Frontier Hard Chrome
Event 2 Long-Term Monitoring Report
(April 2004 Results)
Work Assignment Number: 230-RALR-1027

EPA Contract: 68-W7-0026

June 2004

EPA Region V

RAC

Response Action Contract

Weston Solutions, Inc. · 190 Queen Anne Avenue North · Seattle, WA 98109-4926

04-0126/Event 2 Cover.ai

FRONTIER HARD CHROME
LONG-TERM MONTORING REPORT
EVENT 2 – APRIL 2004
VANCOUVER, WASHINGTON

Prepared for

U.S. Environmental Protection Agency
Region X
1200 Sixth Avenue
Seattle, Washington 98101

Contract No. 68-W7-0026
Work Assignment No. 230-RALR-1027
Work Order No. 20064.230.100.0920
Document Control No. RFW230-2A-AQIX

June 2004

Prepared by

Weston Solutions, Inc.
190 Queen Anne Avenue North
Suite 200
Seattle, WA 98109

FRONTIER HARD CHROME
LONG-TERM MONITORING REPORT
EVENT 2– APRIL 2004
VANCOUVER, WASHINGTON

Prepared for

U.S. EPA Contract No. 68-W7-0026
U.S. Environmental Protection Agency
Region X
1200 Sixth Avenue
Seattle, Washington 98101

Document Control No. RFW230-2A-AQIX

Prepared and Approved By:	Original Signed David L. Dinkuhn, P.E. Project Engineer	Date: 15 June 2004
Prepared and Approved By:	Original Signed Larry Vanselow, P.E. Project Manager	Date: 15 June 2004
Prepared and Approved By:	Original Signed Paul Swift, Ph.D. Quality Assurance Manager	Date: 15 June 2004

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SECTION 1

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

This Long Term Monitoring Report has been prepared as directed by Task 9 "Project Performance" in the Scope of Work for Remedial Action for the Frontier Hard Chrome (FHC) Superfund Site (EPA 2003) located in Vancouver, Washington. This report describes the sampling activities performed and analytical results obtained during "Event 2" of the long-term groundwater monitoring program at the FHC site. Sampling activities for Event 2 were conducted during April 2004.

The FHC site was the subject of a remedial action conducted during the summer of 2003. The purpose of the remedial action (RA) was to treat the site's chromium-contaminated soil and groundwater to cleanup levels specified in the Record of Decision. Long term monitoring is required to track offsite plume concentrations as well as show that the remedy is maintaining its operational functionality.

All Event 2 work was performed in accordance with project work plan titled *Frontier Hard Chrome, Long Term Monitoring Plan* (Weston 2004). No significant deviations from the work plan occurred.

1.2 BACKGROUND AND PROBLEM DEFINITION

1.2.1 Site Background

The FHC site is located in southeastern Vancouver, Washington (Figure 1). The facility address is 113 "Y" Street, Vancouver, Washington. The site is located in the Section 25, Township 2 north, Range 1 east, Willamette Meridian in Clark County, Washington. The location in latitude and longitude coordinates is 45 degrees, 37 minutes, 19 seconds north by 122 degrees, 38 minutes 45 seconds east (Degrees, Minutes, Seconds [DMS]). The site was previously occupied by several metals fabricating businesses and was used for storage and as a staging area for a neighboring business. Currently, no buildings exist on the site and the site is vacant.

The FHC site proper covers approximately 0.5 acre and is bordered to the east by Grand Avenue, to the south by Cassidy Manufacturing, and to the west by "Y" Street.

Work began on the remedial design in October 2001. The remedial design was completed in February 2003. The remedial action, consisting of building demolition, treatment of source area soil and groundwater, and installation of an in-situ redox manipulation (ISRM) treatment wall (to treat hexavalent chromium), was completed in September 2003.

1.2.2 Problem Definition

The goal of the remedial action was to treat source area soil and groundwater to reduce hexavalent chromium concentrations such that groundwater downgradient of the site would attenuate to chromium concentrations less than 50 micrograms per liter (ug/L). To demonstrate this, groundwater quality is being monitored in two areas. The first area consists of locations immediately within and down gradient of the ISRM wall. Wells located within and just down gradient of the wall are being monitored to ensure the continued operational functionality of the ISRM Treatment Wall. The second area targeted for monitoring consists of the historical chromium contaminated groundwater plume located down gradient of the ISRM wall. This down gradient plume did not get treated during the remedial action and is being monitored to track the long-term expected reduction in chromium concentration as a result of completing the remedial action and elimination of the source of hexavalent chromium.

Long-term groundwater monitoring is required by the site's Record of Decision.

1.3 PLANNED MONITORING SCHEDULE

Planned sampling events are to be conducted approximately quarterly for first year. Planned sampling events are scheduled for February, April, August and December 2004. The first three sampling events in 2004 will be completed by EPA. The sampling event scheduled for August will complete monitoring for approximately one year after the remedial action was completed. In September/October 2004, monitoring of the FHC site will be turned over to the Washington State Department of Ecology.

SECTION 2

SAMPLING ACTIVITIES AND RESULTS

2.1 MONITORING WELL SAMPLING PROCEDURES

Sampling activities for Event 2 were conducted on April 5 through April 9, 2004 by EPA's Environmental Services Assistance Team (ESAT) with oversight by Weston Solutions, Inc, (Weston). The monitoring wells in the vicinity of the FHC site are shown on Figure 2. A total of 33 wells in the vicinity of the site were sampled in accordance with the *Long Term Monitoring Plan* (Weston 2004).

Well purging and sampling were performed according to EPA sampling guidelines and Weston standard operating procedures. The wells were sampled with a peristaltic pump equipped with new polyethylene tubing deployed to mid-screen depth at each well. The wells were purged prior to sampling until monitored field parameters (turbidity, conductivity, pH, dissolved oxygen, ORP, and temperature) stabilized. The field parameter readings were recorded on field sampling forms.

