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# REPORTS

# DATE:

12/19/2003

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December 19, 2003

Mr. Stephen Weathers
Duke Energy Field Services, LP
370 Seventeenth Street, Suite 2500
Denver, Colorado 80202

Re: Groundwater Monitoring Summary at the X-Line Pipeline Release, Etcheverry Ranch, Lea County New Mexico (Unit B, Section 7, Township 15 South, Range 34 East: Latitude 33° 02' 11", Longitude 103° 32' 48")

Dear Mr. Weathers:

This letter summarizes the results of the 6-month groundwater monitoring program completed by contractors for Duke Energy Field Services, LP (DEFS) at the X-Line Pipeline Release on the Etcheverry Ranch. The New Mexico Oil Conservation Division required six consecutive months of groundwater monitoring at the onset of the groundwater remediation program to monitor its effectiveness. The remainder of this letter contains a brief review of the remediation system, a description of the field methods and a summary of the data collected.

## Remediation System Description

The X-line remediation system includes free product removal, air sparge (AS) and soil vapor extraction (SVE) components. These components were discussed in detail in an October 1, 2003 Remediacon Incorporated letter report that was submitted by DEFS to the OCD.

The remediation system components are shown on Figure 1. The entire remediation site is enclosed inside a 3-strand barbed-wire fence. The AS and SVE components became fully operational in mid-June 2003. The free product collection system has operated since the last week in July.

The system configuration is shown on an aerial photograph in Figure 1. Free product is collected from well MW-8 located at the original release point. The product is stored in a 550 gallon polyethylene tank. The product is routinely collected by a vacuum truck for offsite disposal/recycling at an approved facility.

The AS system includes 14 sparge points (yellow circles, Figure 1). The SVE system includes eight vapor extraction wells in four clusters (red circles, Figure 1). The SVE blower, the AS blower and the compressor for the free product removal system are all inside a wood-frame building to protect them from the elements. An on-site, propane-fueled generator provides power for the entire system. A telemetry system was installed to alert local maintenance personnel of a power failure on any system component.

Groundwater Monitoring Procedures and Results

Groundwater monitoring was completed at the site on June 20, July 17, August 20, September 22, October 29 and November 20, 2003 as part of the 6-month study. The monthly monitoring activities included the measurement of fluid levels in all eight existing monitoring wells and the collection of groundwater samples from wells MW-1 through MW-7. Well MW-8 was not sampled because it contains free product.

The seven wells were purged and sampled using disposable bailers. Well development consisted of evacuating a minimum of three casing volumes of water and then continuing development until the field parameters temperature, pH and conductivity stabilized.

Unfiltered samples were collected from each well upon stabilization for analysis for benzene, toluene, ethylbenzene and xylenes (BTEX). A field duplicate was collected and a trip blank was provided for each monitoring episode for QA/QC evaluation. The samples were placed in an ice-filled chest immediately upon collection. The samples were delivered directly to the analytical laboratory Environmental Labs of Texas in Midland Texas using standard chain-of-custody protocol. All development and purge water was disposed of at an approved OCD facility.

The groundwater elevation measurements for all sampling episodes are summarized in Table 2. Hydrographs for wells MW-1 through MW-6 are in Figure 2. Well MW-8 is not included in the data because periodic removal of free product results in a continuing non-equilibrated state. Examination of Figure 4 establishes two facts. First, the groundwater in the area is not experiencing the accelerated declines that are present in some other parts of Lea County. This fact is important because well efficiency will not degrade because of declining saturated thicknesses. Second, the relative water-table elevation differences between wells have remained essentially constant over the approximate 1.5 year measurement period; therefore, deployment of the AS and SVE systems has not affected the equilibrated groundwater flow regime.

A water-table contour map based upon the November 2003 measurements was generated using the Surfer program with a kriging option. The map is reproduced as Figure 3. Water table contour maps for the other months will have the same configuration because the relative elevations between wells due not change appreciably between measurement episodes.

The water-table contours in Figure 3 indicate that groundwater gradient is low and that flow has a predominately eastward groundwater flow direction across the site. The Etcheverry Ranch residences lie approximately 1 mile almost due south of the release location and cross-gradient from any impacted groundwater.

Table 3 summarizes the October and November 2003 sampling results. The BTEX data collected for DEFS since the start of the project are summarized in Table 4. Examination

of Table 4 produces the same conclusions as reported in the October 1, 2003 report, namely:

1. BTEX constituents have either never been detected or reported at the reporting limit in wells MW-1 (up-gradient), MW-4 and MW-7;

2. The trace hydrocarbon constituent concentrations detected in MW-5 and MW-6 had declined to below the method detection limits by July 2003;

3. The BTEX concentrations in interior wells MW-2 and MW-3 have declined substantially from the pre-remediation concentrations. The benzene concentrations for these wells are graphed in Figure 5.

The above information demonstrates that the remediation system has stabilized the plume.

The remediation system is inspected a minimum of bi-weekly to ensure continued removal of free product and the dissolved phase hydrocarbons. Well MW-8 will be connected to the soil vapor extraction system in the near future to attempt to accelerate the free product process.

