Chevron

February 6, 1998

**Chevron Products Company**
6001 Bollinger Canyon Road
Building L
San Ramon, CA 94583
P.O. Box 6004
San Ramon, CA 94583-0904

**Marketing – Sales West**
Phone 510 842-9500

Ms. Eva Chu
Alameda County Health Care Services
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

**Re: Former Chevron Service Station #9-7127**
**Interstate 580 and Grantline Road**
**near Tracy , California**

Dear Ms. Chu:

Enclosed is a copy of the *Evaluation of Intrinsic Bioremediation*, dated February 2, 1998, that was prepared by Curtis Peck of Chevron's CRTC group. This evaluation was made to make a determination of the presence of intrinsic bioremediation within the hydrocarbon plume at the above noted site.

The evaluation of indicator parameters across a dissolved contaminant plume can be used in the demonstration of intrinsic bioremediation. One or more trends observed across a dissolved plume with increasing contaminant concentration would suggest the potential occurrence of intrinsic bioremediation. With increasing BTEX concentrations, the expected trend in indicator parameter concentrations would be: Relative Decrease In- Dissolved Oxygen, Oxidation-Reduction Potential, Nitrate and Sulfate; Relative Increase In- Dissolved Iron and Alkalinity.

The dissolved plume was taken from upgradient to downgradient wells with the sum of the BTEX results and the indicator bio-parameter analytical results for each well plotted on the enclosed plots. The plots are than evaluated by observation for apparent trends in the data.

Based on the attached plots, there is indication of the presence of intrinsic bioremediation occurring in the groundwater plume at this site. The effect of this process will be to stabilize the containment plume and reduce the size of the plume as the source area concentrations are reduced.

As noted in the evaluation, it would be appropriate to add Oxygen Releasing Compound (ORC) to the wells located in the plume to expedite plume reduction. (i.e.MW-1, MW-3, MW-4 and MW-6)

For your information, I have discussed the use of the on-site water supply well with the owner of the property Mr. Ardavan Onsori, and he advised me that he will retain the well for future use. Therefore, a carbon adsorption vessel will be placed online to the water supply well. Data is being acquired for the proper sizing of the carbon vessel and when it is installed, Chevron will advise your office.

If you have any questions or comments, call me at (510) 842-9136 or Curtis Peck at (510) 242-7086.

Sincerely,
**CHEVRON PRODUCTS COMPANY**

Philip R. Briggs
Site Assessment and Remediation Project Manager

Enclosure

cc. Mr. John Moody
RWQCB-Central Valley Region
3443 Routier Road, Sacramento, CA 95827-3098

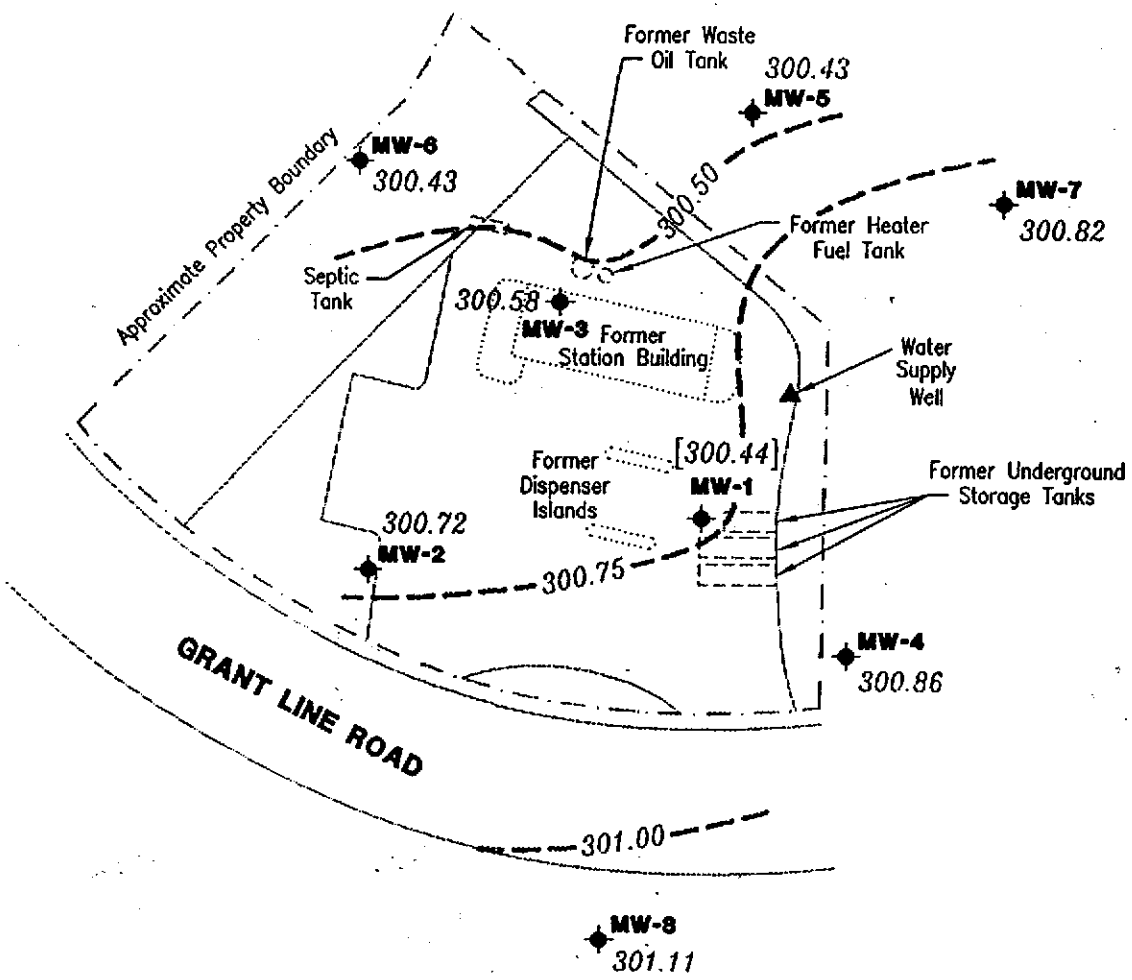
Mr. Ardavan Onsori
29310 Union City Blvd., Union City, CA 94587

