1R - 426-124

WORKPLANS

Date:
12-21-10

Hansen, Edward J., EMNRD

From: Katie Jones [kjones@riceswd.com]
Sent: Monday, January 31, 2011 3:29 PM
To: Hansen, Edward J., EMNRD
Cc: Hack Conder; gil@trident-environmental.com
Subject: Corrected BD Jct. P-30 (1R426-124) CAP Addendum
Attachments: BD Jct. P-30 (1R426-124) Proposed Liner.jpg

Mr. Hansen,

This email is an Addendum to the BD Jct. P-30 (1R426-124) Corrective Action Plan, submitted to the NMOCD on December 21, 2010. Page 2, paragraph 2: text in blue lettering, below, will be added to the paragraph. Red lettering marked with a strike-through will be deleted. A plat showing the proposed liner location is attached. If you need any further information, please let me or Hack Conder know.

"Details of the construction of the lined ET cover are summarized below.

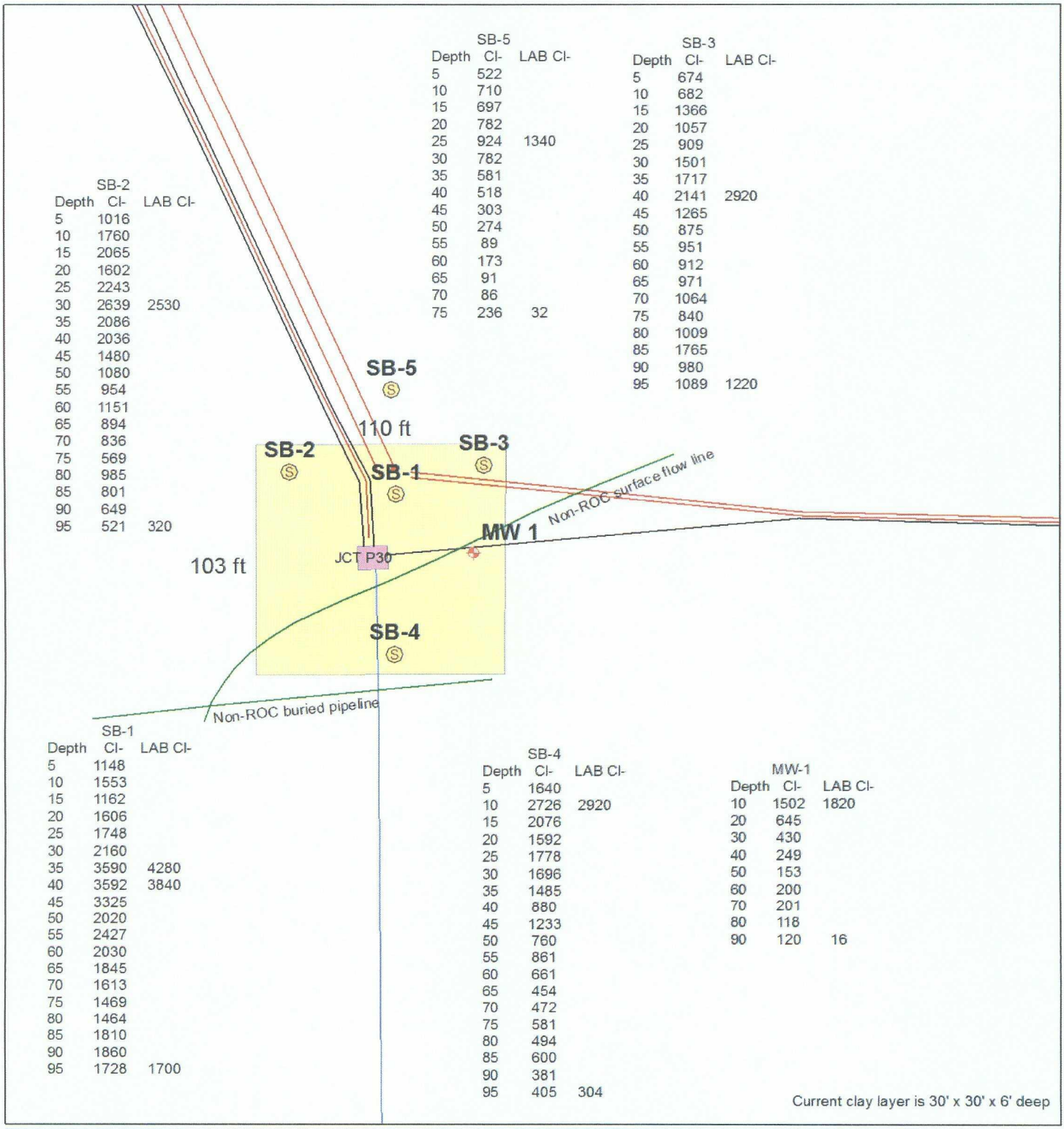
1. Excavate an area ~~101~~110 feet long by ~~97~~103 ft wide (or as close as safety will allow to a buried pipeline located south of this site) to a depth of approximately 4 feet below ground surface (bgs).
2. A 20-mil polyethylene liner will be installed and properly seated at the base of the excavation. ~~Figure 1 in Attachment B~~ The attached plat depicts the proposed liner and area to be excavated.
3. Soil with chloride concentrations no greater than 500 mg/kg and a PID field reading below 100 ppm will be backfilled on top of the poly liner and seeded with native species of grass. Any soil requiring disposal will be properly disposed of at an NMOCD-approved facility.

The surrounding area is supportive of vegetation and will be re-seeded with a mixture of native grasses and plants that will re-vegetate the area at a natural rate."