Wells MW-1 through MW-7 will be sampled in February 2004 to collect winter groundwater samples and complete four seasons of groundwater monitoring. The monitoring program will then be reviewed and revised as appropriate.

Do not hesitate to contact me if you have any questions or comments on this summary.

Respectfully Submitted,
**REMEDIACOM INCORPORATED**

Michael H. Stewart, P.E.
Principal Engineer

MHS:tbm

# TABLES

Table 1 – Monitoring Well Completions

| Well | Date Installed | Well Depth | Completion Interval | Top of Sand |
|---|---|---|---|---|
| | | | | |
| MW-1 | 3/02 | 91 | 71-91 | 68 |
| MW-2 | 3/02 | 88 | 68-88 | 62 |
| MW-3 | 3/02 | 91 | 71-91 | 61 |
| MW-4 | 4/02 | 91 | 71-91 | 68 |
| MW-5 | 4/02 | 89 | 69-89 | 56 |
| MW-6 | 4/02 | 90 | 70-90 | 68 |
| MW-7 | 5/02 | 85 | 65-85 | 59 |

Notes: All units in Feet
Hydrocarbon extraction well (MW-8) completed between approximately 80 and 100 feet

Table 2- Measured Water Table Elevations

| Well | 5/1/2002 | 9/6/2002 | 4/28/2003 | 6/19/03 | 7/17/03 | 8/20/03 | 9/22/03 | 10/29/03 | 11/20/03 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| MW-1 | 4,088.54 | 4088.53 | 4,088.55 | 4088.55 | 4088.52 | 4088.54 | 4088.53 | 4088.60 | 4088.59 |
| MW-2 | 4,089.02 | 4089.03 | 4,089.05 | 4089.07 | 4089.04 | 4089.09 | 4089.06 | 4089.11 | 4089.13 |
| MW-3 | 4,088.83 | 4088.86 | 4,088.86 | 4088.85 | 4088.82 | 4088.87 | 4088.84 | 4088.90 | 4088.95 |
| MW-4 | 4,088.63 | 4088.73 | 4,088.73 | 4088.73 | 4088.70 | 4088.72 | 4088.71 | 4088.78 | 4088.78 |
| MW-5 | 4,088.60 | 4088.68 | 4,088.67 | 4088.65 | 4088.63 | 4088.66 | 4088.65 | 4088.70 | 4088.70 |
| MW-6 | 4,088.69 | 4088.71 | 4,088.70 | 4088.69 | 4088.66 | 4088.70 | 4088.68 | 4088.74 | 4088.74 |
| MW-7 | | | | 4088.04 | 4088.01 | 4088.04 | 4088.03 | 4088.08 | 4088.08 |

All units in feet

Table 3 – October and November 2003 Groundwater Monitoring Results

October 2003 Groundwater Monitoring Results

| Well | Benzene | Toluene | Ethyl Benzene | Total Xylenes |
|---|---|---|---|---|
| | | | | |
| MW-1 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-2 | 0.001 | 0.004 | 0.002 | 0.017 |
| MW-3 | 0.044/.043 | <0.001/0.001 | 0.018/0.018 | 0.001/<0.001 |
| MW-4 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-5 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-6 | <0.001 | <0.001 | <0.001 | 0.003 |
| MW-7 | 0.001 | 0.001 | 0.001 | 0.006 |
| Trip blank | <0.001 | <0.001 | <0.001 | <0.001 |

November 2003 Groundwater Monitoring Results

| Well | Benzene | Toluene | Ethyl Benzene | Total Xylenes |
|---|---|---|---|---|
| | | | | |
| MW-1 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-2 | 0.013 | 0.017 | 0.005 | 0.034 |
| MW-3 | 0.046/0.049 | 0.003/0.002 | 0.018/0.016 | 0.005/0.002 |
| MW-4 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-5 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-6 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-7 | 0.001 | <0.001 | <0.001 | 0.001 |
| Trip blank | <0.001 | <0.001 | <0.001 | <0.001 |

Notes: All units in mg/l
Duplicate sample results separated by a slash "/"

Table 4 – Summary of DEFS Generated Laboratory Data

Benzene

| Well | 4/24/02 | 5/21/02 | 4/28/03 | 6/19/03 | 7/17/03 | 8/20/03 | 9/22/03 | 10/29/03 | 11/20/03 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| MW-1 | <0.002 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-2 | 0.0255 | 0.145 | 0.182 | 0.074 | 0.155 | 0.024 | 0.022 | 0.001 | 0.013 |
| MW-3 | 0.061 | 0.176 | 0.099 | 0.047 | 0.063 | 0.017 | 0.049 | 0.044 | 0.048 |
| MW-4 | <0.002 | <0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-5 | <0.002 | <0.002 | 0.005 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-6 | <0.002 | 0.002 | 0.003 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-7 | --- | --- | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 0.001 |

