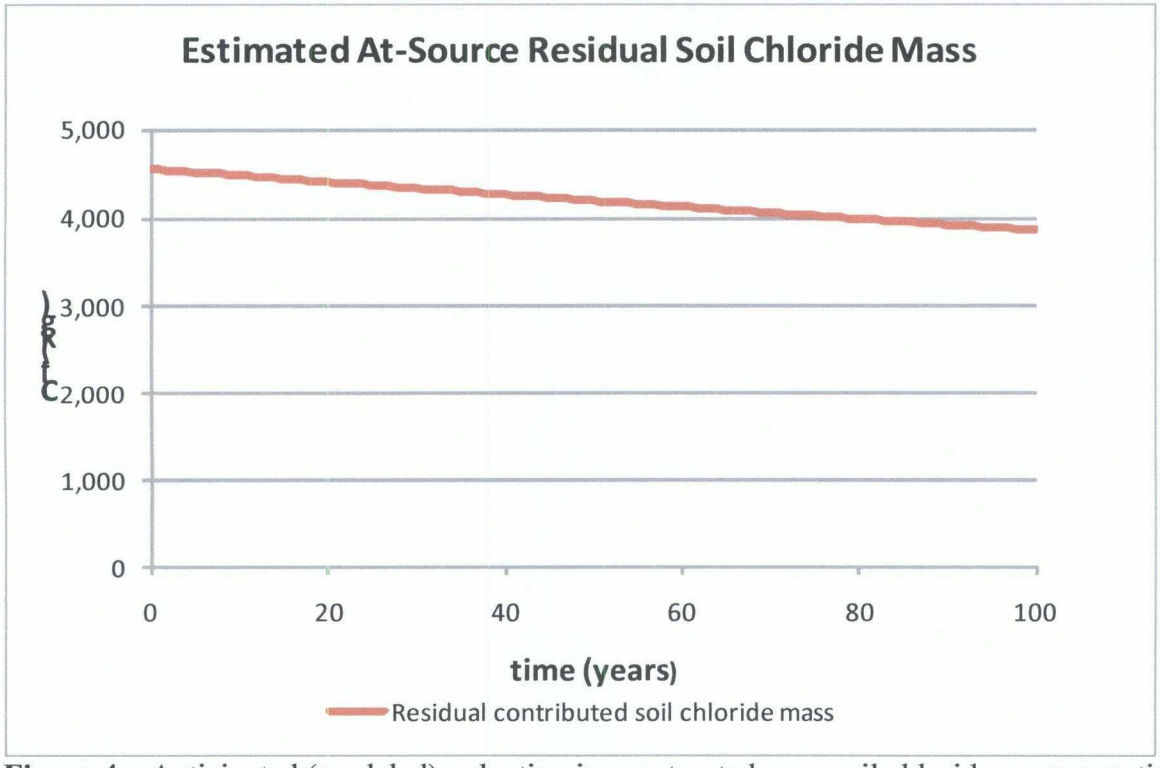
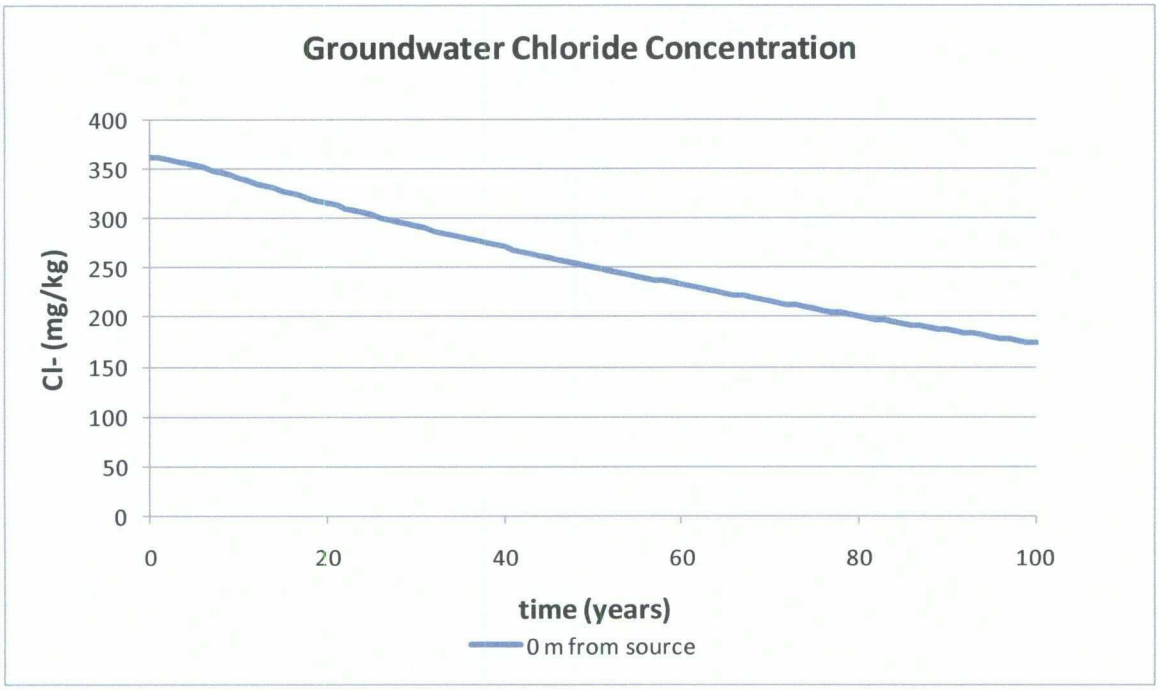