Thank you.

Katie Jones
Environmental Project Coordinator
RICE *Operating Company*

Proposed Liner



SB-5

Depth	Cl-	LAB Cl-
5	522	
10	710	
15	697	
20	782	
25	924	1340
30	782	
35	581	
40	518	
45	303	
50	274	
55	89	
60	173	
65	91	
70	86	
75	236	32

SB-3

Depth	Cl-	LAB Cl-
5	674	
10	682	
15	1366	
20	1057	
25	909	
30	1501	
35	1717	
40	2141	2920
45	1265	
50	875	
55	951	
60	912	
65	971	
70	1064	
75	840	
80	1009	
85	1765	
90	980	
95	1089	1220

SB-2

Depth	Cl-	LAB Cl-
5	1016	
10	1760	
15	2065	
20	1602	
25	2243	
30	2639	2530
35	2086	
40	2036	
45	1480	
50	1080	
55	954	
60	1151	
65	894	
70	836	
75	569	
80	985	
85	801	
90	649	
95	521	320

SB-1

Depth	Cl-	LAB Cl-
5	1148	
10	1553	
15	1162	
20	1606	
25	1748	
30	2160	
35	3590	4280
40	3592	3840
45	3325	
50	2020	
55	2427	
60	2030	
65	1845	
70	1613	
75	1469	
80	1464	
85	1810	
90	1860	
95	1728	1700

SB-4

Depth	Cl-	LAB Cl-
5	1640	
10	2726	2920
15	2076	
20	1592	
25	1778	
30	1696	
35	1485	
40	880	
45	1233	
50	760	
55	861	
60	661	
65	454	
70	472	
75	581	
80	494	
85	600	
90	381	
95	405	304

MW-1

Depth	Cl-	LAB Cl-
10	1502	1820
20	645	
30	430	
40	249	
50	153	
60	200	
70	201	
80	118	
90	120	16

Current clay layer is 30' x 30' x 6' deep

RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC

RECS

BD jct. P-30

Legals: UL/P sec. 30
T21S R37E

Case #: 1R426-124

N W E S

0 30 60 120 Feet

Drawing date: 10-22-10
Drafted by: L. Weinheimer

TRIDENT ENVIRONMENTAL

CERTIFIED MAIL
RETURN RECEIPT NO. 7010 0290 0003 1264 9079

December 21, 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**
BD Jct. P-30 Site (NMOCD Case No. 1R0426-124)
T21S-R37E-Section 30, Unit Letter P
Lea County, New Mexico

Mr. Hansen:

On behalf of RICE Operating Company (ROC), Trident Environmental submits this *Corrective Action Plan* (CAP) for the above-referenced site in response to your October 21, 2010 email (Attachment A).

Recommendations for Corrective Action to Vadose Zone

The former P-30 junction box was rebuilt at a location approximately 30 feet to the south of its former location as part of the Pipeline Replacement/Upgrade Program. Between June 12 and June 21, 2006, a 30 feet wide by 30 feet long area was excavated to a depth of 12 feet below ground surface (bgs). Following the characterization of the soil, the excavated soil was blended and returned to the excavation up to a depth of 6 feet bgs. A 1-foot thick compacted clay barrier was installed to prevent potential downward migration of any residual contaminants and the remaining soil was placed above the clay. The replacement of the former junction box, excavation, backfilling, and clay layer installation has effectively mitigated any future release of chlorides and TDS. However, as an additional precautionary measure, ROC proposes to install a larger, lined evapo-transpiration (ET) cover as the final closure method for the former BD Jct. P-30 site. An ET cover minimizes infiltration by providing temporary water storage capacity within the cover and eventual water removal by evaporation and transpiration. The proposed ET cover will consist of a very low permeable layer - in this case a 20-mil polyethylene liner - capped with an approximately 4 ft thick topsoil layer. The fine-grained topsoil layer provides the necessary water storage capacity to sustain growth of the native species as it

allows for evapotranspiration taking place thus minimizing infiltration into underlying soil horizons.

Details of the construction of the lined ET cover are summarized below.

1. Excavate an area 101 feet long by 97 ft wide to a depth of approximately 4 feet below ground surface (bgs).
2. A 20-mil polyethylene liner will be installed and properly seated at the base of the excavation. Figure 1 in Attachment B depicts the proposed liner and area to be excavated.
3. Soil with chloride concentrations no greater than 500 mg/kg and a PID field reading below 100 ppm will be backfilled on top of the poly liner and seeded with native species of grass. Any soil requiring disposal will be properly disposed of at an NMOCD-approved facility.

The surrounding area is supportive of vegetation and will be re-seeded with a mixture of native grasses and plants that will re-vegetate the area at a natural rate.

Recommendations for Corrective Action to the Groundwater

Based on the characterization of background concentrations for chlorides and total dissolved solids (TDS), as described in the previously submitted *Background Characterization Report* (October 11, 2010), we have determined that groundwater at the site is below background conditions for chloride and therefore has not been impacted by the former junction box. Nonetheless, ROC proposes to use the groundwater recovery system at a nearby site (BD O-23 vent) which utilizes a solar-powered submersible pump, for limited chloride mass removal to compensate for any potential downward migration of residual chlorides into the groundwater. Based on current chloride concentrations at the BD O-23 vent site being near 7,000 mg/L, removing the chloride mass from this site will maximize the environmental benefit of the chloride mass removal effort. Figure 2 in Attachment B depicts the locations of the BD Jct. P-30 and BD O-23 vent sites. Calculations for the chloride mass to be removed based on simple mass balance equations are explained in the next section.