Notes: All units in mg/l. Duplicate sample results were averaged together

Toluene

| Well | 4/24/02 | 5/21/02 | 4/28/03 | 6/19/03 | 7/17/03 | 8/20/03 | 9/22/03 | 10/29/03 | 11/20/03 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| MW-1 | <0.002 | 0.003 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-2 | 0.107 | 0.833 | 0.092 | 0.066 | 0.15 | 0.092 | 0.051 | 0.004 | 0.017 |
| MW-3 | <0.002 | 0.004 | 0.005 | <0.001 | 0.002 | <0.001 | <0.001 | <0.001 | 0.003 |
| MW-4 | <0.002 | <0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-5 | <0.002 | <0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-6 | <0.002 | <0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-7 | --- | --- | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | <0.001 |

Notes: All units in mg/l. Duplicate sample results were averaged together

Table 4 – Summary of DEFS Generated Laboratory Data (continued)

Ethylbenzene

| Well | 4/24/02 | 5/21/02 | 4/28/03 | 6/19/03 | 7/17/03 | 8/20/03 | 9/22/03 | 10/29/03 | 11/20/03 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| MW-1 | <0.002 | <0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-2 | 0.013 | 0.062 | 0.121 | 0.069 | 0.112 | 0.012 | 0.012 | 0.002 | 0.005 |
| MW-3 | 0.023 | 0.023 | 0.03 | 0.02 | 0.023 | 0.006 | 0.02 | 0.018 | 0.017 |
| MW-4 | <0.002 | <0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-5 | <0.002 | <0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-6 | 0.004 | 0.002 | 0.002 | <0.001 | 0.004 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-7 | --- | --- | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | <0.001 |

Total Xylenes

| Well | 4/24/02 | 5/21/02 | 4/28/03 | 6/19/03 | 7/17/03 | 8/20/03 | 9/22/03 | 10/29/03 | 11/20/03 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| MW-1 | <0.006 | <0.006 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-2 | 0.38 | 1.27 | 0.133 | 0.103 | 0.186 | 0.179 | 0.079 | 0.017 | 0.034 |
| MW-3 | 0.189 | 0.451 | 0.039 | 0.006 | 0.007 | 0.001 | 0.001 | 0.001 | 0.004 |
| MW-4 | <0.006 | <0.006 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-5 | 0.011 | <0.006 | 0.003 | 0.003 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 |
| MW-6 | 0.123 | 0.047 | 0.01 | <0.001 | 0.004 | <0.001 | <0.001 | 0.003 | <0.001 |
| MW-7 | --- | --- | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.006 | 0.001 |

