Chevron

September 29, 1998

Chevron Products Company
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Site Assessment & Remediation
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Mr. Larry Seto
Alameda County Health Care Services
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Former Chevron Service Station #9-1153
3126 Fernside Boulevard, Alameda, California

Dear Mr. Seto:

As noted in the previously sent Third Quarter Groundwater Monitoring report for 1998, dated September 17, 1998, bio-parameters were taken at three of the wells sampled, and this information was to be evaluated to determine 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:	Relative Increase In:
Dissolved Oxygen	Dissolved Iron (Ferrous)
Oxidation-Reduction Potential (ORP)	Alkalinity
Nitrate	
Sulfate	

In the attached charts, three sampled wells are presented on the X-axis from the up-gradient wells to the down-gradient wells through the contaminant plume. (Note that the gradient direction changed from the previous sampling event). The resulting order of the wells is C-3, C-1 and MW-10 through the plume. The sum of the BTEX results for each well and the indicator bio-parameter analytical results for each well are plotted on the Y-axis to create the plots on the attached charts. The plots are than evaluated by observation for apparent trends in the data.

The dissolved oxygen vs. BTEX plot shows that as the BTEX concentrations are increasing the dissolved oxygen concentrations are increasing. The expected trend would be a decrease in dissolved oxygen values with increasing BTEX values. Therefore, this trend would not be a good indicator of the presence of intrinsic bioremediation at this site.

The ORP vs. BTEX plot indicates that ORP is increasing with increasing BTEX values. The expected trend would be a decrease in ORP values with increasing BTEX values. Therefore, this trend would not be a good indicator of the presence of intrinsic bioremediation at this site.

The nitrate vs. BTEX plot indicates that nitrate is not present where BTEX concentrations are high. The expected trend would be a decrease in nitrate values with increasing BTEX values. With no nitrate detected, no statement can be made as to whether intrinsic bioremediation is occurring at this site.

The sulfate vs. BTEX plot shows that as the BTEX concentrations are increasing from wells C-3 to C-1, the sulfate concentrations are slightly decreasing, which indicates some biological activity is occurring within this range of the contaminant plume. From wells C-1 to MW-10 the BTEX concentrations decrease as the sulfate concentration increases, which indicates that some biological activity is occurring within this range of the contaminant plume. Therefore, this trend would indicate that partial intrinsic bioremediation is occurring at this site.

The alkalinity vs. 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 iron (ferrous) vs. BTEX plot indicates that as the BTEX concentrations are increasing from wells C-3 to C-1, the dissolved iron concentrations are slightly increasing, which indicates some biological activity is occurring within this range of the contaminant plume. From wells C-1 to MW-10 the BTEX concentrations decrease as the dissolved iron increases, which indicates that some biological activity is occurring within this range of the contaminant plume. Therefore, this trend would indicate that partial intrinsic bioremediation is occurring at this site.

The plots of the indicator parameters for alkalinity vs. 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. While the plots of the

indicator parameters for dissolved iron and sulfate vs. total BTEX for site wells upgradient, within and downgradient of the plume indicates the partial presence of intrinsic bioremediation occurring in the groundwater plume associated with this site.

A trend in four of the six indicator parameters is acceptable to indicate that intrinsic bioremediation is occurring at a site. Therefore, it appears that no intrinsic bioremediation is presently occurring at this site. However, this trend could change in the near future, since oxygen-releasing compounds (ORC) and hydrogen peroxide has just recently been added to three wells at the site. Increasing oxygen to the groundwater is expected to increase the potential for intrinsic bioremediation to occur.

If you have any questions or comments, call me at (925) 842-9136.