Estimate of Chloride Mass in Groundwater

First, a 9,797 ft^2 area of concern was conservatively estimated based on soil boring delineation (soil borings B-1, B-2, B-3, B-4, B-5, and MW-1). The aquifer thickness was estimated to be 25 ft (depth to water table at 95 feet subtracted from aquifer bottom estimated at 120 feet). The known (measured) depth to groundwater and estimated base of the aquifer is consistent with published hydrological reports (Nicholson and Clebsch, 1961). The total area multiplied by the thickness of the aquifer and its porosity (0.25)

results in a saturated pore space volume of 17,340,000 liters. Next, the average chloride concentration observed in MW-1 was calculated based on six quarters of monitoring data. Although this average chloride concentration (346 mg/L) is below previously determined background conditions (570 mg/L), it is being conservatively used to calculate the total chloride mass in groundwater at the site. This chloride concentration multiplied by the saturated pore space volume results in a chloride mass of 599 kg. These calculations are shown in the following table in the same order as described above.

Estimate of Chloride Mass in Groundwater:

Parameter Type	Value	Parameter Validation (description of equations used)
Impact area	9,797 ft^2	Area of Commingled Plume (Total surface area covered by leak)
Aquifer Thickness	25 ft	Known lithology of monitoring well MW-1 and published reports (Nicholson and Clebsch, 1961).
Porosity	0.25	Professional estimate for water saturated pore volume
Volume of impacted Groundwater below site.	61,231 ft^3	Simple multiplication of each parameter listed above (saturated pore space volume).
Volume of Impacted Groundwater below site.	1.73E+06 L	Unit conversion of previous value to liters (saturated pore space volume).
Chloride concentration	346 mg/L	Average chloride concentration observed in MW-1 based on six quarters of monitoring data
Total chloride mass	**599 kg**	Simple multiplication of two parameters listed above

The groundwater recovery system employed at the BD O-23 vent, where chloride concentrations are about 7,000 mg/L, could extract about 38.2 kg of chloride mass per day, assuming an average pumping rate of 1 gallon per minute can be achieved. At that rate it would take approximately 15.7 days and the equivalent of 539 barrels (bbls) to remove 599 kg of chloride mass.

The groundwater recovery system includes a solar-powered submersible pump capable of discharging at a minimum rate of 1 gpm. Water from the recovery well will be utilized in pipeline and well maintenance operations.

Estimate of Chloride Mass in Vadose Zone

In light of the fact that a lined evapo-transpiration (ET) cover is proposed, an exposure assessment was run by ROC for this site using the United States Environmental Protection Agency Exposure Assessment Multimedia Model (MULTIMED Version 1.01, June 1991). Data inputs and model outputs are included in Attachment C. The model output concludes that the peak increased concentration of chlorides in groundwater contributed by soils in the vadose zone would be 205 mg/L in 1,200 years (Figure 3 in Attachment B). Since the estimated increase in chloride concentrations in groundwater from residual chloride migration is below 250 mg/L, and a conservative upper limit for

background chloride concentration in the area is 570 mg/L; vadose zone chloride mass removal estimates are not warranted for this site.

Termination and Proposed Schedule of Activities

ROC will continue quarterly groundwater sampling the monitoring well for chloride and TDS analyses until the groundwater recovery program is completed. EPA Method 8021B analysis will be suspended since concentrations have been below 0.001 mg/L for each constituent of BTEX, which is well below WQCC standards.

Upon approval of this Corrective Action Plan, ROC will schedule the construction of the lined ET cover and re-seed the surface. At the completion of corrective actions as described herein and in accordance with 19.15.29 NMAC, a final report will be submitted to the NMOCD with a termination request for this corrective action plan and plugging of the monitoring well using cement grout with 1% to 3% bentonite.

ROC is the service provider (agent) for the BD Salt Water Disposal System and has no ownership of any portion of the pipelines, wells, or facilities. The BD System is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis. Environmental remediation projects of this magnitude require System Parties AFE approval and work begins as funds are received.

We appreciate the opportunity to work with you on this project. Please feel free to call Hack Conder at 575-393-9174, if you have any questions.

Sincerely,

Gilbert J. Van Deventer, REM, PG
Trident Environmental

cc: Hack Conder (ROC)

ATTACMENT A

NMOCD Correspondence

Subject: Remediation Plan (1R426-124) Corrective Action Plan (CAP) Required - ROC BD Jct P-30 Site
From: "Hansen, Edward J., EMNRD" <edwardj.hansen@state.nm.us>
Date: Thu, 21 Oct 2010 11:38:33 -0600
To: "Hack Conder" <hconder@riceswd.com>
CC: "Leking, Geoffrey R, EMNRD" <GeoffreyR.Leking@state.nm.us>, "Katie Jones" <kjones@riceswd.com>, <gil@trident-environmental.com>

RE: Background Characterization Report for the Rice Operating Company's
BD Jct P-30 Site
Unit Letter P, Section 30, T21S, R37E, NMPM, Lea County, New Mexico
Remediation Plan (1R426-124) Corrective Action Plan (CAP) Required

Dear Mr. Conder:

The New Mexico Oil Conservation Division (OCD) has received Rice Operating Company's (ROC) background characterization report for the above-referenced site (dated October 11, 2010). The report indicates that the chloride concentrations for background may be similar to that at the site; although, not conclusively. Since the vadose chloride concentrations are elevated near the capillary fringe and may pose a threat to groundwater quality, a corrective action plan must be submitted to the OCD for approval. The CAP should include additional source control and at least a limited chloride mass removal.