Figure 4 – Anticipated (modeled) reduction in unsaturated zone soil chloride mass over time under existing conditions (Figure 4a, above) and reflecting the anticipated effects of the construction of a proposed, sub-surface infiltration barrier (Figure 4b, below), where the presumed rate of soil chloride movement would drop from 0.5 m/yr to 0.1 m/yr.



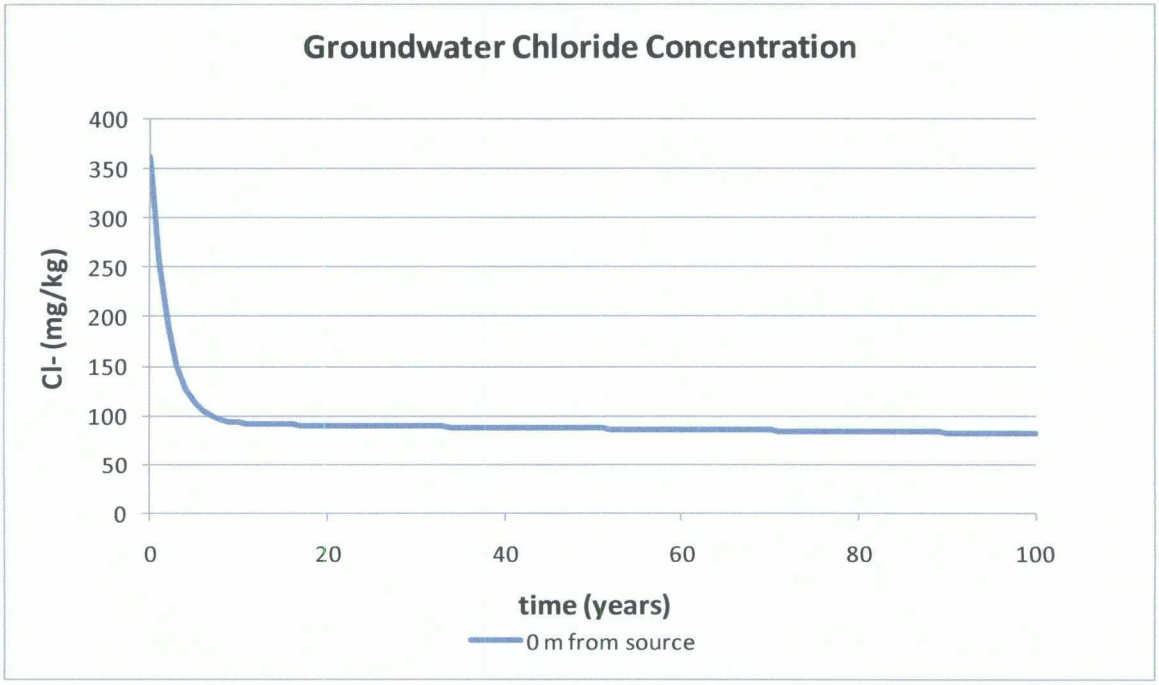


Figure 5 – Anticipated (modeled) groundwater chloride concentrations immediately beneath the subject site under existing conditions (Figure 5a, above) and reflecting the anticipated effects of the construction of a proposed, sub-surface infiltration barrier (Figure 5b, below), where the presumed rate of soil chloride movement would drop from 0.5 m/yr to 0.1 m/yr.

Chloride Transport Model (CTM)				
Copyright L. Peter Galusky, Jr.				
Copyright:	L. Peter Galusky, Jr. Ph.D			
Date:	12-Oct-10			
Unsaturated Zone Inputs				
Parameter	Unit	Value	Notes	
equivalent length (in direction of gw flow) of affected area	m	20	approx. surface footprint	
equivalent width (perpendicular to gw flow) of affected area	m	15	approx. surface footprint	
affected depth	m	7	measured/estimated	
depth to water table	m	60	measured/estimated	
avg Cl- conc of affected soil	mg/kg	1,200	measured/estimated	
est. natural background Cl- conc	mg/kg	120	measured/estimated	
unsat zone mass density	kg/m3	2,000	estimated/assumed	
rate of Cl- percolation	m/yr	0.5	estimated - present conditions	
"	"	0.1	estimated - w/ infiltration barrier	