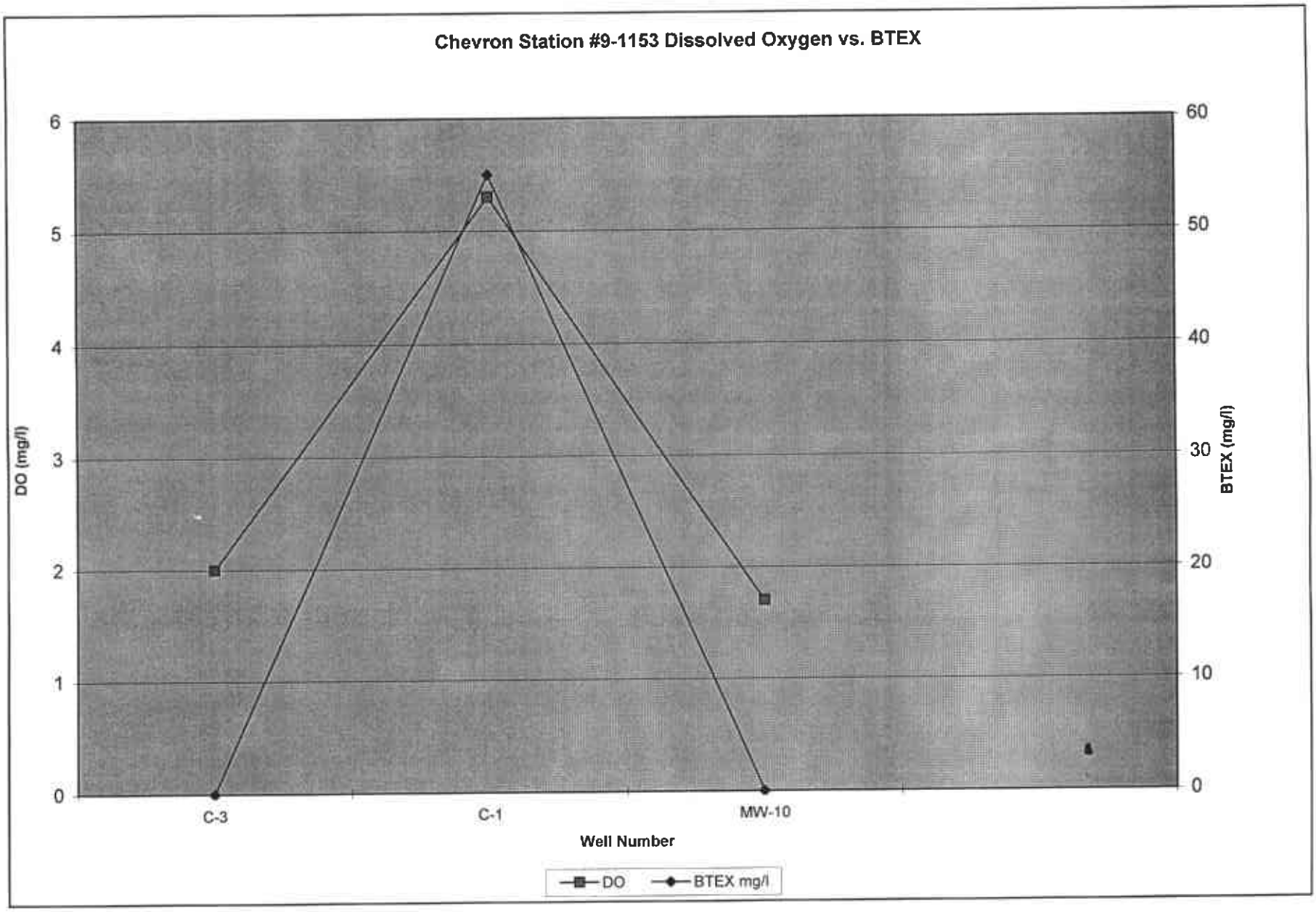
Sincerely,
CHEVRON PRODUCTS COMPANY