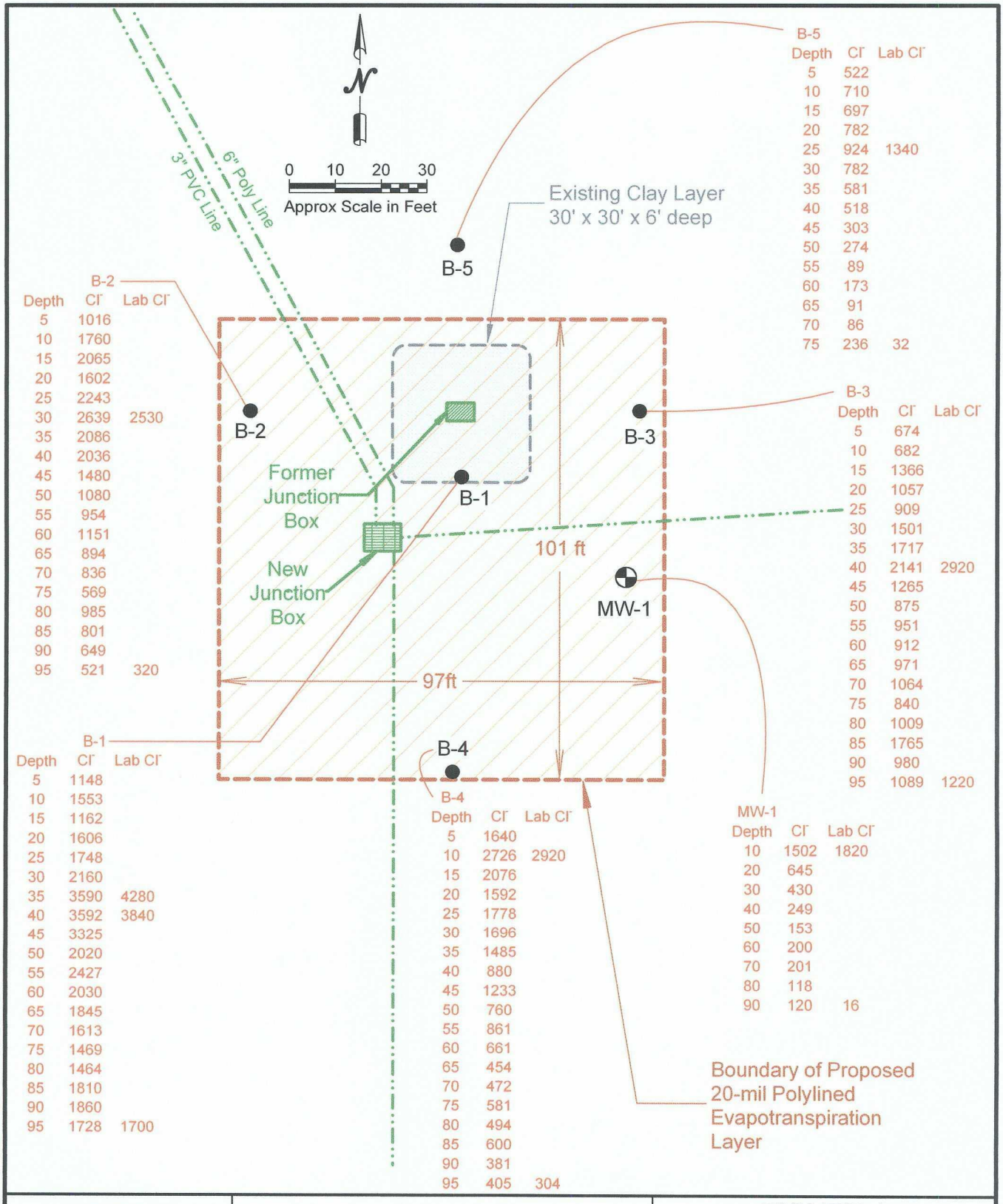
ROC must submit a CAP to the OCD within 60 days.

If you have any questions regarding this matter, please contact me at 505-476-3489.