Saturated Zone Inputs				
Parameter	Unit	Value	Notes	
upgradient (baseline) Cl- conc	mg/kg	25	measured/estimated	
initial Cl- conc (Co)	mg/kg	361	avg of last 4 qtrs	
thickness of affected aquifer	m	3	measured/estimated	
aquifer porosity	per cent	25%	estimated/assumed	
rate of groundwater movement	m/yr	5.00	estimated/assumed	

Table 3 – Excel spreadsheet model "inputs".

Hansen, Edward J., EMNRD

From: Hack Conder [hconder@riceswd.com]
Sent: Tuesday, October 26, 2010 2:03 PM
To: Hansen, Edward J., EMNRD
Subject: FW: Vacuum jct. M-5 proposed infiltration barrier 1R-425-38
Attachments: Vacuum jct M-5 Proposed infiltration barrier.jpg; from center facing east.JPG; from center facing north.JPG; from center facing south.JPG; from center facing west.JPG

Mr. Hansen
Attached is the corrected Plate for Vac. M-5 Cap 1R-425-38. Extended Liner dimensions and the corrected soil bore data. The only obstructions are to the east of this site attached pictures from center out . If you have any questions please contact me.

Hack

Proposed Infiltration Barrier

SB-5

Depth	Cl-	LAB Cl-
5	275	
10	916	1040
15	2055	
20	2576	
25	2258	
30	2882	
35	2762	944
40	2338	
45	2156	
50	2610	
55	2244	
60	1090	
65	2671	
70	2109	
75	1285	
80	953	

SB-1

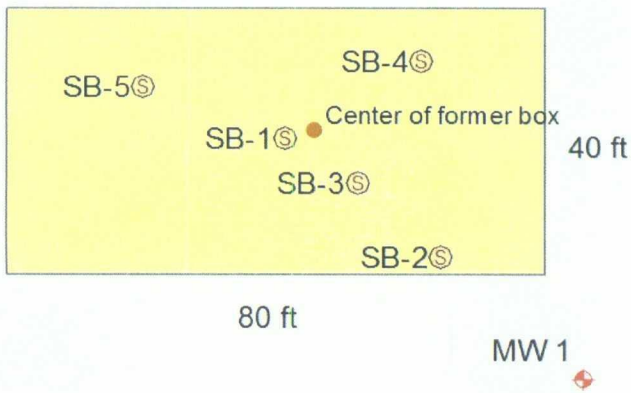
Depth	Cl-	Cl- LAB	GRO	DRO
5	1274			
10	604			
15	883			
20	642			
25	793	912	<10	<10
30	662			
35	658			
40	1197			
45	1166			
50	1612	1540	<10	<10
55	1407			
60	1540			
65	1449			
70	1449			