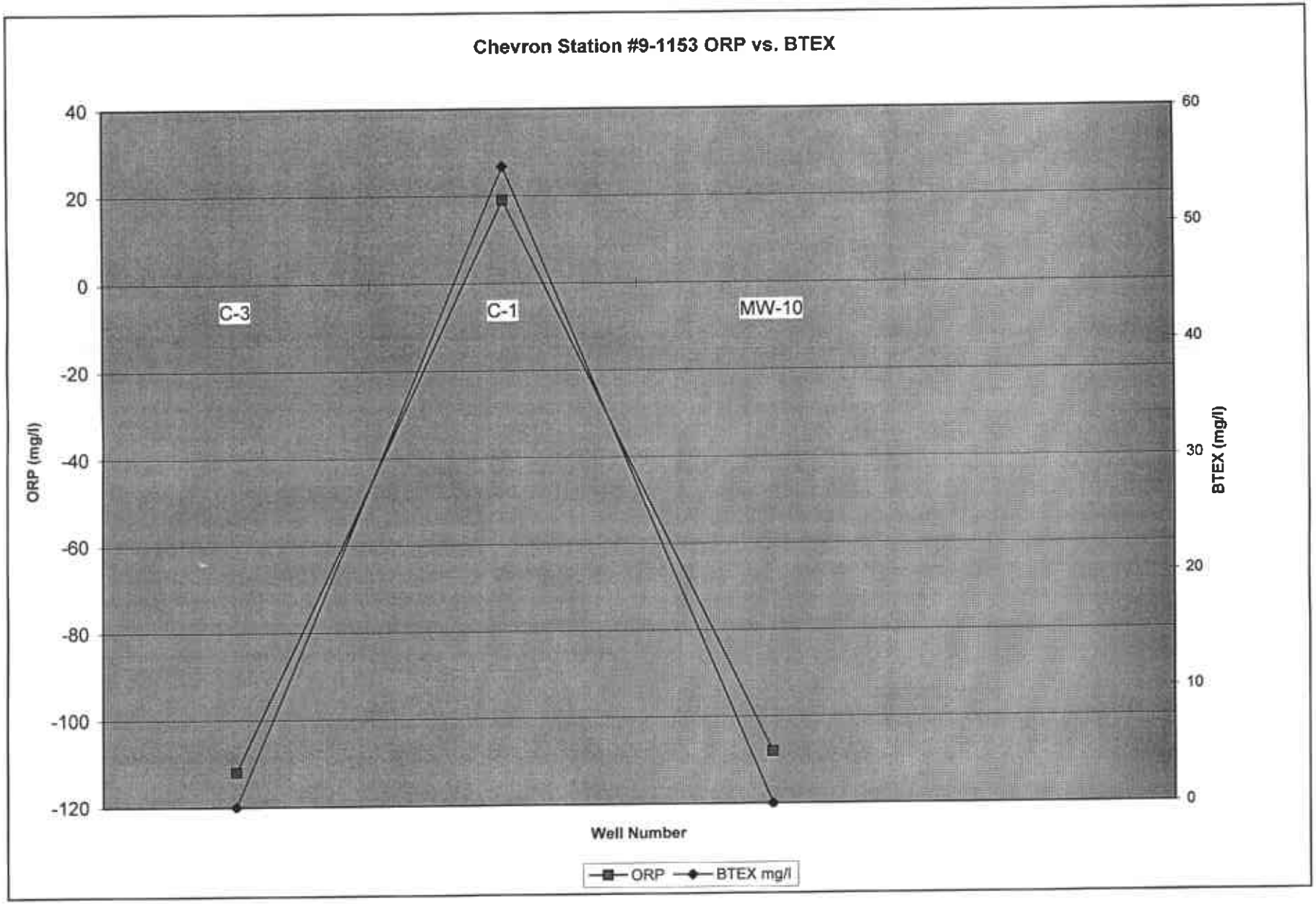
Philip R. Briggs
Site Assessment and Remediation Project Manager