Edward J. Hansen
Hydrologist
Environmental Bureau

ATTACMENT B

FIGURES



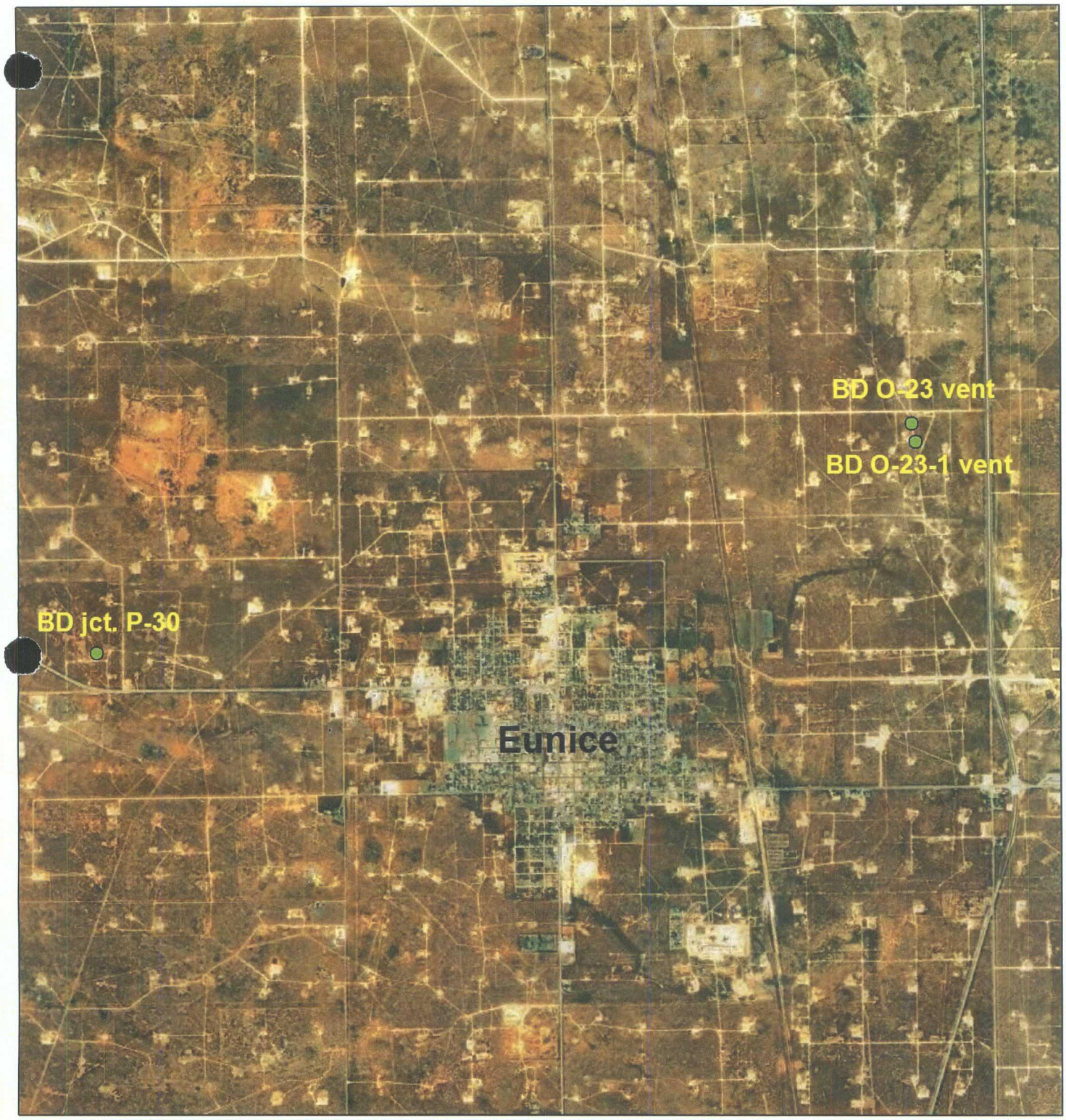
RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC

BD Jct. P-30 Site

T21S - R37E - Section 30, Unit P

RICE *Operating Company*

FIGURE 1
Chloride Concentrations in Vadose Zone and Proposed Polylined Evapotranspiration Layer



RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

BD jct. P-30
BD O-23 vent
BD O-23-1 vent

Legals: T21S R37E

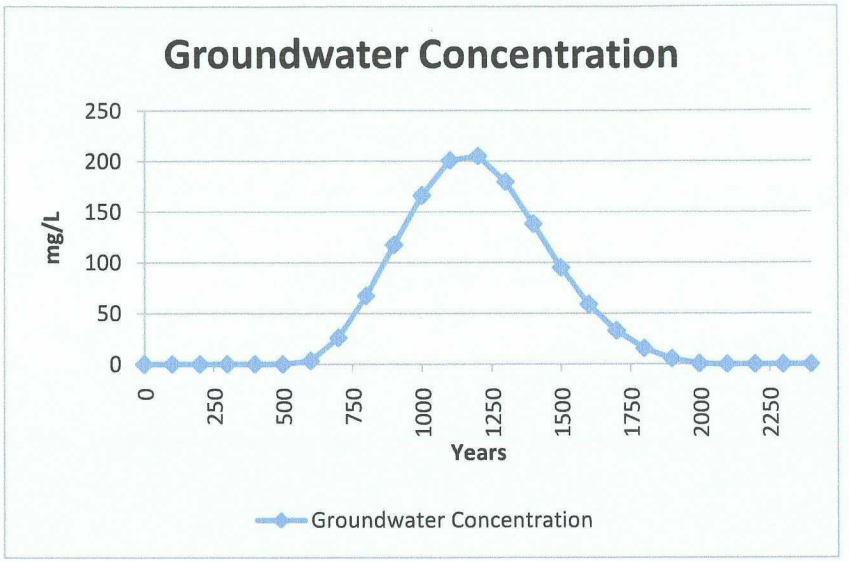
FIGURE 2

N
W E
S

0 0.25 0.5 1 Miles

Drawing date: 12-20-10
Drafted by: L. Weinheimer

MODEL OUTPUT			
Concentration	0.00 mg/L	Time	0 yr
	0.00 mg/L		100 yr
	0.00 mg/L		200 yr
	0.00 mg/L		300 yr
	0.00 mg/L		400 yr
	0.00 mg/L		500 yr
	3.39 mg/L		600 yr
	26.00 mg/L		700 yr
	67.17 mg/L		800 yr
	117.56 mg/L		900 yr
	166.15 mg/L		1000 yr
	200.75 mg/L		1100 yr
	205.21 mg/L		1200 yr
	179.71 mg/L		1300 yr
	138.08 mg/L		1400 yr
	94.93 mg/L		1500 yr
	58.91 mg/L		1600 yr
	32.99 mg/L		1700 yr
	15.52 mg/L		1800 yr
	5.52 mg/L		1900 yr
	0.56 mg/L		2000 yr
	0.00 mg/L		2100 yr
	0.00 mg/L		2200 yr
	0.00 mg/L		2300 yr
	0.00 mg/L		2400 yr



RICE OPERATING COMPANY
ROC
SINCE 1955

FIGURE 3

MULTIMED Output
BD Jct. P-30 (1R0426-124)