Mr. & Mrs. Joe Jess
Jess Ranch, Rout 5, Box 704-A, Tracy, CA 95376

Mr. Ross Tinline
Pacific Environmental Group
2025 Gateway Place, Suite 440, San Jose, CA 95110

Ms. Bette Owen, Chevron

Mr. Curtis Peck, Chevron, CRTC, RIC 100/10-3514




## EXPLANATION

| | |
|---|---|
| ✦ | Groundwater monitoring well |
| 99.99 | Groundwater elevation in feet referenced to Mean Sea Level (MSL) |
| 99.99 | Groundwater elevation contour, dashed where inferred. |
| [99.99] | Not used in contouring |

Approximate groundwater flow direction at a gradient of 0.01 to 0.002 Ft./Ft.

N

0 60

Scale in Feet

**Gettler - Ryan Inc.**
6747 Sierra Ct., Suite J (510) 551-7555
Dublin, CA 94568

POTENTIOMETRIC MAP
Former Chevron Service Station No. 9-7127
Interstate 580 and Grant Line Road
Tracy, California

FIGURE 1

| JOB NUMBER | REVIEWED BY | DATE | REVISED DATE |
|---|---|---|---|
| 5251 | | November 18, 1997 | |

See Revised Graphs in report dated 7/28/98

**MEMORANDUM**

February 2, 1998
Richmond, California

**Evaluation of Intrinsic Bioremediation**
**Former Chevron Service Station #9-7127**
**Interstate 580 and Grantline Road**
**Near Tracy, California**

**Mr. Phil Briggs:**
San Ramon, California

I have reviewed the analytical data collected during the 7/27/97 groundwater sampling event for intrinsic bioremediation parameters and the 11/18/97 semi-annual groundwater sampling event at this site in order to make a determination of the presence of intrinsic bioremediation within the hydrocarbon plume at this site. Based on the attached plots of total BTEX versus indicator parameter, it is likely that intrinsic bioremediation is occurring within the hydrocarbon plume at this site. The effect of this process will be to stabilize the plume and reduce the plume as the source area is depleted.

Background

The demonstration of intrinsic bioremediation requires multiple lines of evidence, including analytical data which suggest that bioremediation is actually occurring in the field. The evaluation of indicator parameters across a dissolved contaminant plume can be used in the demonstration of intrinsic bioremedaition. One or more trends observed across a dissolved plume (with increasing contaminant concentration) would suggest the potential occurrence of intrinsic bioremediation. With increasing BTEX concentrations, the expected trend in indicator parameter concentrations would be:

| Relative Decrease In: | Relative Increase In: |
|---|---|
| Dissolved Oxygen | Dissolved Iron (Ferrous) |
| Oxidation- Reduction Potential (Redox) | Alkalinity |
| Nitrate | |
| Sulfate | |

In the attached plots, the sampled wells are presented on the X-axis from the upgradient wells to downgradient wells through the contaminant plume. The resulting order of the wells is MW-6, MW-3, MW-1 and MW-4 through the plume. Data was collected for wells MW-2, MW-5, MW-7 and MW-8 but it is apparent that these wells are either crossgradient or downgradient to the plume, therefore being similar to the up- and downgradient wells, and were not presented on these plots. The sum of the BTEX results for each well for the 11/18/97 sampling event and the indicator parameter analytical result (7/27/97 event) for each well are plotted on the Y-axis to create the attached plots. The plots are then evaluated by observation for apparent trends in the data.