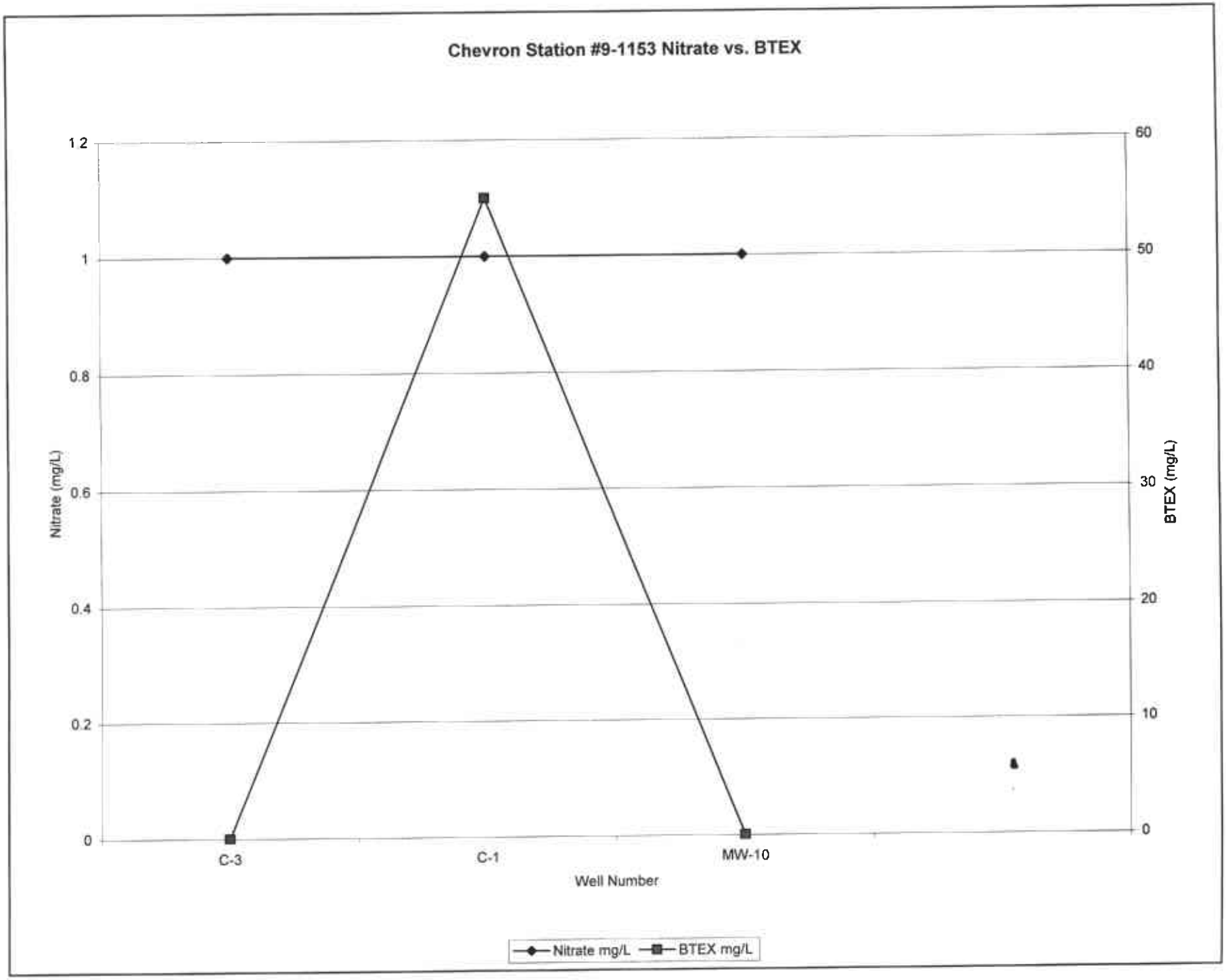
Enclosure

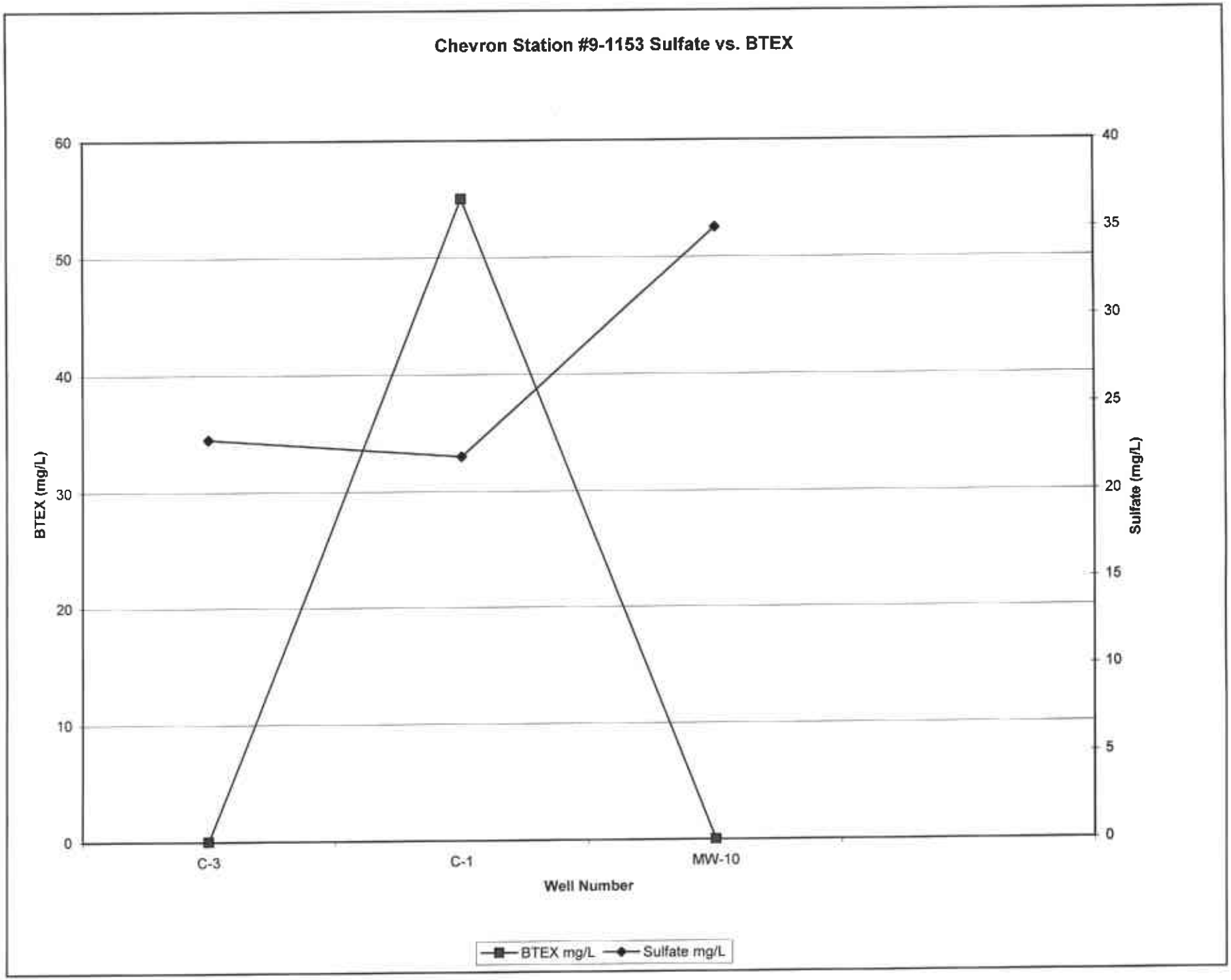
CC. Ms. Bette Owen, Chevron