Notes: All units in mg/l
Duplicate sample results were averaged together

# FIGURES

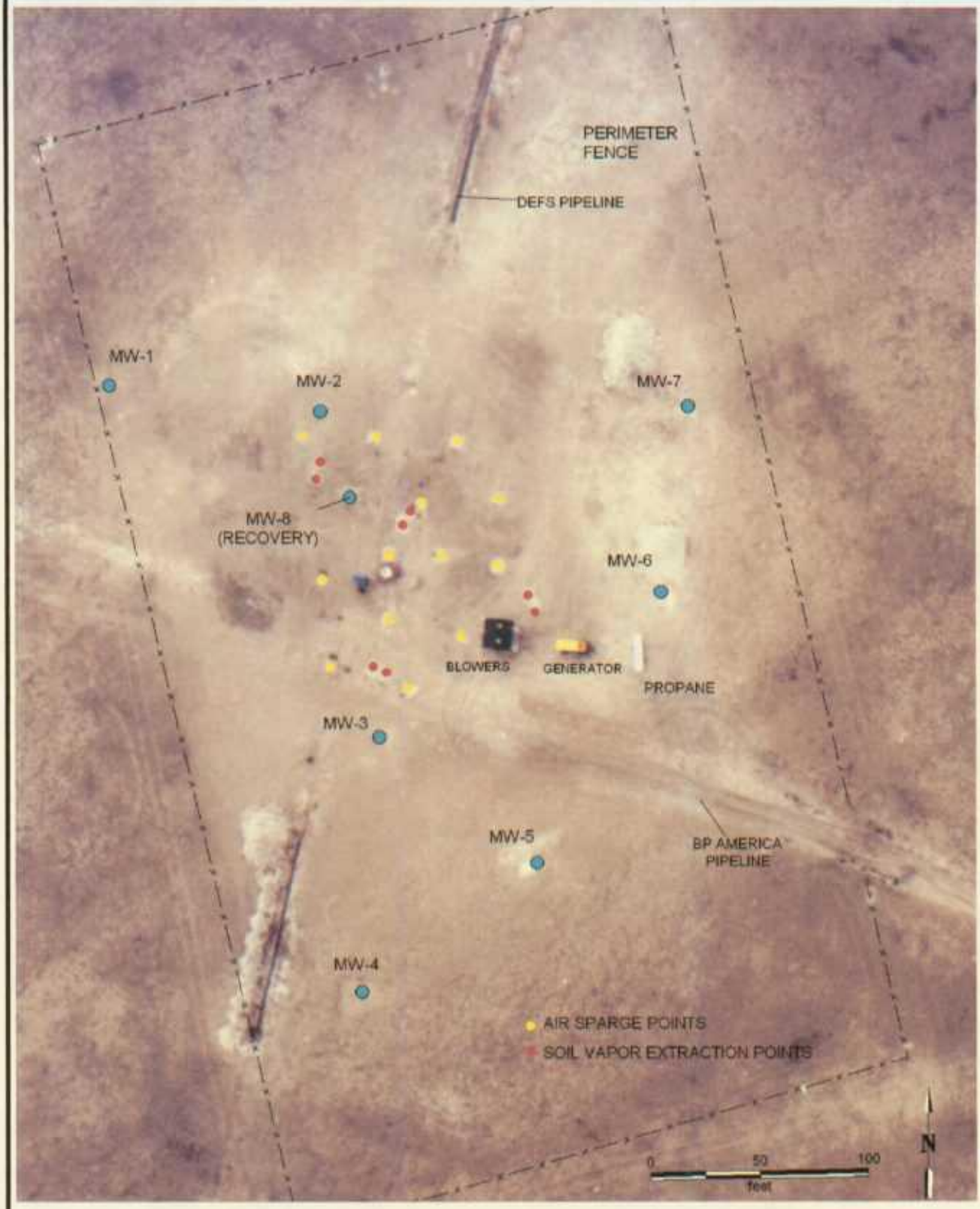


Figure 1 – Facility Configuration
X-Line Remediation

Duke Energy Field Services

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Figure 2 – Well Hydrographs

X-Line Remediation

Duke Energy Field Services

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DATE: 12/03