Results

The dissolved oxygen versus BTEX plot indicates that with high BTEX concentrations, dissolved oxygen concentrations are lower than upgradient and downgradient wells. This indicates that the

biologic activity within the contaminant plume is consuming (depleting) dissolved oxygen during the conversion of BTEX to carbon dioxide and water. This trend is expected in the presence of BTEX and would indicate that intrinsic bioremediation is occurring at this site. Based on this analysis it would be appropriate to add oxygen releasing compound to the wells located within the plume to expedite plume reduction.

The ORP versus BTEX plot indicates that ORP increases with increasing BTEX values. The expected trend for this site would be a decrease in ORP values (getting more negative) with increasing BTEX values. Therefore, this trend for ORP would not be a good indicator of the presence of intrinsic bioremediation at this site.

The nitrate versus BTEX plot indicates that nitrate is present where BTEX concentrations are low and reduced when BTEX concentrations are elevated. This is an expected trend for nitrate in the presence of BTEX and intrinsic bioremediation. The observed nitrate trend through the BTEX plume suggests that intrinsic bioremediation is occurring in the groundwater at this site and that nitrate is a good indicator of this process.

The sulfate versus BTEX plot indicates that sulfate is present where BTEX concentrations are low and reduced when BTEX concentrations are elevated. This is an expected trend for sulfate in the presence of BTEX and intrinsic bioremediation. The observed sulfate trend through the plume suggests that intrinsic bioremediation is occurring in the groundwater at this site. Sulfate is a good indicator of intrinsic bioremediation processes occurring at this site.

The alkalinity versus BTEX plot indicates that the upgradient waters at this site are low in alkalinity and the interior plume waters are higher in alkalinity. An increase in alkalinity across a contaminant plume is a potential indicator of biologic activity. Therefore, the observed trend for alkalinity is consistent with the occurrence of intrinsic bioremediation in the groundwater at this site.

The dissolved (ferrous) iron versus BTEX plot indicates that higher concentrations of ferrous iron are present in the higher BTEX waters of the contaminant plume. An increase of ferrous iron in the interior of a plume is a potential indicator of biologic activity at the site. Therefore, the observed trend for ferrous iron is consistent with the occurrence of intrinsic bioremediation in the groundwater at this site.

The plots of indicator parameters for dissolved oxygen, nitrate, sulfate, alkalinity and ferrous iron versus total BTEX for site wells upgradient, within and downgradient of the plume indicates the presence of intrinsic bioremediation occurring in the groundwater plume associated with this site. The effect of this process will be to stabilize the contaminant plume and reduce the size of the plume as the source area concentrations are reduced.

Please contact me at 242-7086 with questions or comments regarding this review.

