1R-427-318

WORKPLANS

Date:
1-31-13

ARCADIS
Infrastructure, environment, buildings

RECEIVED

FEB 4 2013

Oil Conservation Division
1220 S. St. Francis Drive
Santa Fe, NM 87505

ARCADIS U.S., Inc.
1004 North Big Spring Street
Suite 300
Midland
Texas 79701
Tel 432.687.5400
Fax 432.687.5401
www.arcadis-us.com

Sent Certified Mail
Return Receipt No. 7002 2410 0001 5813 4118

Mr. Ed Hansen
New Mexico Energy, Minerals, & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 S. St. Francis Drive
Santa Fe, New Mexico 87505

Environmental

Subject:

Corrective Action Plan (CAP)
EME Jct. F-29-2
Unit F, SEC. 29, T19S, R37E, Monument, Lea County, New Mexico
NMOCD CASE # 1R427-318

Date:
January 31, 2013

Contact:
Sharon Hall

Phone:
432.687.5400

Email:
sharon.hall@arcadis-us.cor

Our ref:
MT001104.0001

ARCADIS U.S., Inc.
TX Engineering License # F-533

Mr. Hansen:

RICE Operating Company (ROC) has retained ARCADIS U.S., Inc. (ARCADIS) to address potential environmental concerns at the above-referenced site. ROC is the service provider (agent) for the EME SWD System and has no ownership of any portion of the pipeline, well, or facility. The System is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis. Environmental projects of this nature require System Party AFE approval prior to work commencing at the site. In general, project funding is not forthcoming until NMOCD approves the work plan. Therefore, your timely review of this submission is greatly appreciated.

On behalf of ROC, ARCADIS respectfully submits this Corrective Action Plan (CAP) for the above-referenced site.

SITE HISTORY AND BACKGROUND

The site is located approximately one mile northwest of Monument, New Mexico as shown on the Site Location Map. Groundwater at the site will likely be encountered at a depth of 23 feet below ground surface (bgs). The junction box was eliminated and initial delineation was conducted from November 17th, 2008 through January 2nd, 2009. Initial delineation was completed with the drilling of a soil boring on November 3rd, 2009.

A backhoe was used to excavate soils from an excavation measuring 30 feet by 30 feet by 12 feet deep around the former junction box. Soil samples were collected at regular intervals and analyzed in the field for chlorides using field-adapted Standard Method 4500-Cl⁻B and screened in the field using a photoionization detector (PID).

A five-point wall composite sample was collected from each of the four walls and combined to make a representative four-wall composite sample, and a five-point composite sample was collected from the bottom of the excavation and submitted to Cardinal Laboratories for gasoline range organics (GRO), diesel range organics (DRO) and chloride analysis. DRO was detected at a concentration of 219 milligrams per kilogram (mg/kg) in the four-wall composite sample and 324 mg/kg in the five-point bottom composite sample. Chlorides were detected at a concentration of 272 mg/kg in the four-wall composite sample and 352 mg/kg in the five-point composite bottom sample. GRO was not detected in either of the samples.

Excavated soils were blended on site with clean imported back soil and backfilled into the excavation to ground surface. The area was contoured to the surrounding landscape.

A sample of the blended backfill material was submitted to Cardinal Laboratories for GRO, DRO and chloride analysis. DRO was detected at a concentration of 474 mg/kg. Chlorides were detected at a concentration of 144 mg/kg. GRO was not detected.

ROC disclosed potential groundwater impact at the site to New Mexico Oil Conservation Division (NMOCD) via e-mail on May 7th, 2009.

To further investigate the depth of hydrocarbon impact at the site, a soil boring was advanced 13 feet south of the former junction box location (SB-1). Soil samples were collected every foot and analyzed in the field for chlorides using field-adapted Standard Method 4500-Cl⁻B and screened in the field using a photoionization detector (PID). Two samples were submitted to Cardinal Laboratories for laboratory analysis. The 15 foot sample was submitted for GRO, DRO and chloride analysis. Chlorides were detected at a concentration of 400 mg/kg. GRO and DRO were not detected. The 19-21 foot sample was submitted for GRO, DRO, benzene, toluene, ethylbenzene, xylenes and chloride analysis. GRO was detected at a concentration of 139 mg/kg and DRO was detected at a concentration of 1,180 mg/kg. Chlorides were detected at a concentration of 352 mg/kg. Benzene was not detected. Toluene,

ethylbenzene and xylenes were detected at concentrations of 0.136, 0.310 and 2.52 mg/kg, respectively.

The borehole was plugged with bentonite from surface to total depth.

A disclosure report was submitted to NMOCD in the 2009 junction box closures and disclosures. ROC submitted an ICP to NMOCD on May 30, 2012 and was approved by NMOCD on June 7, 2012.

ICP INVESTIGATION RESULTS

Seven soil borings (SB-2 through SB-8) were drilled at the site. Soil boring (SB-2) was advanced at the former junction box location and the other six soil borings were advanced 20 feet S/SW (SB-3), 25 feet E/SE (SB-4), 28 feet N/NE (SB-5), 23 feet W/NW (SB-6), 32 feet SE (SB-7) and 30 feet NW (SB-8) of the former junction box location.

Five soil borings (SB-2 through SB-6) were drilled July 11 and 12, 2012, and two soil borings (SB-7 and SB-8) were drilled on August 9, 2012. The soil borings were drilled to depths of 6 to 21 feet bgs. Soil samples were collected every three feet and analyzed in the field for chlorides using field-adapted Method 4500-Cl-B and screened in the field using a PID. Two samples from each boring were submitted to Cardinal Laboratories and analyzed for chlorides, GRO and DRO.