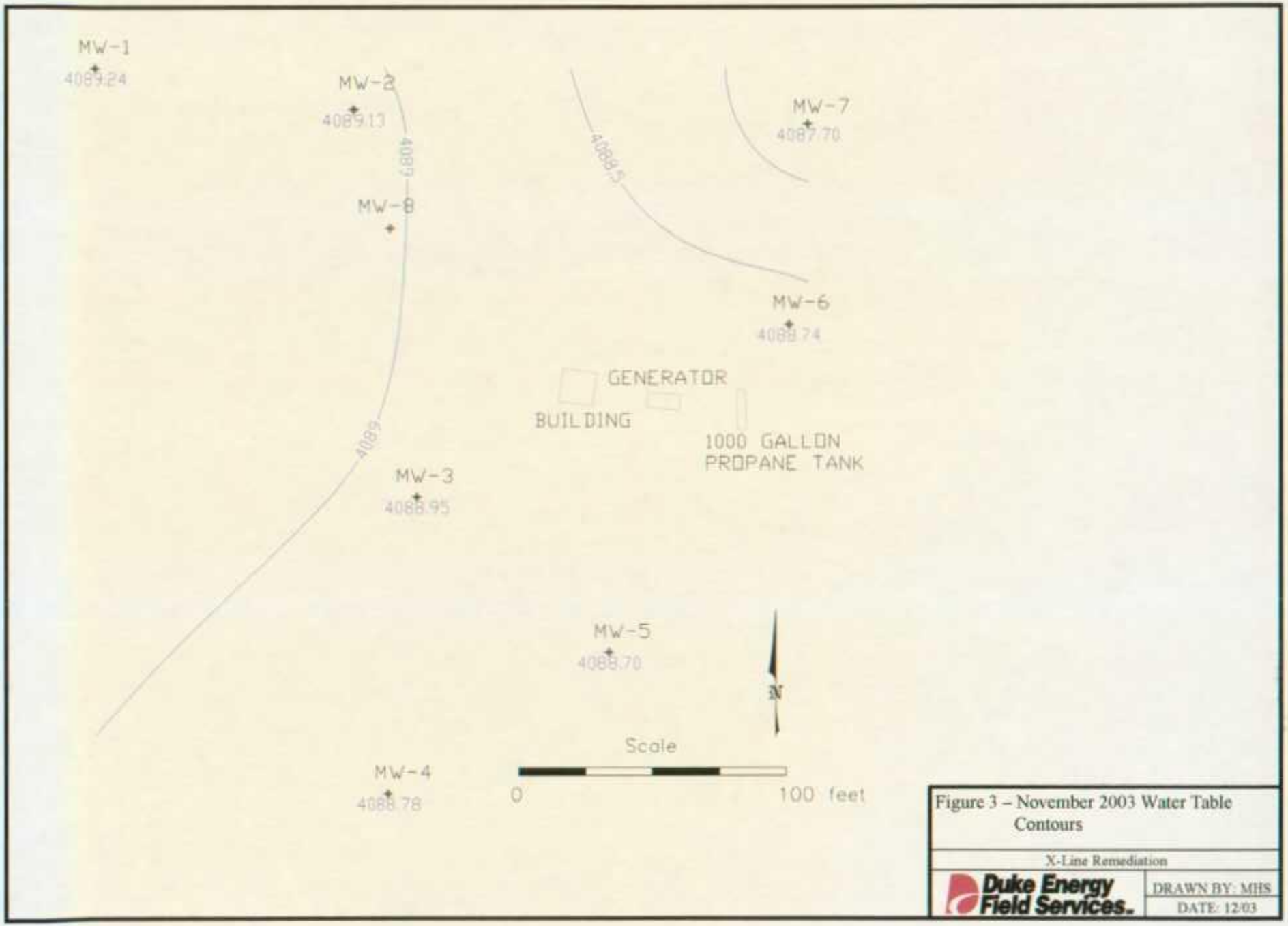


Figure 3 – November 2003 Water Table Contours

X-Line Remediation

Duke Energy Field Services

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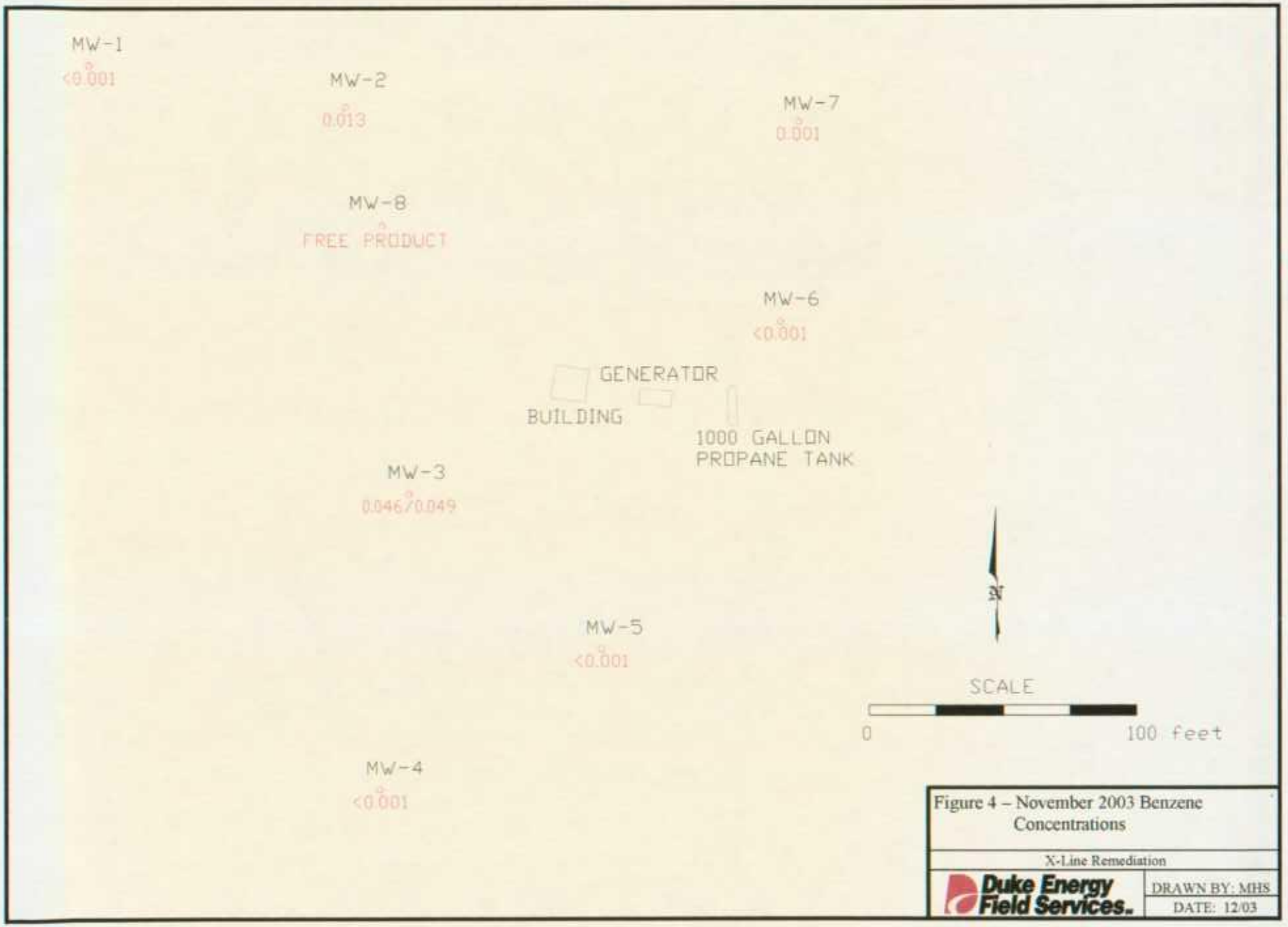


Figure 4 – November 2003 Benzene Concentrations

X-Line Remediation

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Figure 5 – Benzene Concentrations in MW-2 and MW-3