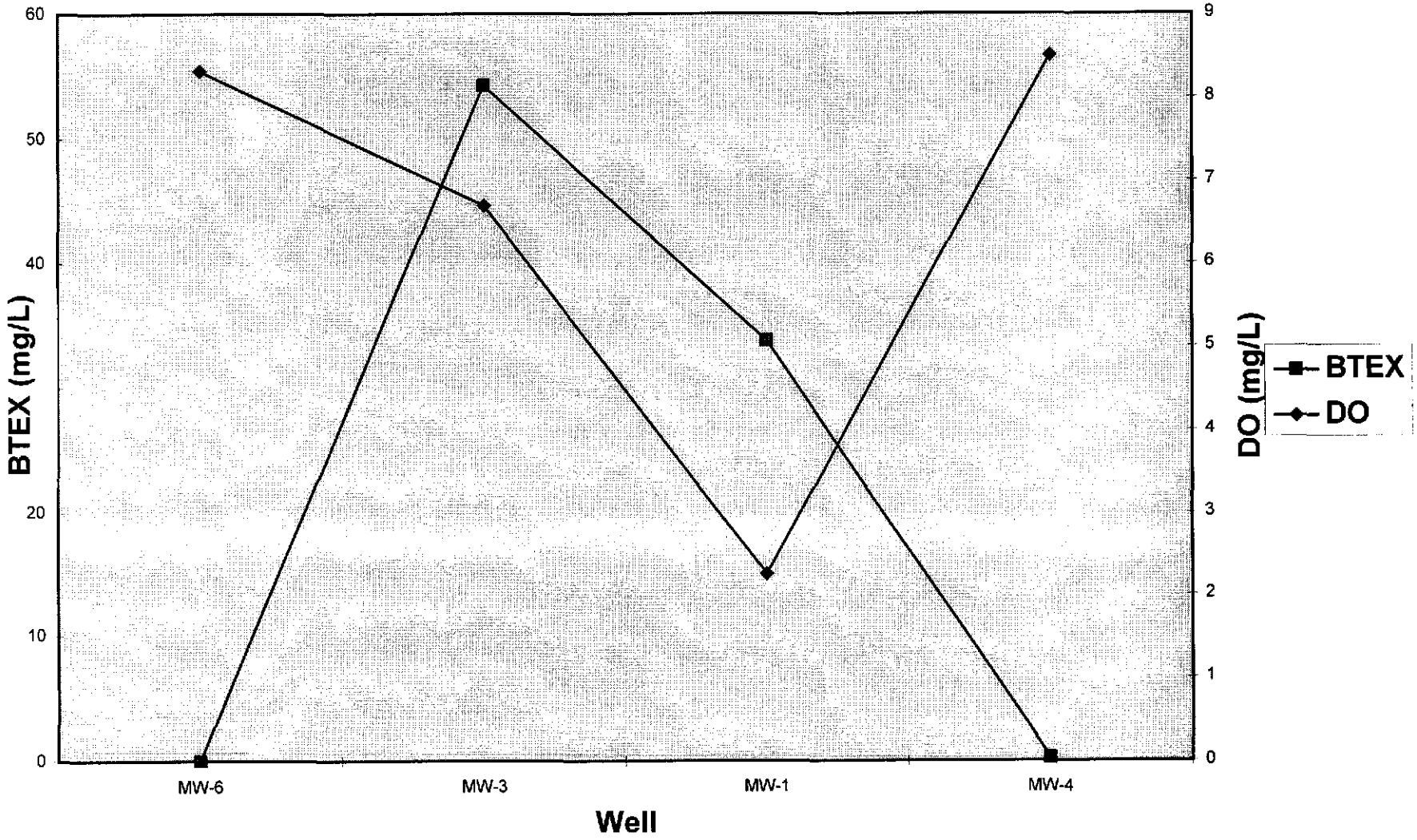
Sincerely,

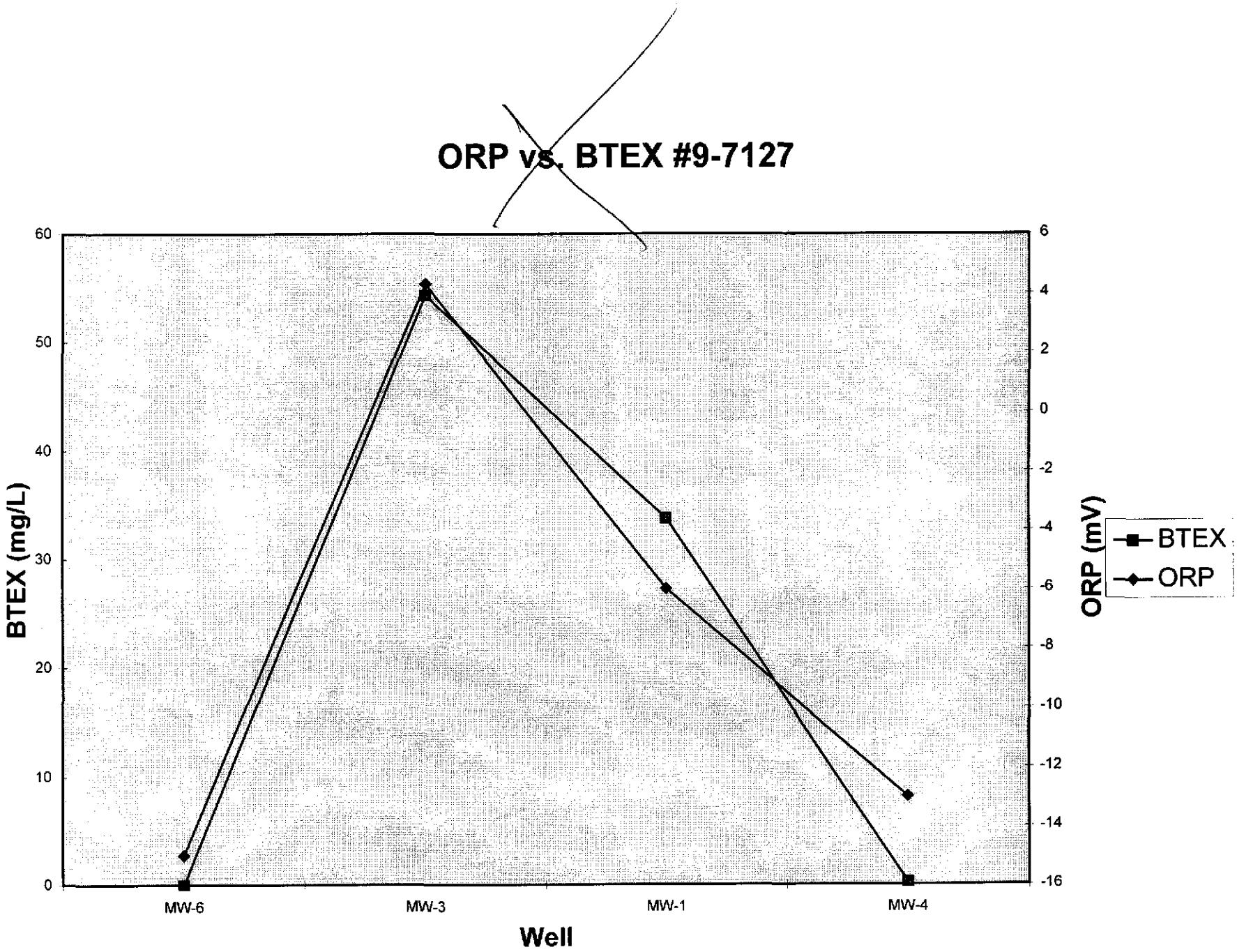
Curtis A. Peck
*Hydrogeologist*