SB-2 laboratory analysis resulted in a decrease in chloride concentration from 160 mg/kg at 15 feet bgs to 144 mg/kg at 21 feet bgs. Chloride concentrations in SB-3 were low throughout, all below 128 mg/kg. Chloride concentrations in SB-4 decreased from 528 mg/kg at 9 feet bgs to 192 mg/kg at 15 feet bgs. Chloride concentrations in SB-5 and SB-6 were also low, all below 80 mg/kg. Chloride concentrations in SB-7 decreased from 336 mg/kg at 3 feet bgs to 304 mg/kg at 9 feet bgs. Chloride concentrations in SB-8 remained the same with 304 mg/kg at 6 and 9 feet bgs.

GRO was non-detect throughout all borings. SB-2 laboratory analysis resulted in a DRO concentration of 333 mg/kg at 15 feet bgs and 367 mg/kg at 21 feet bgs. DRO concentration in SB-3 decreased from 60.8 mg/kg at surface to <50 mg/kg at 6 feet bgs. DRO concentrations in SB-4 were 16.4 mg/kg at 9 feet bgs and 92.5 mg/kg at 15 feet bgs. DRO concentration in SB-5 decreased from 16.9 mg/kg at surface to <10 mg/kg at 6 feet bgs. DRO concentration in SB-6 decreased from 701 mg/kg at

surface to 446 mg/kg at 6 feet bgs. DRO concentration in SB-7 decreased from 11.6 mg/kg at 3 feet bgs to <10 mg/kg at 9 feet bgs. DRO concentration in SB-8 decreased from 398 mg/kg at 6 feet bgs to 215 mg/kg at 9 feet bgs.

In addition to chloride, GRO and DRO, the sample at SB-2 (15 feet bgs) was submitted for benzene, toluene, ethylbenzene and xylenes (BTEX). BTEX was not detected in the sample (see attached figure).

PROPOSED CORRECTIVE ACTION WORKPLAN

In order to prevent the migration of any residual constituents, ARCADIS recommends excavating the site to dimensions of 26 feet x 52 feet and install a 20-mil, reinforced poly liner at approximately 5 feet bgs. The soils placed above the liner will have a laboratory chloride reading no greater than 500 mg/kg and a field PID measurement below 100 ppm. Excavated soil will be evaluated for use as backfill and any soils requiring disposal will be properly disposed of at a NMOCD approved facility. Upon completion of backfilling, the site will be seeded with a blend of native vegetation mix. Vegetation above the liner will also provide a natural infiltration barrier for the site since plants capture water through their roots thereby reducing the volume of water moving through the vadose zone. The location of the proposed liner is shown on the attached figure.

Thank you for your consideration concerning this CAP. If you have any questions, do not hesitate to contact Hack Conder or me.