X-Line Remediation

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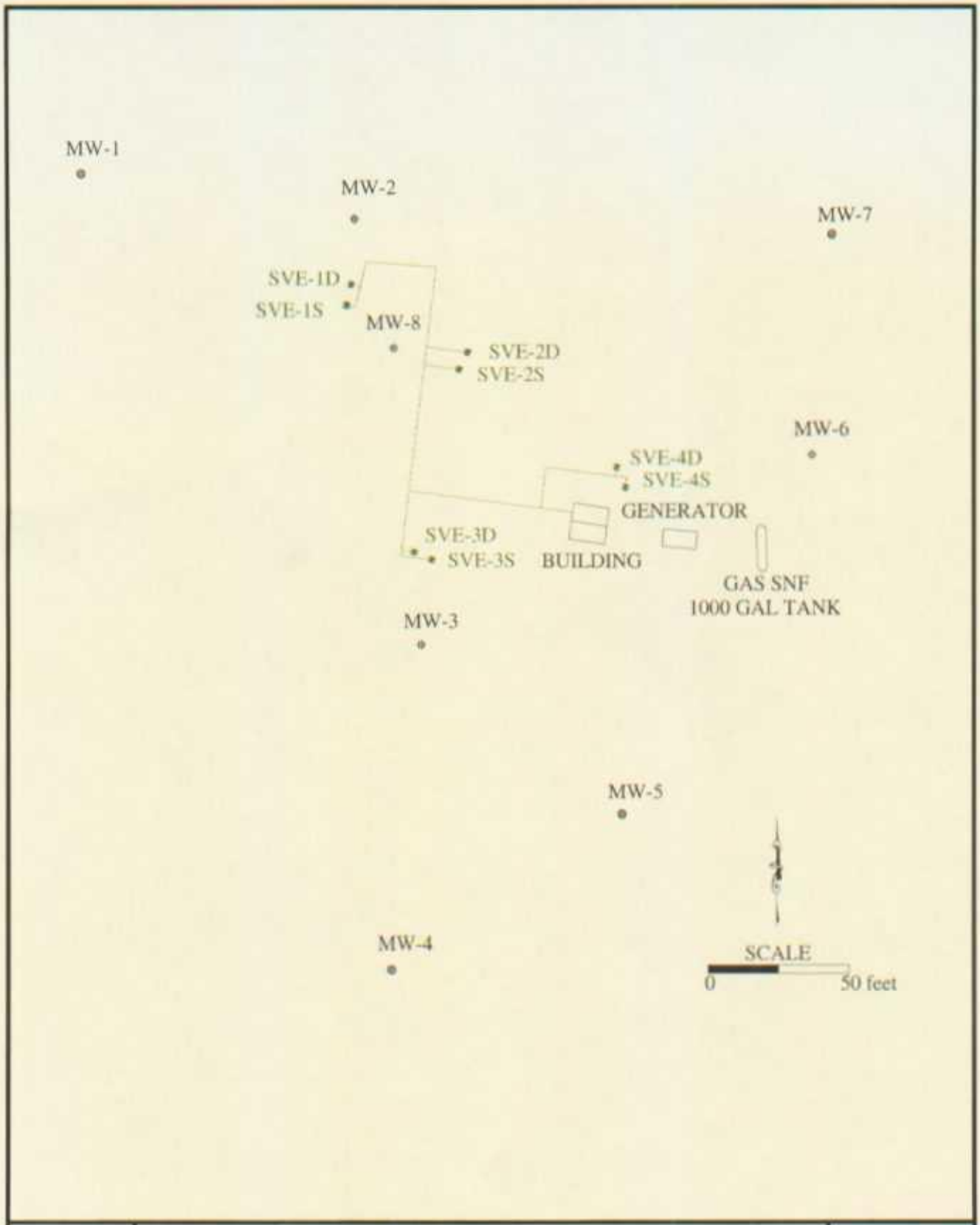


Figure 2 – Soil Vapor Extraction Well Locations
ETCHEVERRY RANCH GROUNDWATER INVESTIGATION

