1R - 401

REPORTS

DATE:

8/20/2003

Remediacon Incorporated PO Box 302, Evergreen, Colorado 80437
Geological and Engineering Services Telephone: 303.674.4370
mstewart@remediacon.com Facsimile: 720.528.8132

August 20, 2003
Mr Stephen Weathers
Duke Energy Field Services, LP
370 17th Street, Suite 900
Denver, CO 80202

Re: Report on Groundwater Monitoring Activities and Recommendations for Further Characterization Activities at the C-Line 50602 Location in Lea County New Mexico (Unit O, Section 31, Township 19 South, Range 37 East)

Dear Mr. Weathers:
This report summarizes the groundwater monitoring activities completed at the C-Line 50602 study area by Remediacon Incorporated (Remediacon) for Duke Energy Field Services, LP (DEFS). Discussion of the monitoring activities follows a brief section of background information. The final section of the letter recommends additional characterization and remediation activities along with a proposed schedule.

BACKGROUND INFORMATION

The study area is located in the southwestern quarter of the southeastern quarter (Unit O) of Section 31, Township 19 South, Range 37 East. The approximate coordinates are 32 degrees 32.5 minutes north, 103 degrees 15.3 minutes east. The site is approximately 6.25 miles south and 1.25 miles west of the town of Monument in Lea County New Mexico. The area surrounding the release sites is uninhabited and is used for ranching. Two large gas-processing facilities lie approximately 1 mile south of the site. Figure 1 shows the surrounding topography and drainage features. The topography in the area falls gently (0.33 percent) to the northeast toward Monument Draw. Monument Draw is located approximately 2 miles to the north, and it is the nearest defined surface drainage feature in the area.

Six monitoring wells are present at the site (MW-1 through MW-6, Figure 2). Construction information on these wells is included in Table 1. Well MW-1 is located at or near to the original release location. Well MW-2 was installed north of the release location immediately south of an area covered with historic (non-DEFS) tank bottoms. This area is labeled on the topographic map as "tanks" (Figure 1). Wells MW-3 through MW-6 were installed toward the southeast in the perceived down-gradient direction. At least five pipelines traverse the study area (Figure 2). DEFS owns two of these pipelines. Rice, Dynegy and SRG own the remaining pipelines.

SUMMARY OF MONITORING ACTIVITIES

Groundwater monitoring activities were completed at the site on February 19th and April 18th 2003. The February episode was completed as part of the quarterly monitoring schedule. The April episode was completed 1 month early to evaluate the differences

between the November 2002 and the February 2003 monitoring results. The depth to water (and product in MW-1) was measured in all of the wells prior to purging for both episodes. Casing volumes were then calculated based on the construction information contained in Table 1. Each well (excepting MW-1) was then developed using a disposable bailer until a minimum of three casing volumes of water was removed and the field parameters temperature, pH and conductivity stabilized. Dissolved oxygen was also measured to evaluate bioremediation. The equilibrated field parameters and dissolved oxygen are summarized in Table 2. All samples were placed in an ice-filled chest immediately upon collection and delivered to the analytical laboratory (Environmental Labs of Texas) using standard chain-of-custody protocols. The samples were analyzed for benzene, toluene, ethylbenzene and total xylenes (BTEX). All development and purge water was disposed of at an approved OCD facility. A field duplicate was collected from MW-4 during the April 2003 sampling episode to evaluate quality control. A trip blank prepared by the laboratory was also included in the April 2003 analytical set. The field duplicate and a trip blank were both analyzed for BTEX. The field duplicate exhibited good agreement with the original sample. None of the BTEX constituents were measured in the trip blank. The calculated groundwater elevations are summarized in Table 3. Well MW-1 contained 3.62 and 2.92 feet of free product in February and April 2003 respectively. The remaining wells did not contain any free product. The groundwater elevation values for well MW-1 were corrected using the following formula (all values in feet): $GWE_{corr} = MGWE + (PT*PD)$: where
MGWE is the actual measured groundwater elevation;
PT is the measured free-phase hydrocarbon thickness, and
PD is the free phase hydrocarbon density (assumed 0.7).
The free-product extraction system proposed in the February 2003 report could not be installed because a bend in the 2-inch casing in well MW-1 at approximately 19 feet below ground surface restricted access. This well will be replaced with a 4-inch well during the field program proposed below in the recommendation section. A 440-volt power source was also installed on one of the electrical poles near to MW-1 (Figure 2). A free product collection system will be installed immediately upon installation of the replacement well.

RESULTS AND DISCUSSION

Figures 3 and 4 show the groundwater contours based upon the water measurements. The contours were generated using the Surfer® program with the kriging option. The contours in both figures indicate that the groundwater flow in area investigated is generally to the east-southeast rather than north toward Monument Draw. The groundwater flow gradients and directions are virtually identical to each other as well as the November 2002 results. The analytical results for all three sampling episodes are summarized in Table 4. The concentrations of the BTEX constituents, particularly benzene and toluene, increased substantially between the November 2002 and the February 2003 results in wells MW-2, MW-3, MW-4 and MW-5. The February and April 2003 benzene concentrations are plotted on Figure 5. The benzene distribution pattern does not match the measured groundwater gradient. The predicted migration direction from a source at well MW-1 should be toward the southeast toward
well MW-4 or MW-5 based upon the water table configurations shown in Figures 3 and 4.

Instead, well MW-3, that is almost directly south of MW-1, exhibited the greatest BTEX increases.