Attachments:

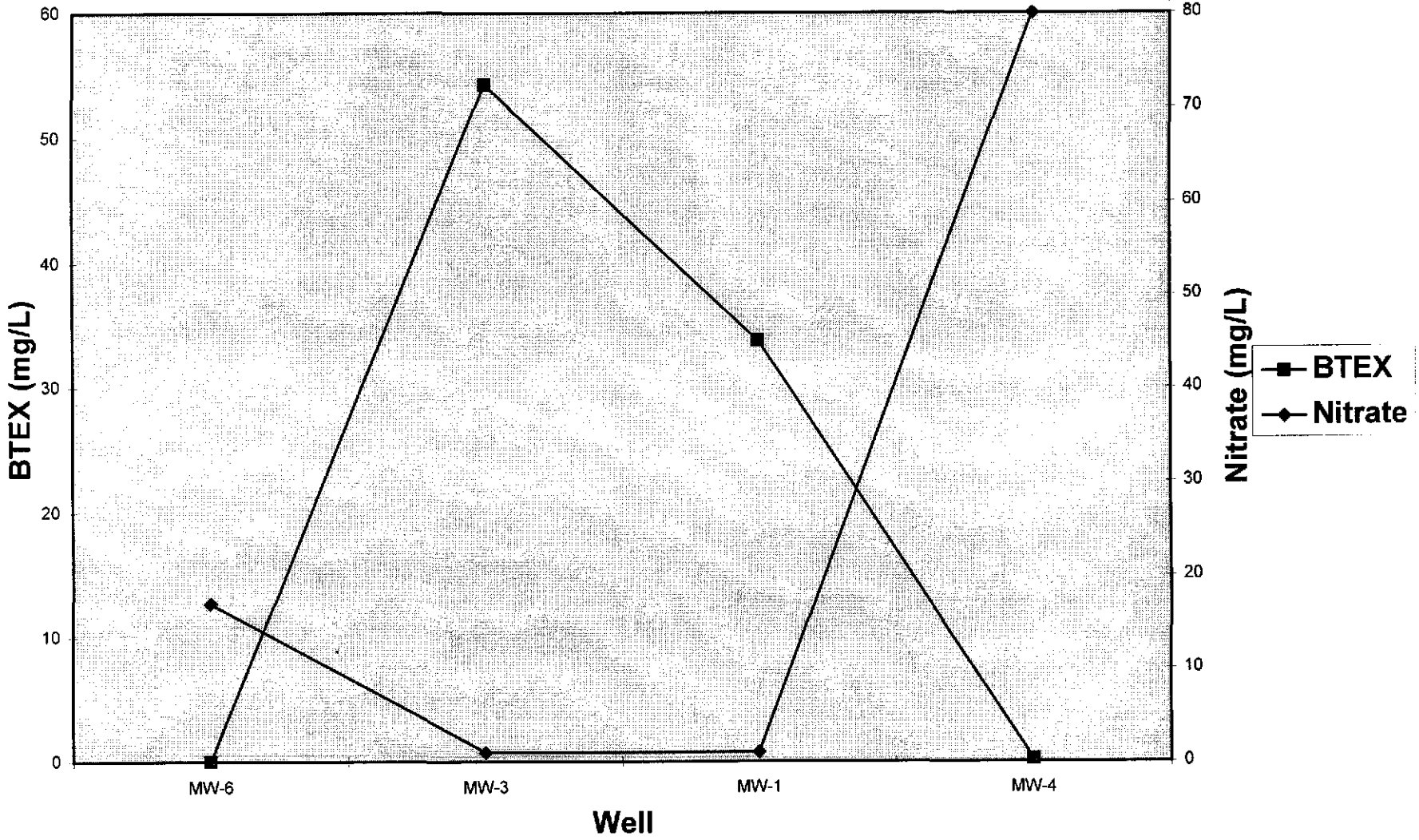
- Data Table
- Dissolved Oxygen vs. BTEX
- ORP vs. BTEX