Duke Energy Field Services

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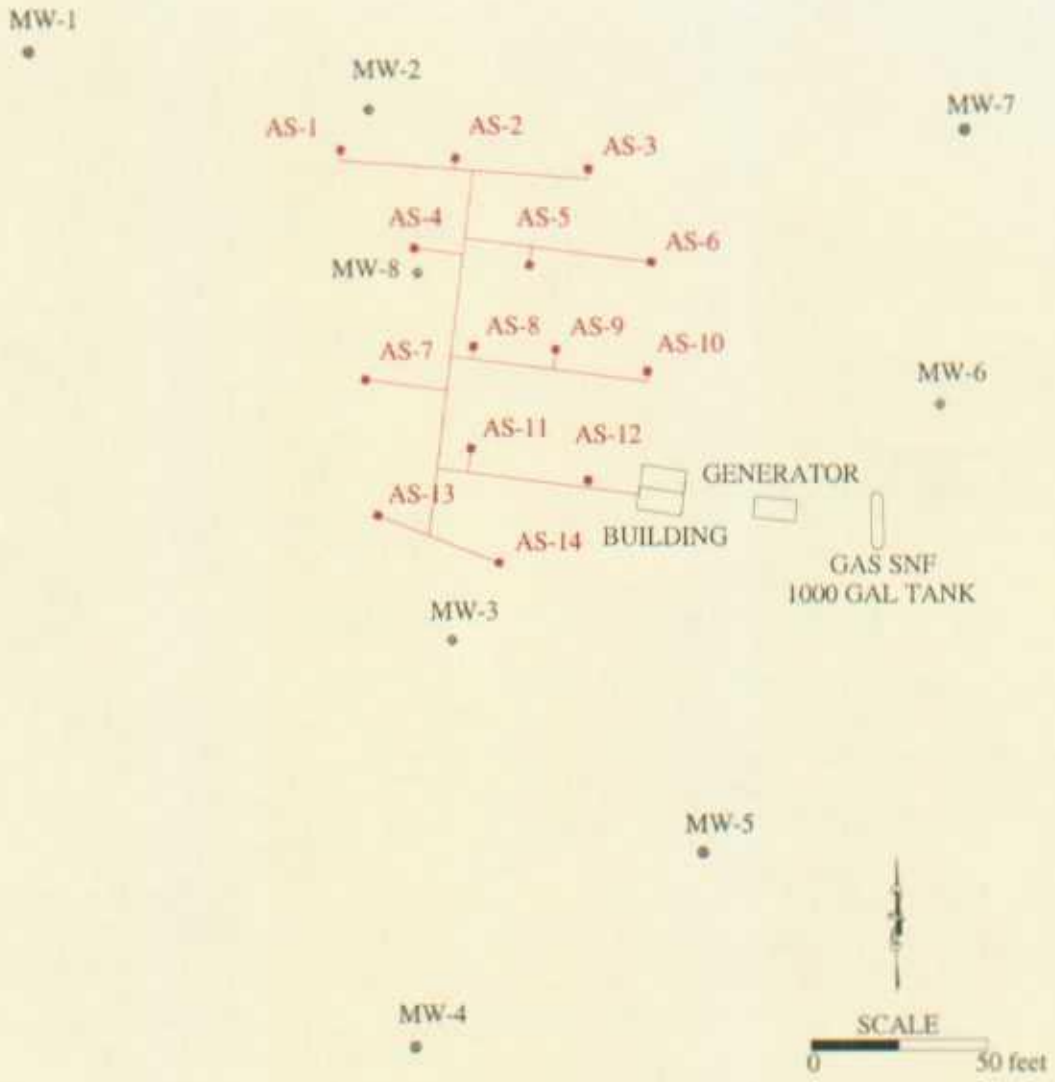


Figure 3 – Sparge Point Locations
ETCHEVERRY RANCH GROUNDWATER INVESTIGATION

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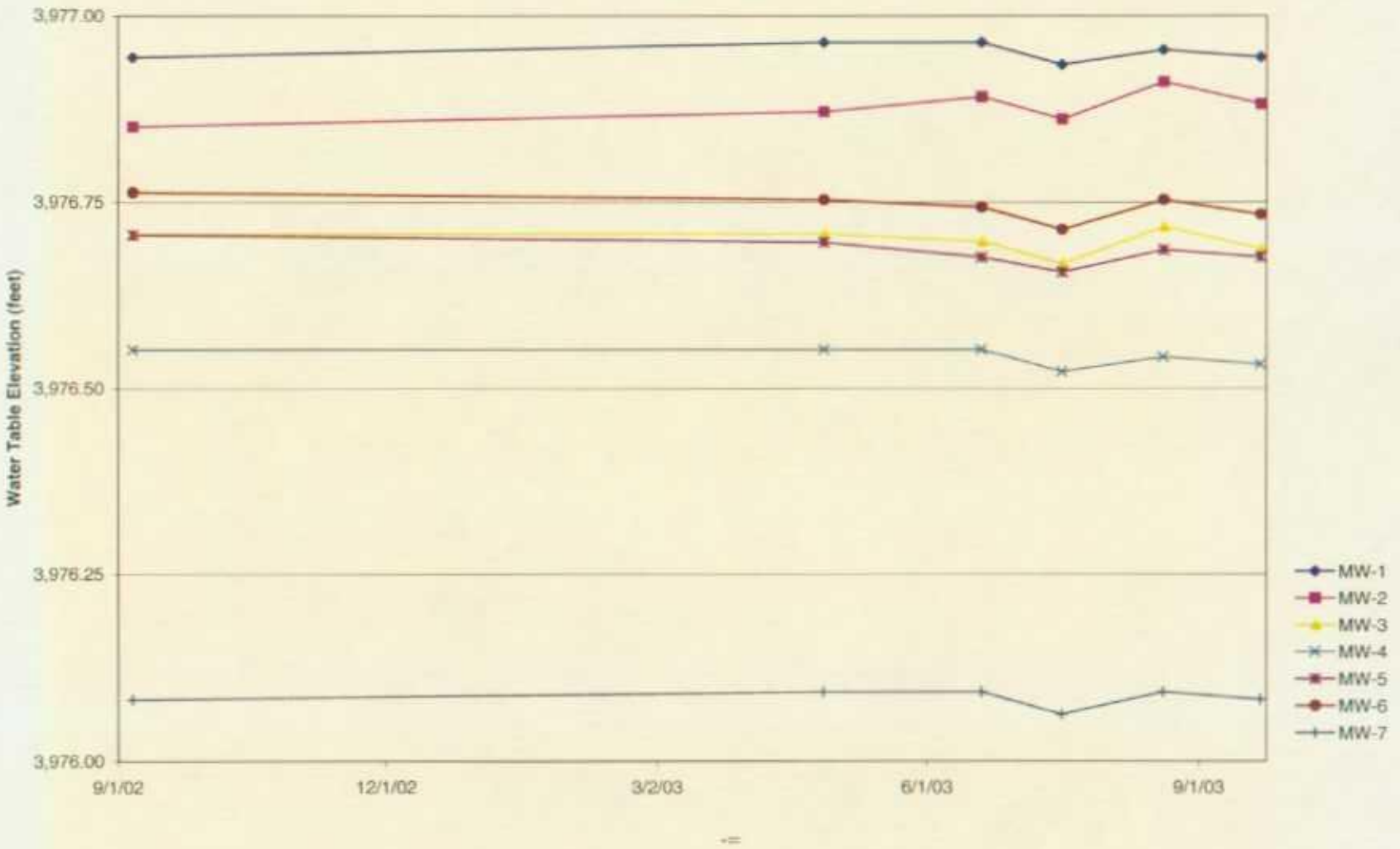