Sincerely,

ARCADIS U.S., Inc.
Sharon E Hall
Sharon E. Hall
Associate Vice President

Copies:
Hack Conder, ROC

Attachments:
Site Location Map
Proposed Liner Dimensions

Site Location Map

RICE ENVIRONMENTAL
RECS
CONSULTING & SAFETY, LLC

EME jct. F-29-2

Legals: UL/F sec. 29
T-19-S R-37-E
LEA COUNTY, NM

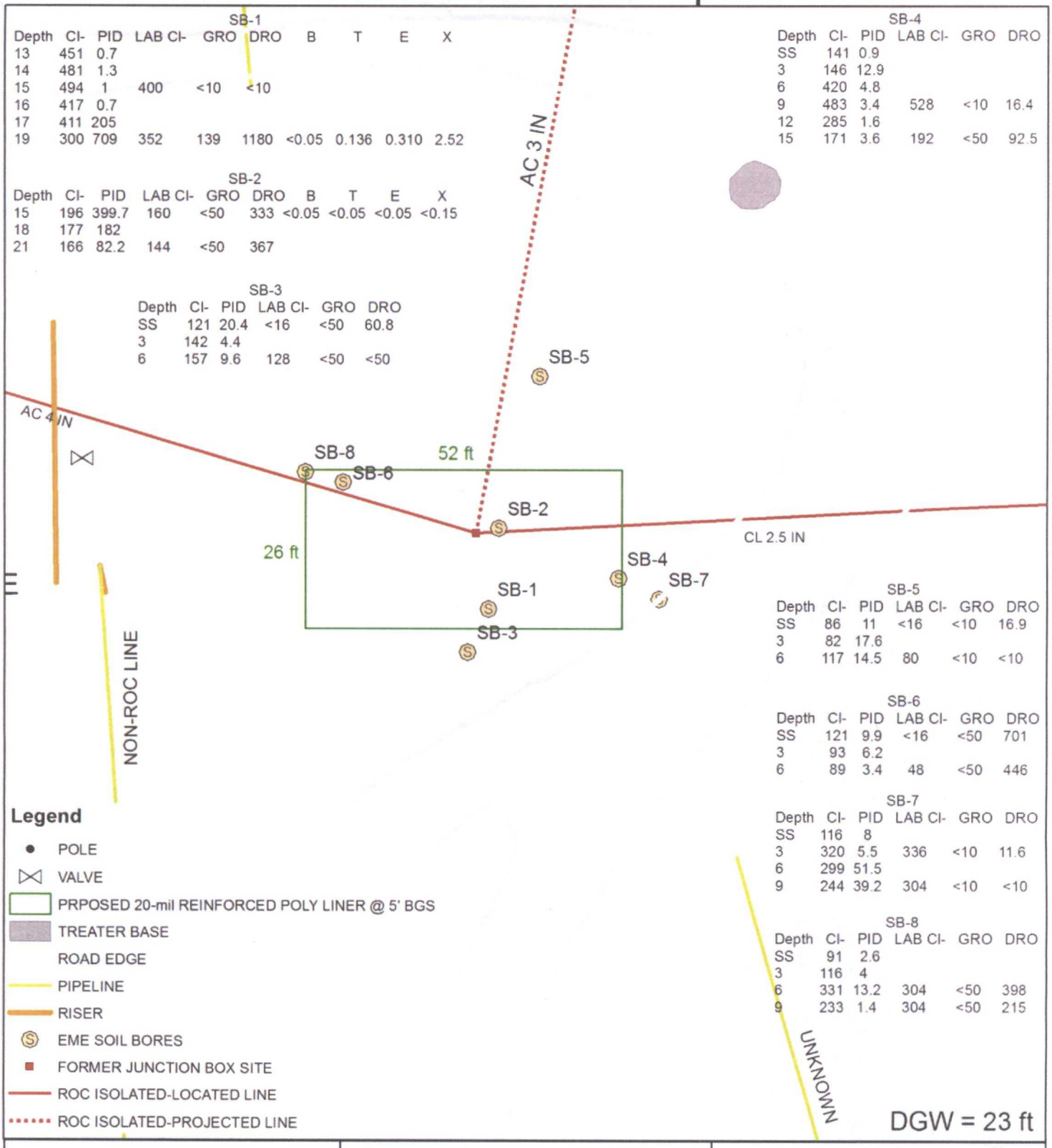
Case #: 1R427-318

N
W E
S

0 0.125 0.25 0.5
Miles

Drawing date: 5-1-12
Drafted by: L. Weinheimer

Soil Bore Installation and Propsed Liners



SB-1

Depth	Cl-	PID	LAB Cl-	GRO	DRO	B	T	E	X
13	451	0.7							
14	481	1.3							
15	494	1	400	<10	<10				
16	417	0.7							
17	411	205							
19	300	709	352	139	1180	<0.05	0.136	0.310	2.52

SB-2

Depth	Cl-	PID	LAB Cl-	GRO	DRO	B	T	E	X
15	196	399.7	160	<50	333	<0.05	<0.05	<0.05	<0.15
18	177	182							
21	166	82.2	144	<50	367				

SB-3

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	121	20.4	<16	<50	60.8
3	142	4.4			
6	157	9.6	128	<50	<50

SB-4

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	141	0.9			
3	146	12.9			
6	420	4.8			
9	483	3.4	528	<10	16.4
12	285	1.6			
15	171	3.6	192	<50	92.5

SB-5

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	86	11	<16	<10	16.9
3	82	17.6			
6	117	14.5	80	<10	<10

SB-6

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	121	9.9	<16	<50	701
3	93	6.2			
6	89	3.4	48	<50	446

SB-7

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	116	8			
3	320	5.5	336	<10	11.6
6	299	51.5			
9	244	39.2	304	<10	<10

SB-8

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	91	2.6			
3	116	4			
6	331	13.2	304	<50	398
9	233	1.4	304	<50	215

Legend

- POLE
- VALVE
- PRPOSED 20-mil REINFORCED POLY LINER @ 5' BGS
- TREATER BASE
- ROAD EDGE
- PIPELINE
- RISER
- EME SOIL BORES
- FORMER JUNCTION BOX SITE
- ROC ISOLATED-LOCATED LINE
- ROC ISOLATED-PROJECTED LINE

RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

EME Jct. F-29-2

UL/F SECTION 29
T-19-S R-37-E
LEA COUNTY, NM

NMOCD Case #: 1R427-318

N W E S

0 20 40 Feet

GPS date: 7/12/12 by TG
Drawing date: 7/20/12
Drafted by: L. Weinheimer

Google earth

feet 800
meters 200

Hansen, Edward J., EMNRD

From: Katie Jones <kjones@riceswd.com>
Sent: Friday, February 15, 2013 3:25 PM
To: Hansen, Edward J., EMNRD
Cc: Hack Conder; Laura Pena; Hall, Sharon
Subject: ROC - EME Jct. F-29-2 (1R427-318) CAP Addendum
Attachments: ROC - EME Jct. F-29-2 (1R427-318) CAP.pdf; ROC - EME Jct. F-29-2 (1R427-318) Proposed Liner.jpg; ROC - EME Jct. F-29-2 (1R427-318) Total Xylene.inp; ROC - EME Jct. F-29-2 (1R427-318) MultiMed Total Xylene.pdf; EME Jct. F-29-2 (1R427-318) Aerial Photo.jpg

Mr. Hansen,

The following is an Addendum to the Corrective Action Plan (CAP) for the EME Jct. F-29-2 (1R427-318) site. The CAP was submitted to the NMOCD on January 31, 2013.

The CAP proposed installing 26 ft x 52 ft 20-mil, reinforced liner at approximately 5 ft bgs. The excavation would be backfilled with soil containing a chloride concentration below 500 mg/kg and field PID reading below 100 ppm. To determine if residual BTEX, specifically total xylene, in the vadose zone pose a threat to groundwater quality, ROC ran the U.S. Environmental Protection Agency Exposure Assessment Multimedia Model (MULTIMED Version 1.5, 2005). Site specific data inputs are as follows:

- Initial Concentration: The highest BTEX concentration observed at the site was the total xylene at 19 ft bgs in SB-1 (2.52 mg/kg). Benzene concentrations were below detectable limits throughout the site.
- Infiltration Rate: 0.0305 m/yr, based on a 20-mil, reinforced liner being installed at the site.
- Layer Thickness: Depth to groundwater at this site is approximately 23 ft below ground surface (bgs). The depth to groundwater (23 ft bgs) subtracted from the depth BTEX was observed at the highest concentration (19 ft bgs), 23 ft – 19 ft to yield 4 ft or approximately 1 meter.
- An estimated area of 10 ft x 10 ft surrounding SB-1. BTEX was not observed in any other soil bores at this site.
- An aquifer thickness of 20 ft (6.10 meters).