Unit Letter P, Section 30, T21S-R37E

ATTACMENT C

MULTIMED MODEL

Input and Output Data

BD JUNCTION P-30
TRANSIENT CASE

GENERAL DATA

*** CHEMICAL NAME FORMAT(80A1)
CHLORIDE

*** ISOURC				ROUTE		NT		IYCHK		PALPH	APPTYP		
***OPTION	OPTAIR	RUN	MONTE	ISTEAD		IOPEN		IZCHK		LANDF	COMPLETE		
2	0	0	DETERMINISTIC	500	1	0	25	1	0	1 90.0	0	1	1

*** XST

*** TIME STEPPING PARAMETERS FOR SATURATED ZONE MODEL

0.00	100.00	200.00	300.00	400.00	500.00	600.00	700.00	800.00	900.00
1000.00	1100.00	1200.00	1300.00	1400.00	1500.00	1600.00	1700.00	1800.00	1900.00
2000.00	2100.00	2200.00	2300.00	2400.00					

END GENERAL

CHEMICAL SPECIFIC VARIABLE DATA

ARRAY VALUES
*** CHEMICAL SPECIFIC VARIABLES

***	VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
1	Solid phase decay coeff (1/yr)		0	0.000E+00	-999.	0.000E+00	0.100E+11
2	Diss phase decay coeff (1/yr)		0	0.000E+00	-999.	0.000E+00	0.100E+11
3	Overall chem dcy coeff (1/yr)		0	0.000E+00	-999.	0.000E+00	0.100E+11
4	Acid cataly hydrol rte(l/M-yr)		0	0.000E+00	-999.	0.000E+00	-999.
5	Neutral hydrol rate cons(1/yr)		0	0.000E+00	-999.	0.000E+00	-999.
6	Base cataly hydrol rte(l/M-yr)		0	0.000E+00	-999.	0.000E+00	-999.
7	Reference temperature (C)		0	25.0	-999.	0.000E+00	100.
8	Normalized distrib coeff(ml/g)		0	0.000E+00	-999.	0.000E+00	-999.
9	Distribution coefficient		-2	-999.	-999.	0.000E+00	0.100E+11
10	Biodegrad coef(sat zone)(1/yr)		0	0.000E+00	-999.	0.000E+00	-999.
11	Air diffusion coeff (cm2/s)		0	0.000E+00	-999.	0.000E+00	10.0
12	Ref temp for air diffusion (C)		0	25.0	-999.	0.000E+00	100.
13	Molecular weight (g/mole)		0	35.5	-999.	0.000E+00	-999.
14	Mole fraction of solute		0	0.000E+00	-999.	0.100E-08	1.00
15	Solute vapor pressure (mm Hg)		0	0.000E+00	-999.	0.000E+00	100.
16	Henry`s law cons (atm-m^3/M)		0	0.000E+00	-999.	0.100E-09	1.00

END ARRAY AND CHEMICAL SPECIFIC VARIABLE DATA

SOURCE SPECIFIC VARIABLE DATA

ARRAY VALUES
*** SOURCE SPECIFIC VARIABLES

***	VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
***				MEAN	STD DEV	MIN	MAX
1	Infiltration rate (m/yr)		0	0.640E-02	-999.	0.100E-09	0.100E+11
2	Area of waste disp unit (m^2)		0	912.	-999.	0.100E-01	-999.
3	Duration of pulse (yr)		0	500.	-999.	0.100E-08	-999.
4	Spread of contaminant srce (m)		-1	-999.	-999.	0.100E-08	0.100E+11
5	Recharge rate (m/yr)		0	0.200E-02	-999.	0.000E+00	0.100E+11
6	Source decay constant (1/yr)		0	0.000E+00	-999.	0.000E+00	-999.
7	Init conc at landfill (mg/l)		0	0.116E+04	-999.	0.000E+00	-999.
8	Length scale of facility (m)		-1	30.8	-999.	0.100E-08	0.100E+11
9	Width scale of facility (m)		-1	29.6	-999.	0.100E-08	0.100E+11

END ARRAY

END SOURCE SPECIFIC VARIABLE DATA

VFL UNSATURATED FLOW MODEL PARAMETERS

CONTROL PARAMETERS

*** DUMMY	NMAT	KPROP	DUMMY	NVFLAY
0	1	1	1	1

END CONTROL PARAMETERS

SATURATED MATERIAL PROPERTY PARAMETERS

ARRAY VALUES
*** SATURATED MATERIAL VARIABLES

***	VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
***				MEAN	STD DEV	MIN	MAX
1	Sat hydraulic conduct (cm/hr)		0	2.54	-999.	0.100E-10	0.100E+05
2	Unsaturated zone porosity		0	0.300	-999.	0.100E-08	0.990

3 Air entry pressure head (m)	0	0.000E+00	-999.	0.000E+00	-999.	
4 Depth of the unsat zone (m)	0	30.0	-999.	0.100E-08	-999.	