RECOMMENDATIONS

Remediacon recommends completing the following activities based upon the data collected in February and April 2003:

1. Replacement of MW-1 with a new 4-inch well and installation of an active free product collection system:
2. Installation of three additional groundwater-monitoring wells at the locations labeled MW-7, MW-8 and MW-9 on Figure 6. These wells would be installed developed and sampled using the protocols used to install wells MW-2 through MW-6.
3. Sampling the groundwater in all wells, including the new wells and the new free product collection well (MW-1), for the BTEX constituents to better evaluate the discrepancy between the groundwater gradients and the benzene concentration results.
4. Sampling all of the wells for chlorides to better assess the historic (non-DEFS) chloride distribution identified in the November 2002 groundwater-sampling episode.

Well installation and groundwater sampling will be completed in the month of August based upon contractor availability. The free product collection system will be installed in early September and monitor for effectiveness for a period of approximately 1 month. A report detailing all activities will be provided to OCD by the middle of October.

Thank you for allowing Remediacon to complete this work. Do not hesitate to contact me if you have any questions or comments on the contents of this letter or the proposed activities.

Sincerely,

REMEDIACON INCORPORATED

Michael H. Stewart, P.E., C.P.G.
Principal Engineer
MHS/tbm

cc: Mr. William Olson, OCD Santa Fe
Mr. Larry Johnson, OCD Hobbs District

TABLES

Table 1 – Summary of Well Construction Information

MW#	Top of Casing Elevation	Ground Elevation	Screen Diameter	Screened Interval	Sand Interval	Total Depth
1	3542.10	3539.41	2"			93.14
2	3540.91	3537.70	2"	81-101	77+102	101.83
3	3541.41	3539.30	2"	80-100	78-102	102.56
4	3541.40	3538.51	2"	80-100	78-103	103.42
5	3541.45	3538.69	2"	80-100	78-102	102.86
6	3543.98	3540.94	2"	79-99	75-102	102.80

All units in feet

Table 2 – Summary of Equilibrated Field Parameters

2/18/2003	MW-2	MW-3	MW-4	MW-5	MW-6
Temperature	19.9	19.5	19.6	19.6	19.8
Conductivity	2.80	3.55	3.06	3.54	6.88
pH	8.37	8.23	8.60	8.40	8.07
Dissolved Oxygen	4.64	3.55	7.46	5.35	5.49

4/17/2003	MW-2	MW-3	MW-4	MW-5	MW-6
Temperature	20.1	20.2	20.0	19.9	19.9
Conductivity	2.86	2.79	2.72	3.03	4.92
pH	7.16	7.24	7.41	7.20	7.09
Dissolved Oxygen	2.79	2.57	5.78	3.78	4.46

Units: Temperature: ^{o}C
Conductivity: mS/cm
pH: pH units
Dissolved Oxygen: mg/l

Table 3 – Summary of Water Table Elevations

Well	November-02	February-03	April-03
1	3,452.01	3,451.60	3,451.73
2	3,452.11	3,451.97	3,451.96
3	3,452.25	3,451.37	3,451.33
4	3,451.56	3,451.32	3,451.21
5	3,451.39	3,451.21	3,451.09
6	3,448.77	3,448.51	3,448.38

Notes: All units in feet.
The Elevation for MW-1 was corrected using a product density of 0.7

Table 4 - Summary of Chemistry Results

Benzene	MW-2	MW-3	MW-4	MW-4 (duplicate)	MW-5	MW-6
11/15/2002	<0.001	0.017	0.114	0.100	<0.001	<0.001
2/18/2003	0.29	2.52	1.12	0.328	0.001	
4/17/2003	0.175	3.18	0.782	0.773	0.128	0.002

Toluene	MW-2	MW-3	MW-4

MW-4
(duplicate) MW-5 MW-6
11/15/2002 <0.001 0.005 0.039 0.036 <0.001 <0.001
2/18/2003 0.014 0.634 0.436 0.056 <0.001
4/17/2003 0.007 0.513 0.450 0.445 0.007 <0.001
Ethylbenzene MW-2 MW-3 MW-4
MW-4
(duplicate) MW-5 MW-6
11/15/2002 <0.001 <0.001 0.002 0.002 <0.001 <0.001
2/18/2003 0.001 0.021 0.022 0.004 <0.001
4/17/2003 <0.001 0.028 0.029 0.029 <0.001 <0.001
Xylenes MW-2 MW-3 MW-4
MW-4
(duplicate) MW-5 MW-6
11/15/2002 <0.001 <0.001 0.003 0.003 <0.001 <0.001
2/18/2003 0.001 0.064 0.032 0.004 <0.001
4/17/2003 <0.001 0.1 0.055 0.054 <0.001 <0.001
All units mg/l

FIGURES

Figure 1 – Study Location and Topography
DATE: 8/03
DRAWN BY: MHS
C-Line Study Area
SITE
0 5,000 feet
N
Note: Approximate well locations shown in blue.
Figure 2 – Study Area Detail and Monitor Well Locations
DATE: OCT 2002
DRAWN BY: MHS
C-Line Groundwater Characterization
DATE: 8/03
DRAWN BY: MHS
Figure 3 – February 2003 Water Table Elevations
C-Line Groundwater Characterization
DATE: 8/03
DRAWN BY: MHS
Figure 4 – August 2003 Water Table Elevations
C-Line Groundwater Characterization
DATE: 8/03
DRAWN BY: MHS
Figure 5 – February and August 2003 Benzene Concentrations
C-Line Groundwater Characterization
Notes: 1) All concentrations mg/l
2) Upper values are from February 2003, lower values are from April 2003
DATE: OCT 2002
DRAWN BY: MHS
Figure 6 – Proposed New Well Locations
C-Line Groundwater Characterization