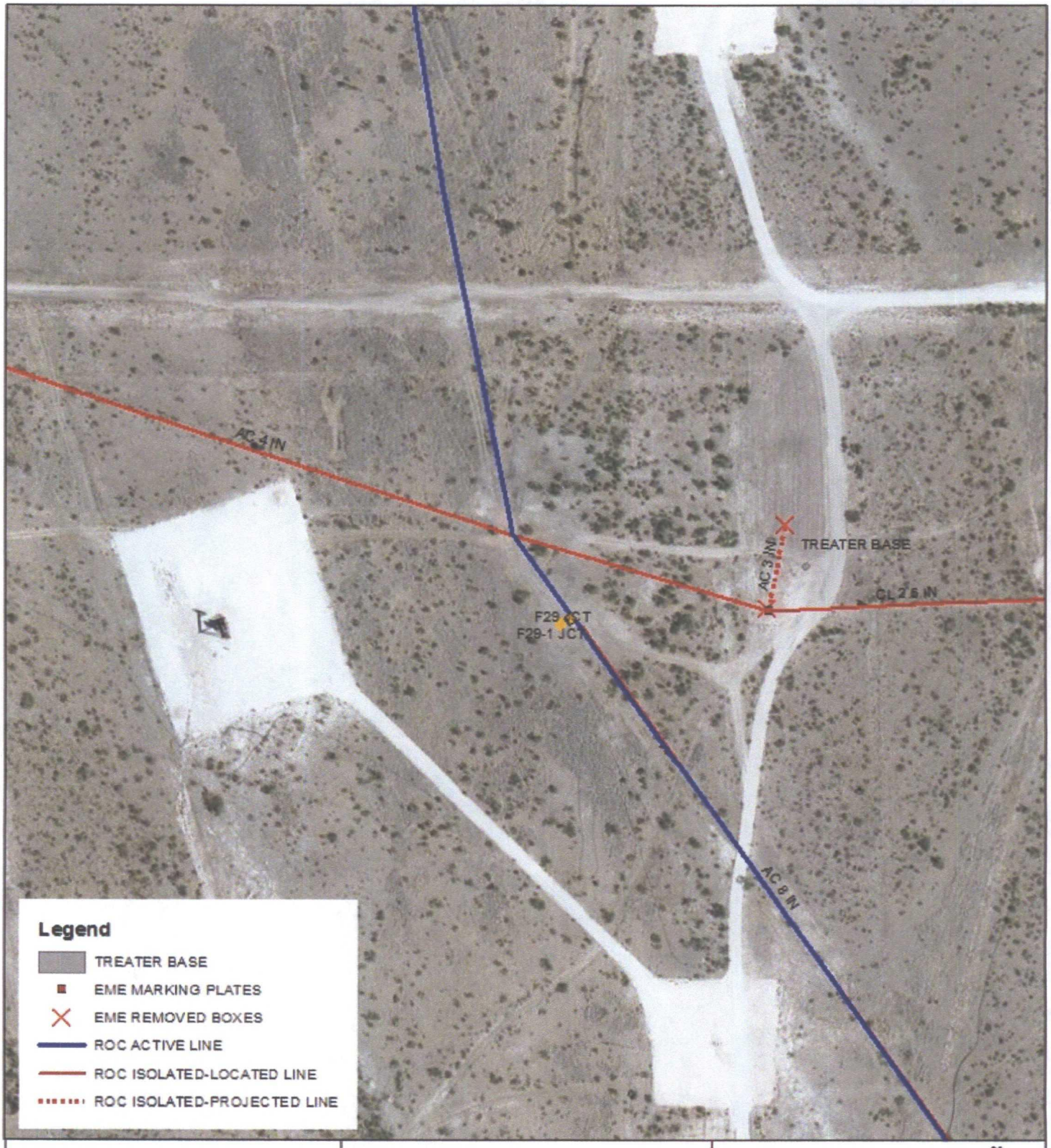
A detailed input file and a pdf output file along with a graph is attached. The model output concludes that the peak concentration of xylene in the groundwater contributed by the vadose zone soils would be approximately 0.237 mg/kg in 12 years. Since the estimated increase in groundwater concentrations from residual xylene observed in SB-1 is the WQCC standard of 0.62 mg/L, installing the proposed 52 ft x 26 ft 20-mil reinforced liner will provide sufficient protection of groundwater quality.

An aerial photo plat is also attached showing the area surrounding the former junction box.

If you have any questions or require any additional information, please contact me or Hack Conder at (575)393-9174.

Thank you.