Mr. & Mrs. Thompson
3135 Gibbons Drive
Alameda, CA 94501

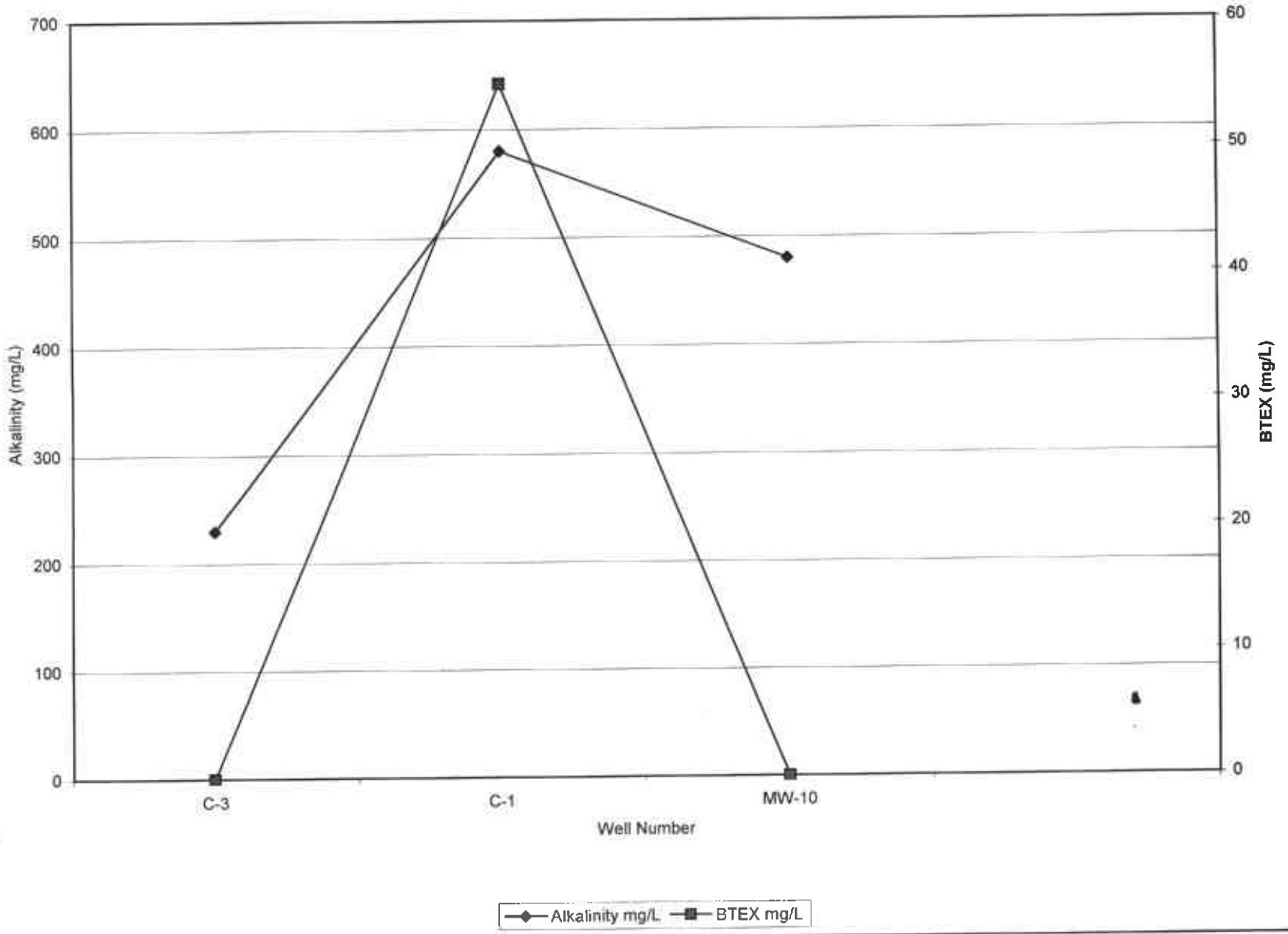

Chevron Station #9-1153 Dissolved Oxygen vs. BTEX
DO (mg/l)
BTEX (mg/l)
0
1
2
3
4
5
6
0
10
20
30
40
50
60
C-3
C-1
MW-10
Well Number
DO
BTEX mg/l