# Dissolved Oxygen vs BTEX #9-7127

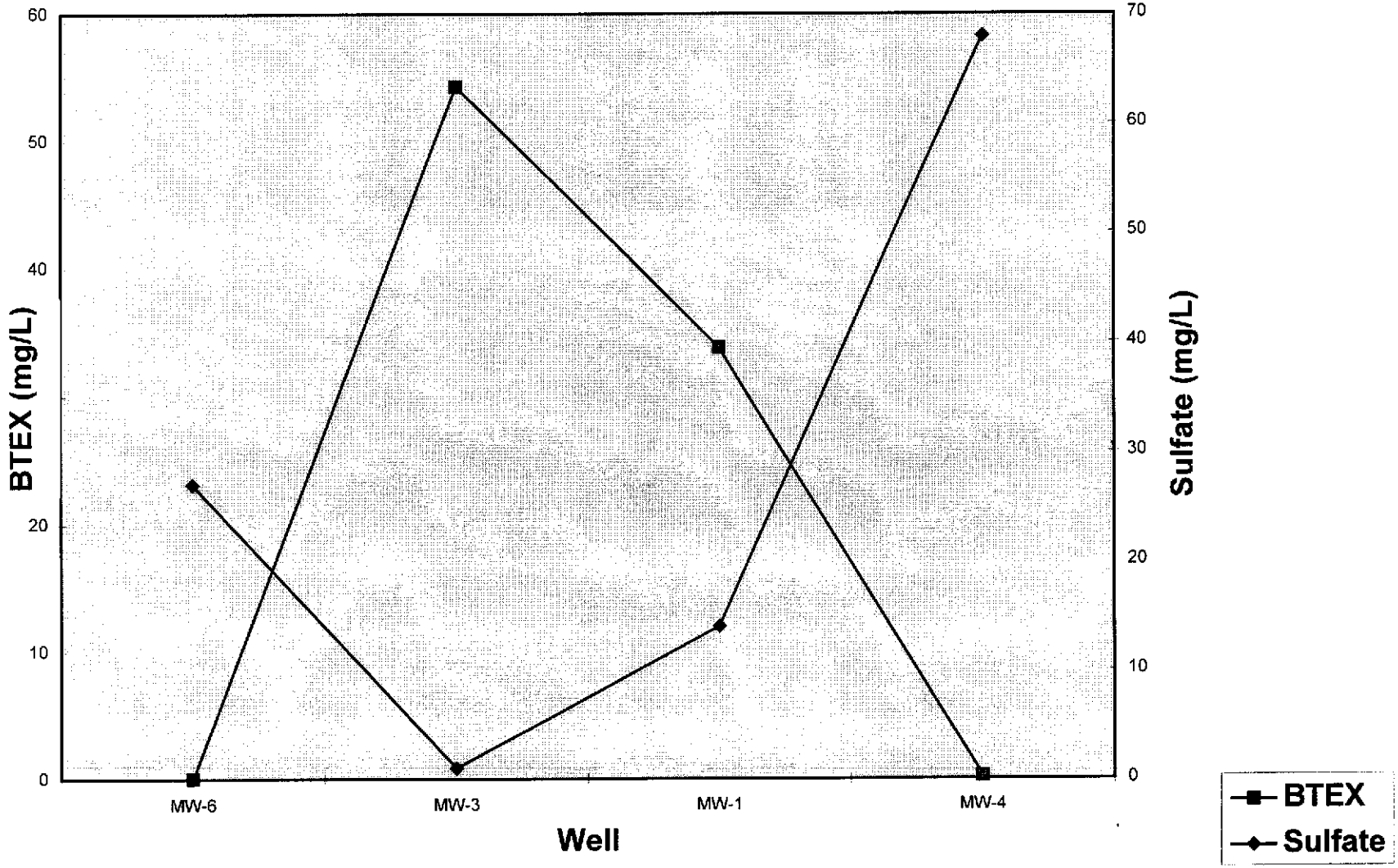


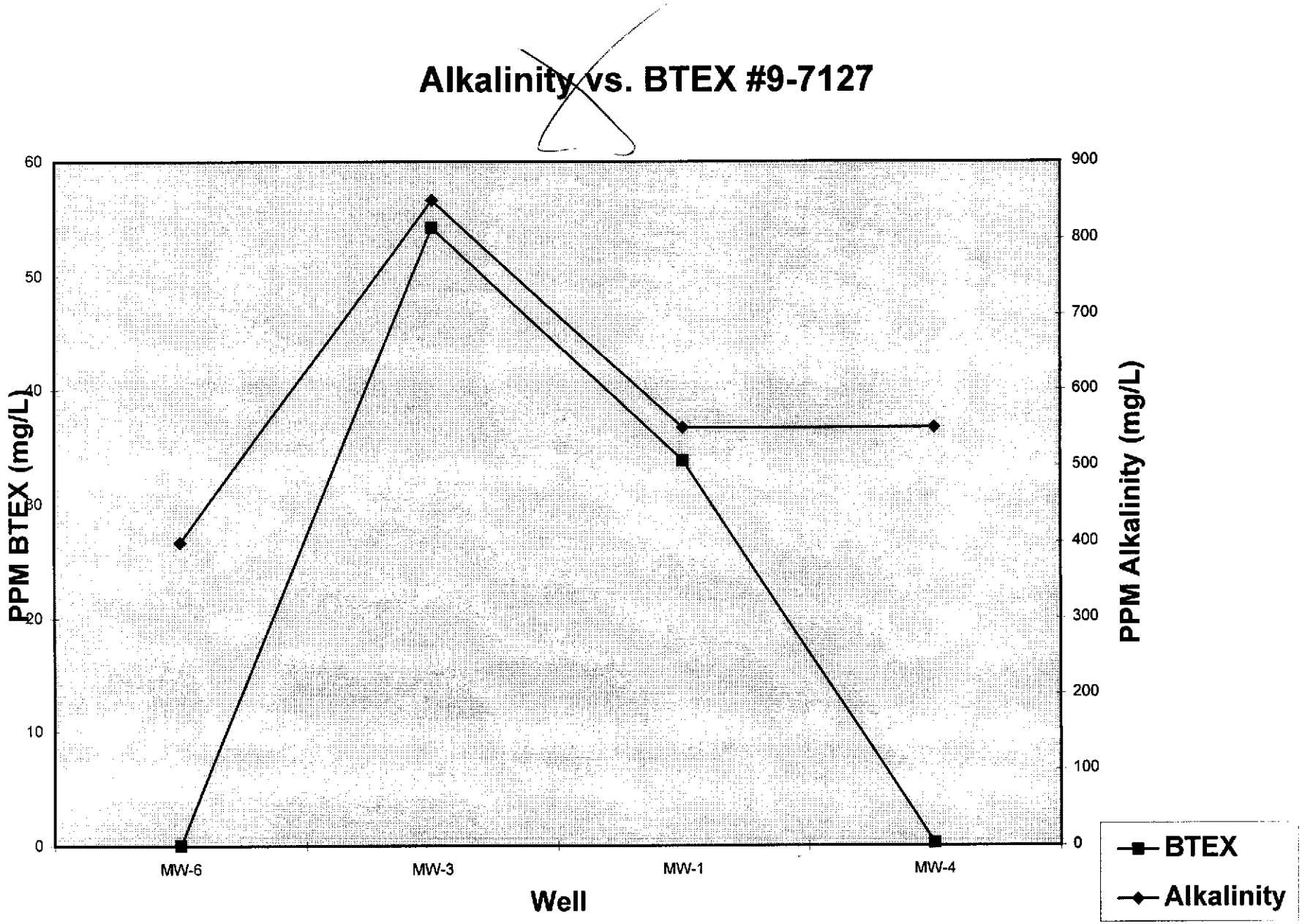

ORP vs. BTEX #9-7127
BTEX (mg/L)
ORP (mV)
60
50
40
30
20
10
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
MW-6
MW-3
MW-1
MW-4
Well
BTEX
ORP