Katie Jones
Environmental Project Manager
RICE *Operating Company*



RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

EME Jct. F-29-2

UL/F SECTION 29
T-19-S R-37-E
LEA COUNTY, NM

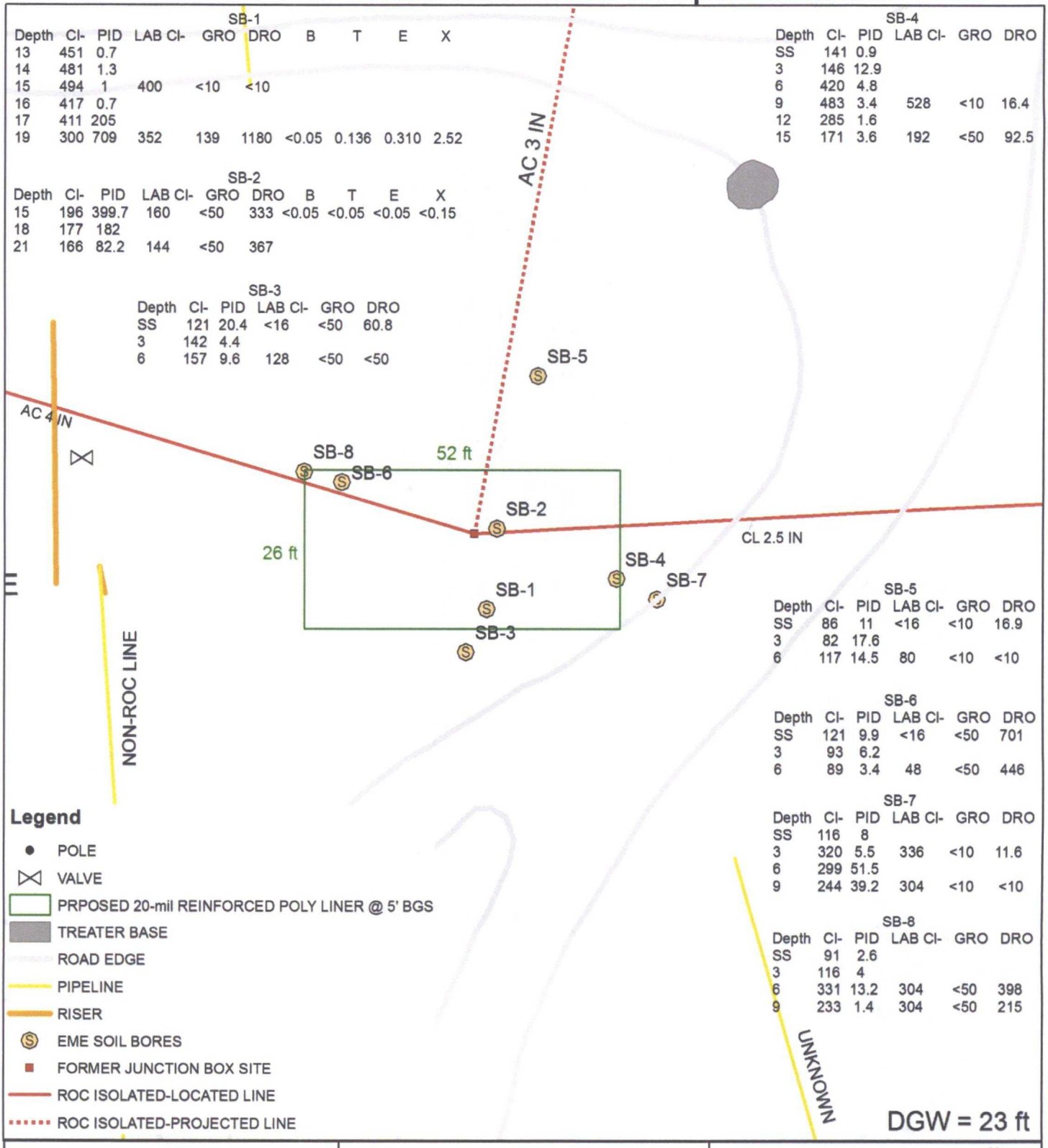
NMOCD Case #: 1R427-318

N
W E
S

0 100 200
Feet

GPS date: 5/4/12 by TG
Drawing date: 5/4/12
Drafted by: TONY GRIECO

Soil Bore Installation and Propsed Liners



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Depth	Cl-	PID	LAB Cl-	GRO	DRO
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3	320	5.5	336	<10	11.6
6	299	51.5			
9	244	39.2	304	<10	<10

SB-8

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	91	2.6			
3	116	4			
6	331	13.2	304	<50	398
9	233	1.4	304	<50	215

DGW = 23 ft

RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

EME Jct. F-29-2

UL/F SECTION 29
T-19-S R-37-E
LEA COUNTY, NM

NMOCD Case #: 1R427-318

N W E S

0 20 40 Feet

GPS date: 7/12/12 by TG
Drawing date: 7/20/12
Drafted by: L. Weinheimer

MULTIMED V1.01 DATE OF CALCULATIONS: 13-FEB-2013 TIME: 10:29:11

U. S. ENVIRONMENTAL PROTECTION AGENCY

EXPOSURE ASSESSMENT

MULTIMEDIA MODEL

MULTIMED (Version 1.50, 2005)

1
Run options
--- -------

Chemical simulated is BTEX

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration Specified By User: 3.048E-02 m/yr
Run was transient
Well Times: Entered Explicitly
Reject runs if Y coordinate outside plume
Reject runs if Z coordinate outside plume
Gaussian source used in saturated zone model
1
1
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
------- ------
Van Genuchten functional coefficients
User defined coordinate system
1

Layer information

LAYER NO.	LAYER THICKNESS	MATERIAL PROPERTY
1	1.00	1

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

ROC - EME Jct. F-29-2 (1R427-318) Total Xylene

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	STD DEV	LIMITS MIN	MAX
Saturated hydraulic conductivity	cm/hr	CONSTANT	3.60	-999.	-999.	-999.
Unsaturated zone porosity	--	CONSTANT	0.250	-999.	-999.	-999.
Air entry pressure head	m	CONSTANT	0.700	-999.	-999.	-999.
Depth of the unsaturated zone	m	CONSTANT	1.00	0.000	0.000	0.000

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	STD DEV	LIMITS MIN	MAX
Residual water content	--	CONSTANT	0.116	-999.	-999.	-999.
Brook and Corey exponent,EN	--	CONSTANT	-999.	-999.	-999.	-999.
ALFA coefficient	1/cm	CONSTANT	0.500E-02	-999.	-999.	-999.
Van Genuchten exponent, ENN	--	CONSTANT	1.09	-999.	-999.	-999.