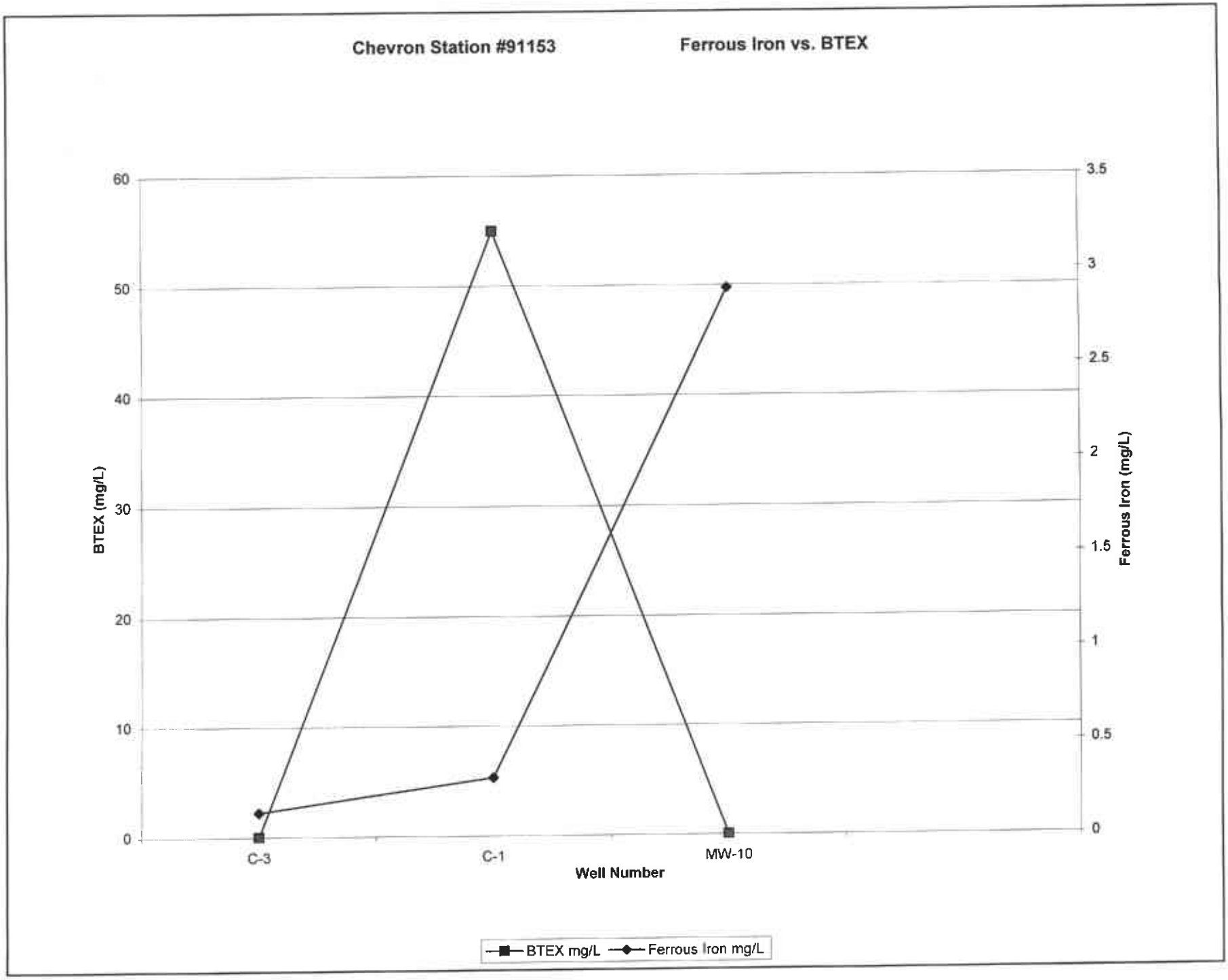

Chevron Station #9-1153 ORP vs. BTEX
40
20
0
-20
-40
-60
-80
-100
-120
ORP (mg/l)
60
50
40
30
20
10
0
BTEX (mg/l)
C-3
C-1
MW-10
Well Number
ORP
BTEX mg/l


Chevron Station #9-1153 Nitrate vs. BTEX
Nitrate (mg/L)
BTEX (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
60
50
40
30
20
10
0
C-3
C-1
MW-10
Well Number
Nitrate mg/L
BTEX mg/L


Chevron Station #9-1153 Sulfate vs. BTEX
BTEX (mg/L)
Sulfate (mg/L)
60
50
40
30
20
10
0
40
35
30
25
20
15
10
5
0
C-3
C-1
MW-10
Well Number
BTEX mg/L
Sulfate mg/L

Chevron Station #91153 **Alkalinity vs. BTEX**




Chevron Station #91153
Ferrous Iron vs. BTEX
BTEX (mg/L)
Ferrous Iron (mg/L)
60
50
40
30
20
10
0
3.5
3
2.5
2
1.5
1
0.5
0
C-3
C-1
MW-10
Well Number
BTEX mg/L
Ferrous Iron mg/L