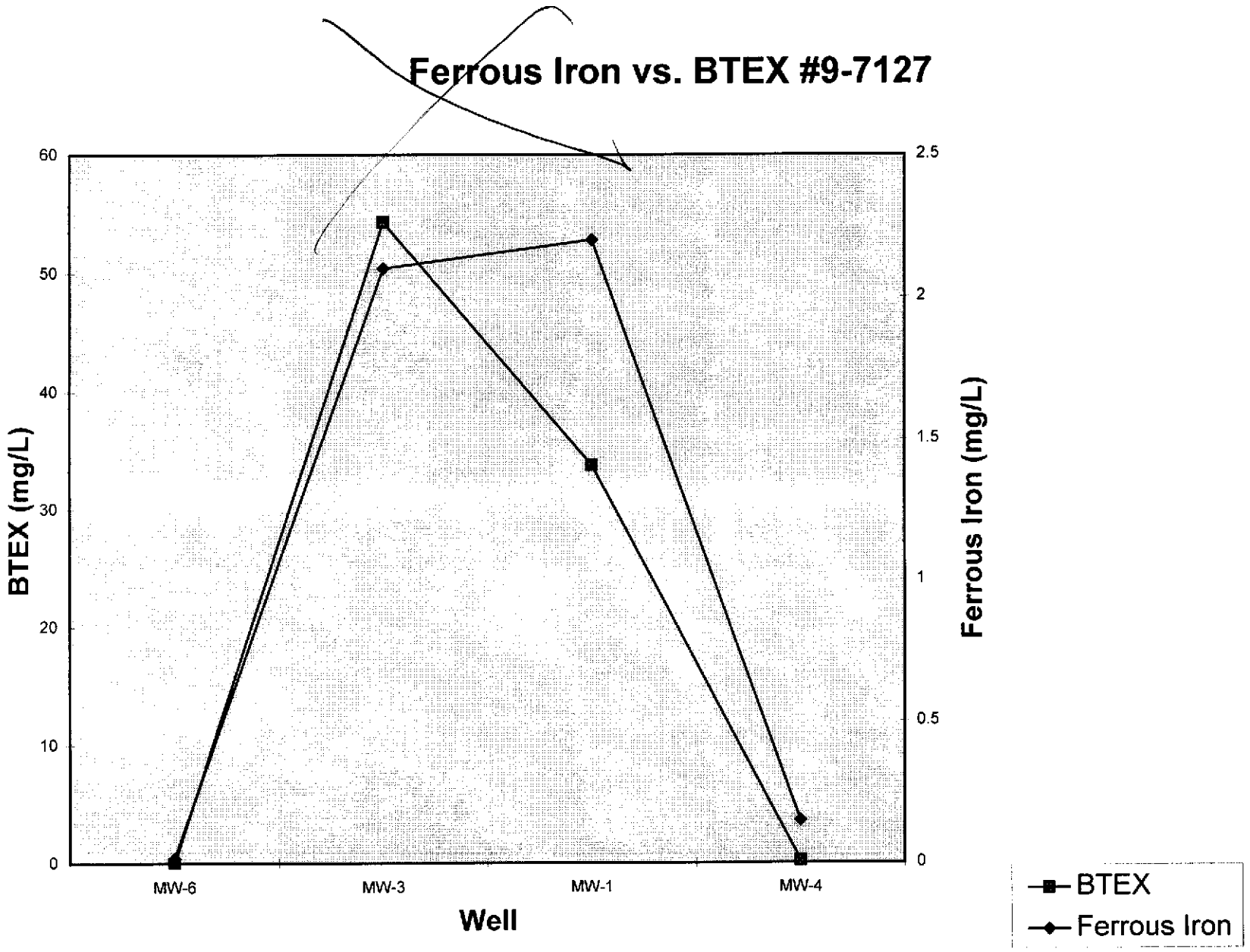
# Nitrate vs. BTEX #9-7127



# Sulfate vs. BTEX #9-7127




Alkalinity vs. BTEX #9-7127
PPM BTEX (mg/L)
PPM Alkalinity (mg/L)
60
50
40
30
20
10
0
900
800
700
600
500
400
300
200
100
0
MW-6
MW-3
MW-1
MW-4
Well
BTEX
Alkalinity


Ferrous Iron vs. BTEX #9-7127
BTEX (mg/L)
Ferrous Iron (mg/L)
Well
MW-6
MW-3
MW-1
MW-4
0
10
20
30
40
50
60
0
0.5
1
1.5
2
2.5
BTEX
Ferrous Iron