1

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		2
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		3
ITSGEN	- Time values generated or input		1
TMAX	- Max simulation time	--	0.0
WTFUN	- Weighting factor	--	1.2

OPTIONS CHOSEN

Convolution integral approach
Exponentially decaying continuous source
Computer generated times for computing concentrations

1

DATA FOR LAYER 1

VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	STD DEV	LIMITS MIN	MAX
Thickness of layer	m	CONSTANT	1.00	-999.	-999.	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	-999.	-999.
Percent organic matter	--	CONSTANT	0.000	-999.	-999.	-999.
Bulk density of soil for layer	g/cc	CONSTANT	1.99	-999.	-999.	-999.

Biological decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.

1

CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Solid phase decay coefficient	1/yr	CONSTANT	0.200	-999.	-999.	-999.
Dissolved phase decay coefficient	1/yr	CONSTANT	0.200	-999.	-999.	-999.
Overall chemical decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Acid catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Neutral hydrolysis rate constant	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Base catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Reference temperature	C	CONSTANT	25.0	-999.	-999.	-999.
Normalized distribution coefficient	ml/g	CONSTANT	0.000	-999.	-999.	-999.
Distribution coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Biodegradation coefficient (sat. zone)	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Air diffusion coefficient	cm2/s	CONSTANT	-999.	-999.	-999.	-999.
Reference temperature for air diffusion	C	CONSTANT	-999.	-999.	-999.	-999.
Molecular weight	g/M	CONSTANT	-999.	-999.	-999.	-999.
Mole fraction of solute	--	CONSTANT	-999.	-999.	-999.	-999.
Vapor pressure of solute	mm Hg	CONSTANT	-999.	-999.	-999.	-999.
Henry's law constant	atm-m^3/M	CONSTANT	-999.	-999.	-999.	-999.
Overall 1st order decay sat. zone	1/yr	DERIVED	0.000	0.000	0.000	1.00
Not currently used		CONSTANT	0.000	0.000	0.000	0.000
Not currently used		CONSTANT	0.000	0.000	0.000	0.000

1

SOURCE SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Infiltration rate	m/yr	CONSTANT	0.305E-01	-999.	-999.	-999.
Area of waste disposal unit	m^2	DERIVED	9.00	-999.	-999.	-999.
Duration of pulse	yr	DERIVED	10.0	-999.	-999.	-999.
Spread of contaminant source	m	DERIVED	-999.	-999.	-999.	-999.
Recharge rate	m/yr	CONSTANT	0.000	-999.	-999.	-999.
Source decay constant	1/yr	CONSTANT	0.250E-01	0.000	0.000	0.000
Initial concentration at landfill	mg/l	CONSTANT	2.52	-999.	-999.	-999.
Length scale of facility	m	CONSTANT	3.05	-999.	-999.	-999.
Width scale of facility	m	CONSTANT	3.05	-999.	-999.	-999.
Near field dilution		DERIVED	1.00	0.000	0.000	1.00

1

AQUIFER SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS MAX
Particle diameter	cm	CONSTANT	-999.	-999.	-999.	-999.
Aquifer porosity	--	CONSTANT	0.300	-999.	-999.	-999.
Bulk density	g/cc	CONSTANT	1.86	-999.	-999.	-999.
Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
Source thickness (mixing zone depth)	m	DERIVED	3.00	-999.	-999.	-999.
Conductivity (hydraulic)	m/yr	CONSTANT	315.	-999.	-999.	-999.
Gradient (hydraulic)		CONSTANT	0.300E-02	-999.	-999.	-999.