Figure 4 – Monitoring Well Hydrographs

Etcheverry Ranch Groundwater Investigation

Duke Energy Field Services.

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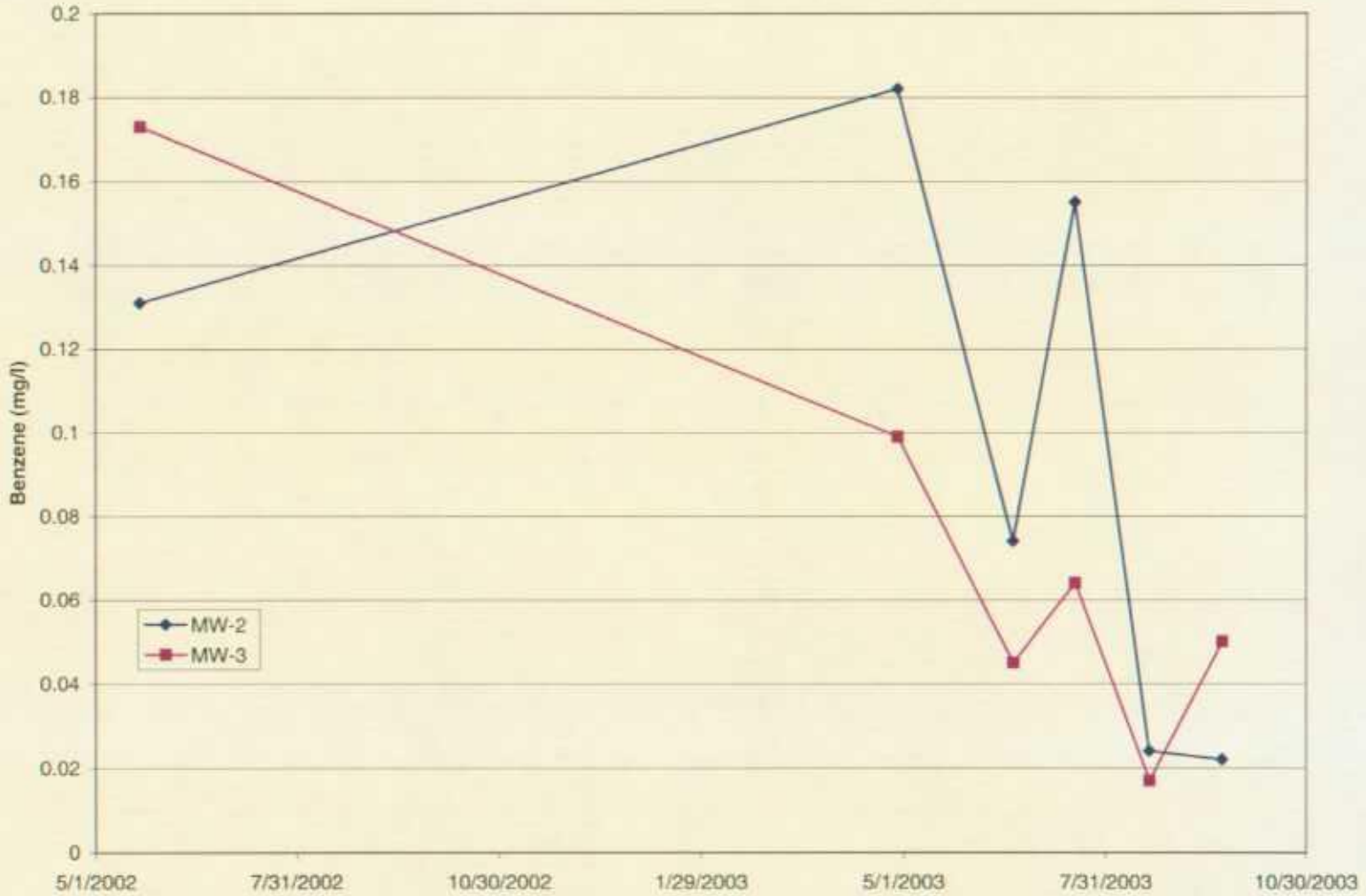


Figure 5 – Benzene Concentrations in MW-2 and MW-3

Etcheverry Ranch Groundwater Investigation

Duke Energy Field Services.

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