SB-3

Depth	Cl-	LAB Cl-	GRO	DRO
5	448			
10	1258			
15	1251			
20	1548			
25	1213			
30	1267			
35	1529			
40	1678			
45	1695	1580	<10	<10
50	331			
55	1029			
60	1525	1540	<10	<10
65	1709			

SB-4

Depth	Cl-	Depth Cl-
15	1658	
20	1870	
25	1733	
30	1446	
35	1495	
40	1214	
45	1963	1700
50	1277	
55	1550	
60	1723	
65	722	
70	790	
75	753	
80	878	
85	954	
90	882	



SB-2

Depth	Cl-	Cl- LAB	GRO	DRO
5	449			
10	533			
15	374			
20	616	624	<10	<10
25	579			
30	307			
35	325			
40	193			
45	207			
50	206			
55	168			
60	168	32	<10	<10

RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

Vacuum jct. M-5

Legals: UL/M sec. 5
T18S R35E
NMOCD Case #: 1R425-38

N W E S

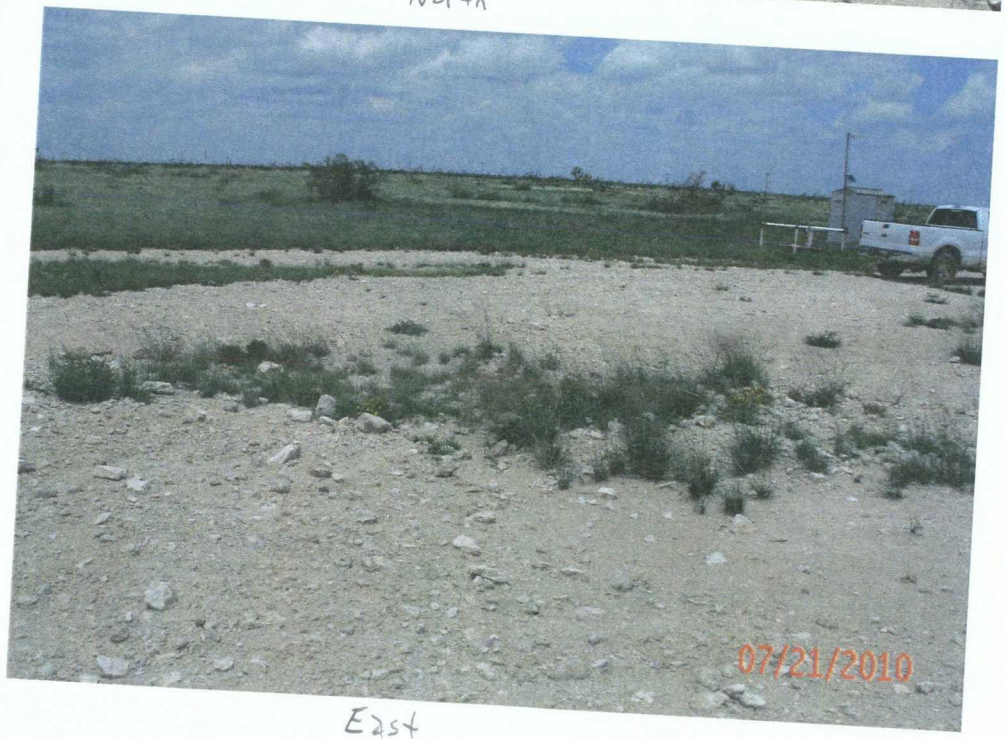
0 12.5 25 50 Feet

Drawing date: 9-2-10
Drafted by: L. Weinheimer

West

North

South



East