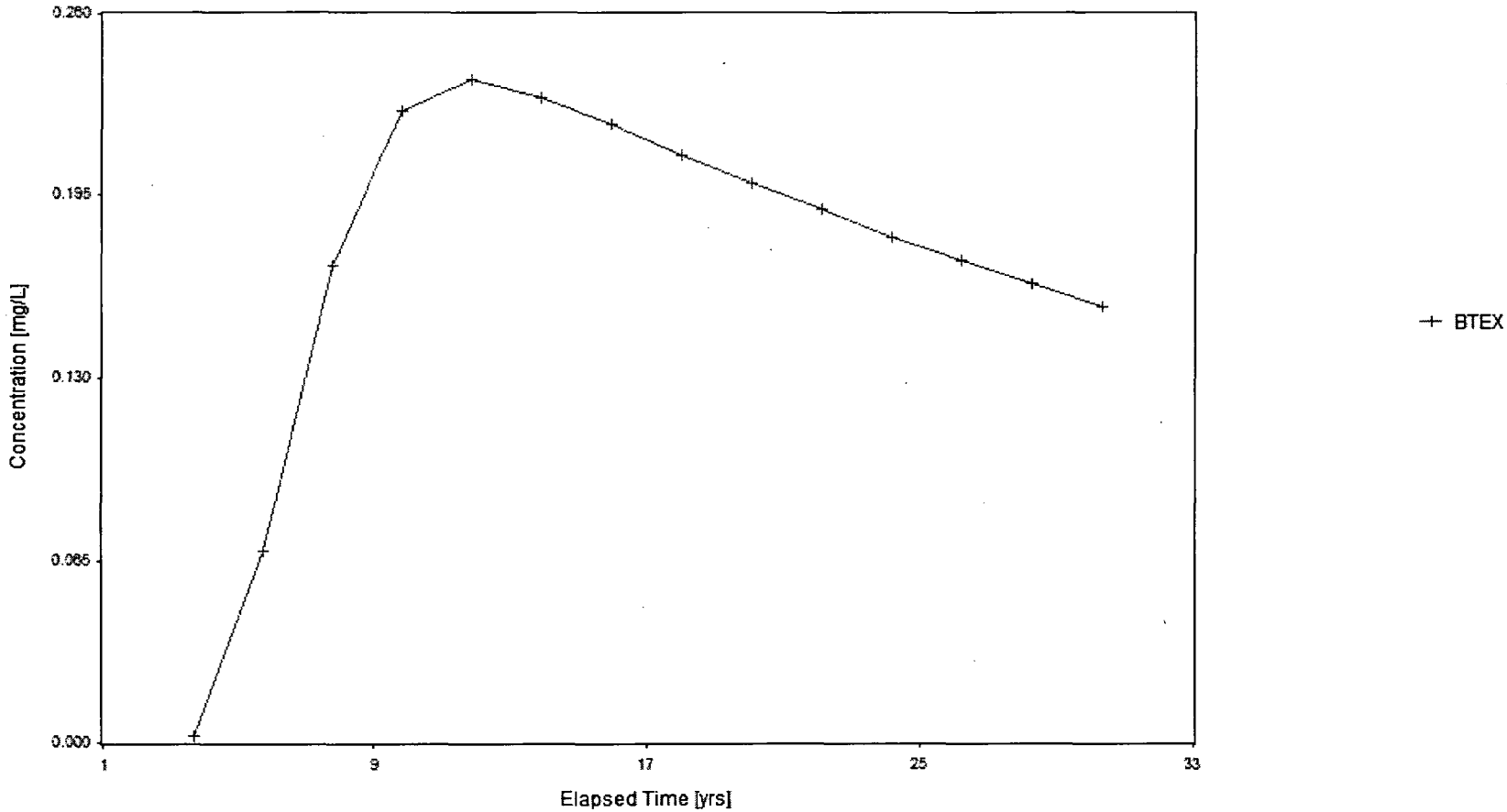
ROC - EME Jct. F-29-2 (1R427-318) Total Xylene

Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.	-999.	-999.
Retardation coefficient	--	DERIVED	-999.	-999.	-999.	-999.
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	20.0	-999.	-999.	-999.
pH	--	CONSTANT	7.00	-999.	-999.	-999.
Organic carbon content (fraction)		CONSTANT	0.000	-999.	-999.	-999.
Well distance from site	m	CONSTANT	1.00	-999.	-999.	-999.
Angle off center	degree	CONSTANT	0.000	-999.	-999.	-999.
Well vertical distance	m	CONSTANT	0.000	-999.	-999.	-999.

1

TIME	CONCENTRATION
0.400E+01	0.25679E-02
0.600E+01	0.68414E-01
0.800E+01	0.17010E+00
0.100E+02	0.22574E+00
0.120E+02	0.23694E+00
0.140E+02	0.23061E+00
0.160E+02	0.22099E+00
0.180E+02	0.20992E+00
0.200E+02	0.19984E+00
0.220E+02	0.19046E+00
0.240E+02	0.18055E+00
0.260E+02	0.17220E+00
0.280E+02	0.16380E+00
0.300E+02	0.15544E+00

BTEX Concentration At The Receptor Well



Hansen, Edward J., EMNRD

From: Hansen, Edward J., EMNRD
Sent: Wednesday, March 06, 2013 4:19 PM
To: Katie Jones <kjones@riceswd.com> (kjones@riceswd.com)
Cc: Leking, Geoffrey R, EMNRD; Hack Conder (hconder@riceswd.com); Laura Pena (lpena@riceswd.com)
Subject: MULTIMED files for (1R427-318) ROC EME Jct F-29-2
Attachments: ROC - EME Jct. F-29-2 (1R427-318) Total Xylene ejh.out; ROC - EME Jct. F-29-2 (1R427-318) Total Xylene ejh.inp

Dear Ms. Jones:

Attached are MULTIMED files for ROC EME Jct F-29-2. Please note that the "Mixing Zone" has been specified at 3 meters – the total xylenes are still predicted to be below WQCC standards in groundwater at the site.

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

Edward J. Hansen
Hydrologist
Environmental Bureau

MULTIMED V1.01 DATE OF CALCULATIONS: 6-MAR-2013 TIME: 13: 4:56

U. S. E N V I R O N M E N T A L P R O T E C T I O N A G E N C Y

E X P O S U R E A S S E S S M E N T

M U L T I M E D I A M O D E L

MULTIMED (Version 1.50, 2005)

1
Run options
--- -------

Chemical simulated is BTEX

Option Chosen	Saturated and unsaturated zone models
Run was	DETERMIN

Infiltration Specified By User: 3.048E-02 m/yr
Run was transient
Well Times: Entered Explicitly
Reject runs if Y coordinate outside plume
Reject runs if Z coordinate outside plume
Gaussian source used in saturated zone model
1
1
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
------- ------
Van Genuchten functional coefficients
User defined coordinate system
1

Layer information

LAYER NO.	LAYER THICKNESS	MATERIAL PROPERTY
1	1.00	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	3.60	-999.	-999.	-999.
Unsaturated zone porosity	--	CONSTANT	0.250	-999.	-999.	-999.
Air entry pressure head	m	CONSTANT	0.700	-999.	-999.	-999.
Depth of the unsaturated zone	m	CONSTANT	1.00	0.000	0.000	0.000

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Residual water content	--	CONSTANT	0.116	-999.	-999.	-999.
Brook and Corey exponent,EN	--	CONSTANT	-999.	-999.	-999.	-999.
ALFA coefficient	1/cm	CONSTANT	0.500E-02	-999.	-999.	-999.
Van Genuchten exponent, ENN	--	CONSTANT	1.09	-999.	-999.	-999.