END ARRAY

END MATERIAL 1

SOIL MOISTURE PARAMETERS

*** FUNCTIONAL COEFFICIENTS
ARRAY VALUES
*** FUNCTIONAL COEFFICIE VARIABLES

*** VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	STD DEV	LIMITS MIN	MAX
1 Residual water content		0	0.450E-01	-999.	0.100E-08	1.00
2 Brooks and Corey exponent, EN		0	0.000E+00	-999.	0.000E+00	10.0
3 ALFA van Genuchten coefficient		0	0.900E-02	-999.	0.000E+00	1.00
4 BETA Van Genuchten coefficient		0	1.23	-999.	1.00	5.00

END ARRAY

END MATERIAL 1
END UNSATURATED FLOW

VTP UNSATURATED TRANSPORT MODEL
CONTROL PARAMETERS

*** NLAY	DUMMY	IADU	ISOL	N	NTEL	NGPTS	NIT	DUMMY	DUMMY	WTFUN
1	20	1	1	18	3	104	2	1	1	1.200

END CONTROL PARAMETERS

UNSATURATED TRANSPORT PARAMETERS

ARRAY VALUES
*** UNSATURATED TRANSPOR VARIABLES

*** VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	STD DEV	LIMITS MIN	MAX
1 Thickness of layer (m)		0	30.0	-999.	0.100E-08	-999.
2 Longit disper of layer (m)		-1	-999.	-999.	0.100E-02	0.100E+05
3 Percent organic matter		0	0.500	-999.	0.000E+00	100.
4 Bulk dens of soil layer (g/cc)		0	1.85	-999.	0.100E-01	5.00
5 Biological decay coeff (1/yr)		0	0.000E+00	-999.	0.000E+00	-999.

END ARRAY

END LAYER 1
END UNSATURATED TRANSPORT PARAMETERS
END TRANSPORT MODEL

AQUIFER SPECIFIC VARIABLE DATA

ARRAY VALUES
*** AQUIFER SPECIFIC VARIABLES

***	VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
***				MEAN	STD DEV	MIN	MAX
1	Particle diameter (cm)		0	0.500E-02	-999.	0.100E-08	100.
2	Aquifer porosity		0	0.250	-999.	0.100E-08	0.990
3	Bulk density (g/cc)		0	1.85	-999.	0.100E-01	5.00
4	Aquifer thickness (m)		0	7.62	-999.	0.100E-08	0.100E+06
5	Mixing zone depth (m)		0	3.05	-999.	0.100E-08	0.100E+06
6	Hydraulic conductivity (m/yr)		0	223.	-999.	0.100E-06	0.100E+09
7	Hydraulic Gradient		0	0.300E-02	-999.	0.100E-07	-999.
8	Grndwater seep velocity (m/yr)		-2	-999.	-999.	0.100E-09	0.100E+09
9	Retardation coefficient		-1	-999.	-999.	1.00	0.100E+09
10	Longitudinal dispersivity (m)		10	-999.	-999.	-999.	-999.
11	Transverse dispersivity (m)		10	-999.	-999.	-999.	-999.
12	Vertical dispersivity (m)		10	-999.	-999.	-999.	-999.
13	Temperature of aquifer (C)		0	22.1	-999.	0.000E+00	100.
14	pH		0	7.28	-999.	0.300	14.0
15	Organic carbon content (fract)		0	0.300E-02	-999.	0.100E-05	1.00
16	Receptor distance from site(m)		0	1.00	-999.	1.00	-999.
17	Angle off center (degree)		0	0.000E+00	-999.	0.000E+00	360.
18	Z-dist from watertable (fract)		0	0.000E+00	-999.	0.000E+00	1.00

END ARRAY

END AQUIFER SPECIFIC VARIABLE DATA

END ALL DATA

Modeling input performed by:
RICE *Operating Company*

U. S. ENVIRONMENTAL PROTECTION AGENCY

EXPOSURE ASSESSMENT

MULTIMEDIA MODEL

MULTIMED (Version 1.01, June 1991)

Modeling output performed by:
RICE *Operating Company*

Run options
--- -------

BD JUNCTION P-30

TRANSIENT CASE
Chemical simulated is CHLORIDE

Option Chosen	Saturated and unsaturated zone models
Run was	DETERMIN

Infiltration input by user
Run was transient
Reject runs if Y coordinate outside plume
Do not reject runs if Z coordinate outside plume
Gaussian source used in saturated zone model

UNSATURATED ZONE FLOW MODEL PARAMETERS
(input parameter description and value)

NP	- Total number of nodal points	240
NMAT	- Number of different porous materials	1
KPROP	- Van Genuchten or Brooks and Corey	1
IMSHGN	- Spatial discretization option	1
NVFLAYR	- Number of layers in flow model	1

OPTIONS CHOSEN
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Van Genuchten functional coefficients
User defined coordinate system

Layer information

LAYER NO.	LAYER THICKNESS	MATERIAL PROPERTY
1	30.00	1

DATA FOR MATERIAL 1
---- --- --------
VADOSE ZONE MATERIAL VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Saturated hydraulic conductivity	cm/hr	CONSTANT	2.54	-999.	0.100E-10	0.100E+05
Unsaturated zone porosity	--	CONSTANT	0.300	-999.	0.100E-08	0.990
Air entry pressure head	m	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Depth of the unsaturated zone	m	CONSTANT	30.0	-999.	0.100E-08	-999.

DATA FOR MATERIAL 1
---- --- --------
VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Residual water content	--	CONSTANT	0.450E-01	-999.	0.100E-08	1.00
Brook and Corey exponent,EN	--	CONSTANT	0.000E+00	-999.	0.000E+00	10.0
ALFA coefficient	1/cm	CONSTANT	0.900E-02	-999.	0.000E+00	1.00
Van Genuchten exponent, ENN	--	CONSTANT	1.23	-999.	1.00	5.00

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY	- Number of different layers used	1
NTSTPS	- Number of time values concentration calc	40
DUMMY	- Not presently used	1
ISOL	- Type of scheme used in unsaturated zone	1
N	- Stehfest terms or number of increments	18
NTEL	- Points in Lagrangian interpolation	3

NGPTS	- Number of Gauss points		104
NIT	- Convolution integral segments		2
IBOUND	- Type of boundary condition		2
ITSGEN	- Time values generated or input		1
TMAX	- Max simulation time	--	0.0
WTFUN	- Weighting factor	--	1.2

OPTIONS CHOSEN
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Stehfest numerical inversion algorithm
Nondecaying pulse source
Computer generated times for computing concentrations

DATA FOR LAYER 1
VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Thickness of layer	m	CONSTANT	30.0	-999.	0.100E-08	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	0.100E-02	0.100E+05
Percent organic matter	--	CONSTANT	0.500	-999.	0.000E+00	100.
Bulk density of soil for layer	g/cc	CONSTANT	1.85	-999.	0.100E-01	5.00
Biological decay coefficient	1/yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.

CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Solid phase decay coefficient	1/yr	CONSTANT	0.000E+00	-999.	0.000E+00	0.100E+11
Dissolved phase decay coefficient	1/yr	CONSTANT	0.000E+00	-999.	0.000E+00	0.100E+11
Overall chemical decay coefficient	1/yr	CONSTANT	0.000E+00	-999.	0.000E+00	0.100E+11
Acid catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Neutral hydrolysis rate constant	1/yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Base catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Reference temperature	C	CONSTANT	25.0	-999.	0.000E+00	100.
Normalized distribution coefficient	ml/g	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Distribution coefficient	--	DERIVED	-999.	-999.	0.000E+00	0.100E+11
Biodegradation coefficient (sat. zone)	1/yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Air diffusion coefficient	cm2/s	CONSTANT	0.000E+00	-999.	0.000E+00	10.0
Reference temperature for air diffusion	C	CONSTANT	25.0	-999.	0.000E+00	100.
Molecular weight	g/M	CONSTANT	35.5	-999.	0.000E+00	-999.
Mole fraction of solute	--	CONSTANT	0.000E+00	-999.	0.100E-08	1.00

Vapor pressure of solute	mm Hg	CONSTANT	0.000E+00	-999.	0.000E+00	100.
Henry`s law constant	atm-m^3/M	CONSTANT	0.000E+00	-999.	0.100E-09	1.00
Overall 1st order decay sat. zone	1/yr	DERIVED	0.000E+00	0.000E+00	0.000E+00	1.00

SOURCE SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Area of waste disposal unit	m^2	CONSTANT	912.	-999.	0.100E-01	-999.
Duration of pulse	yr	CONSTANT	500.	-999.	0.100E-08	-999.
Spread of contaminant source	m	DERIVED	-999.	-999.	0.100E-08	0.100E+11
Recharge rate	m/yr	CONSTANT	0.200E-02	-999.	0.000E+00	0.100E+11
Source decay constant	1/yr	CONSTANT	0.000E+00	-999.	0.000E+00	-999.
Initial concentration at landfill	mg/l	CONSTANT	0.116E+04	-999.	0.000E+00	-999.
Length scale of facility	m	DERIVED	30.8	-999.	0.100E-08	0.100E+11
Width scale of facility	m	DERIVED	29.6	-999.	0.100E-08	0.100E+11
Near field dilution		DERIVED	1.00	0.000E+00	0.000E+00	1.00

AQUIFER SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Particle diameter	cm	CONSTANT	0.500E-02	-999.	0.100E-08	100.
Aquifer porosity	--	CONSTANT	0.250	-999.	0.100E-08	0.990
Bulk density	g/cc	CONSTANT	1.85	-999.	0.100E-01	5.00
Aquifer thickness	m	CONSTANT	7.62	-999.	0.100E-08	0.100E+06
Source thickness (mixing zone depth)	m	CONSTANT	3.05	-999.	0.100E-08	0.100E+06
Conductivity (hydraulic)	m/yr	CONSTANT	223.	-999.	0.100E-06	0.100E+09
Gradient (hydraulic)		CONSTANT	0.300E-02	-999.	0.100E-07	-999.
Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.	0.100E-09	0.100E+09
Retardation coefficient	--	DERIVED	-999.	-999.	1.00	0.100E+09
Longitudinal dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Transverse dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Vertical dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Temperature of aquifer	C	CONSTANT	22.1	-999.	0.000E+00	100.
pH	--	CONSTANT	7.28	-999.	0.300	14.0
Organic carbon content (fraction)		CONSTANT	0.300E-02	-999.	0.100E-05	1.00
Well distance from site	m	CONSTANT	1.00	-999.	1.00	-999.
Angle off center	degree	CONSTANT	0.000E+00	-999.	0.000E+00	360.
Well vertical distance	m	CONSTANT	0.000E+00	-999.	0.000E+00	1.00

TIME	CONCENTRATION
0.000E+00	0.00000E+00
0.100E+03	0.00000E+00
0.200E+03	0.00000E+00
0.300E+03	0.00000E+00
0.400E+03	0.00000E+00
0.500E+03	0.00000E+00
0.600E+03	0.33891E+01
0.700E+03	0.25998E+02
0.800E+03	0.67172E+02
0.900E+03	0.11756E+03
0.100E+04	0.16615E+03
0.110E+04	0.20075E+03
0.120E+04	0.20521E+03
0.130E+04	0.17971E+03
0.140E+04	0.13808E+03
0.150E+04	0.94931E+02
0.160E+04	0.58912E+02
0.170E+04	0.32988E+02
0.180E+04	0.15523E+02
0.190E+04	0.55158E+01
0.200E+04	0.56338E+00
0.210E+04	0.00000E+00
0.220E+04	0.00000E+00
0.230E+04	0.00000E+00
0.240E+04	0.00000E+00