1

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		2
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		3
ITSGEN	- Time values generated or input		1
TMAX	- Max simulation time	--	0.0

WTFUN - Weighting factor -- 1.2

OPTIONS CHOSEN
------- ------
Convolution integral approach
Exponentially decaying continuous source
Computer generated times for computing concentrations
1

DATA FOR LAYER 1
---- --- -----
VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Thickness of layer	m	CONSTANT	1.00	-999.	-999.	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	-999.	-999.
Percent organic matter	--	CONSTANT	0.000	-999.	-999.	-999.
Bulk density of soil for layer	g/cc	CONSTANT	1.99	-999.	-999.	-999.
Biological decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.

1

CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Solid phase decay coefficient	1/yr	CONSTANT	0.200	-999.	-999.	-999.
Dissolved phase decay coefficient	1/yr	CONSTANT	0.200	-999.	-999.	-999.
Overall chemical decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Acid catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Neutral hydrolysis rate constant	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Base catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Reference temperature	C	CONSTANT	25.0	-999.	-999.	-999.
Normalized distribution coefficient	ml/g	CONSTANT	0.000	-999.	-999.	-999.
Distribution coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Biodegradation coefficient (sat. zone)	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Air diffusion coefficient	cm2/s	CONSTANT	-999.	-999.	-999.	-999.
Reference temperature for air diffusion	C	CONSTANT	-999.	-999.	-999.	-999.
Molecular weight	g/M	CONSTANT	-999.	-999.	-999.	-999.
Mole fraction of solute	--	CONSTANT	-999.	-999.	-999.	-999.
Vapor pressure of solute	mm Hg	CONSTANT	-999.	-999.	-999.	-999.

	Henry`s law constant	atm-m^3/M	CONSTANT	-999.	-999.
-999.	-999.				
	Overall 1st order decay sat. zone	1/yr	DERIVED	0.000	0.000
0.000	1.00				
	Not currently used		CONSTANT	0.000	0.000
0.000	0.000				
	Not currently used		CONSTANT	0.000	0.000
0.000	0.000				

1

SOURCE SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS	
			MEAN	STD DEV
Infiltration rate	m/yr	CONSTANT	0.305E-01	-999.
-999.	-999.			
Area of waste disposal unit	m^2	DERIVED	9.00	-999.
-999.	-999.			
Duration of pulse	yr	DERIVED	10.0	-999.
-999.	-999.			
Spread of contaminant source	m	DERIVED	-999.	-999.
-999.	-999.			
Recharge rate	m/yr	CONSTANT	0.000	-999.
-999.	-999.			
Source decay constant	1/yr	CONSTANT	0.250E-01	0.000
0.000	0.000			
Initial concentration at landfill	mg/l	CONSTANT	2.52	-999.
-999.	-999.			
Length scale of facility	m	CONSTANT	3.05	-999.
-999.	-999.			
Width scale of facility	m	CONSTANT	3.05	-999.
-999.	-999.			

LIMITS	
MIN	MAX

	Near field dilution		DERIVED	1.00	0.000	
0.000	1.00					
1						

AQUIFER SPECIFIC VARIABLES

	VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
				MEAN	STD DEV	MIN	MAX
	Particle diameter	cm	CONSTANT	-999.	-999.	-999.	-999.
	Aquifer porosity	--	CONSTANT	0.300	-999.	-999.	-999.
	Bulk density	g/cc	CONSTANT	1.86	-999.	-999.	-999.
	Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
	Source thickness (mixing zone depth)	m	CONSTANT	3.00	-999.	-999.	-999.
	Conductivity (hydraulic)	m/yr	CONSTANT	315.	-999.	-999.	-999.
	Gradient (hydraulic)		CONSTANT	0.300E-02	-999.	-999.	-999.
	Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.	-999.	-999.
	Retardation coefficient	--	DERIVED	-999.	-999.	-999.	-999.
	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	20.0	-999.
-999.	-999.				
	pH	--	CONSTANT	7.00	-999.
-999.	-999.				
	Organic carbon content (fraction)		CONSTANT	0.000	-999.
-999.	-999.				
	Well distance from site	m	CONSTANT	1.00	-999.
-999.	-999.				
	Angle off center	degree	CONSTANT	0.000	-999.
-999.	-999.				
	Well vertical distance	m	CONSTANT	0.000	-999.
-999.	-999.				

1

TIME	CONCENTRATION
0.400E+01	0.36043E-03
0.600E+01	0.96031E-02
0.800E+01	0.23889E-01
0.100E+02	0.31694E-01
0.120E+02	0.33267E-01
0.140E+02	0.32379E-01
0.160E+02	0.31028E-01
0.180E+02	0.29473E-01
0.200E+02	0.28062E-01
0.220E+02	0.26742E-01
0.240E+02	0.25350E-01
0.260E+02	0.24177E-01
0.280E+02	0.22998E-01
0.300E+02	0.21824E-01