Groundwater samples were analyzed for total analytes list (TAL) metals. In cases where groundwater turbidity was greater than 10 nephalometric turbidity units, samples were passed through a 0.45-micron filter in the field and submitted for dissolved TAL metals. Field analysis for hexavalent chromium (using Hach test kits) was also performed on all samples. Selected samples were analyzed for total sulfur and sulfate to provide an assessment of the distribution of byproducts from the reducing agent used during ISRM wall installation.

Groundwater chemical data and field parameters are provided in Tables 1 and 2.

2.2 ANALYTICAL RESULTS

2.2.1 Chromium

Chromium was detected in 28 of the 33 wells sampled. Chromium concentrations in the "A" zone ranged from a maximum concentration of 241 ug/L in well B87-8 (located on the immediate south side of East 1st Street) to a low of 1.8 ug/L in well RA-MW-15A (located immediately downgradient of the ISRM Treatment Wall). Monitoring well RA-MW-12A, which typically has had the highest concentrations of chromium, dropped in concentration since the last round of sampling. Dissolved concentrations of chromium in well RA-MW-12A has dropped from the 150 to 200 ug/L range in previous samples to 56 ug/L in this latest round of sampling. "A" zone chromium concentrations and plume contours are shown in Figure 3.

Chromium concentrations in "B" zone groundwater were similar to those in "A" zone groundwater. Chromium concentrations in "B" zone groundwater ranged from 10.7 ug/L

downgradient of the site (well W85-7B) to a low of 0.76 ug/L onsite (well RA-MW-11B). "B" zone chromium concentrations and plume contours are shown in Figure 4.

Hexavalent chromium was generally not detected. Hexavalent chromium was detected in only 1 of 31 wells sampled, given the typical detection limit of 40 ug/L. The hexavalent chromium concentration in well B87-8 was 250 ug/L.

Similar to previous groundwater sampling events, the data appear to indicate that most all chromium present in groundwater is hexavalent chromium. The hexavalent chromium value was very consistent with total chromium value for the one well where hexavalent chromium was detected (B87-8). Since the hexavalent chromium detection limit was approximately 40 ug/L and most total chromium concentrations were below 40 ug/L, no correlation between total and hexavalent chromium concentrations could be drawn at the lower concentrations.

Figures showing the chromium concentration trends in groundwater over time are included in Appendix A. Data from wells sampled during Operational and Functional monitoring in November and December 2003 are included in these figures where available to assist in determining trends.

Figures 3, 4 and those in Appendix A used dissolved chromium values where turbidity exceeded 10 NTU.

2.2.2 Water Quality

Dissolved oxygen (DO) concentrations ranged from a low of 0.07 mg/L to a high of 6.13 mg/L. DO was generally less than 0.25 mg/L in samples collected within the ISRM Treatment Wall. This low DO indicates the wall is still reductive which is necessary for treatment of hexavalent chromium. Samples of groundwater collected downgradient of the ISRM Treatment Wall had the highest concentrations of DO which tended to increase with distance from the wall.

pH ranged from 5.9 to 8.7. The highest pH was located within the treatment zone; this trend is consistent with the high pH of the reagent used to create the ISRM Treatment Wall.

The highest sulfur and sulfate concentrations were located within the treatment wall. Sulfur and sulfate concentrations in groundwater were less than 300 mg/L and 760 mg/L, respectively. Concentrations of sulfur and sulfate were slightly lower immediately downgradient of the wall.

2.3 GROUNDWATER FLOW DIRECTION AND ELEVATION

Groundwater surface elevations were determined using the known elevation of the top of each well casing and the depth to groundwater measured in each long term monitoring well. The depth to groundwater measurements were collected during a single afternoon on the first day of the sampling event by the Weston field leader. The elevation of the Columbia River at the United State Geological Survey (USGS) gauging station 14144700 located at the nearby I-5 bridge was also obtained for use in determining flow direction.
The river elevation information was obtained from http://waterdata.usgs.gov/wa/nwis/.

Groundwater surface elevations for each well measured are shown in Table 3.

The groundwater flow direction, as determined using groundwater surface elevations measured just prior to sampling, is heading to the southwest from the FHC site. Groundwater elevation and gradient information is graphically shown in Figure 5.

The stage height of the Columbia River was 5.55 feet (AMSL) on April 5, 2004 at 12:00 P.M. A horizontal gradient was calculated for April 5, 2004 with a result of 0.000062 ft/ft with a flow direction from the FHC site towards the Columbia river. The groundwater table during this period was nearly flat with a drop in elevation of 0.16 feet over a distance of 2,600 feet.

2.4 INVESTIGATION-DERIVED WASTES

Investigation-derived waste (IDW) generated during the sampling event consisted of well purge water, used PPE, and disposable sampling supplies. During sampling, purge water was stored on site in 5-gallon buckets. At the completion of sampling, the water was transported to the City of Vancouver's operations center and disposed of in accordance with the disposal permit issued to Weston by the city. Personnel protective equipment and other solid wastes were disposed of in a dumpster.

2.5 DISCUSSION AND CONCLUSIONS

Chromium concentrations in onsite "A" zone groundwater were less than 150 ug/L with most concentrations less than 10 ug/L.

Chromium concentrations in downgradient "A" zone groundwater were less than 15 ug/L. One exception was well B87-8 located across East 1st Street; this well had a chromium concentration of 241 ug/L up from 18 ug/L in February 2004. This well has historically had high chromium concentrations.

Overall, groundwater chromium concentrations have decreased since February 2004 in 18 out of 33 wells.

The deeper "B" zone groundwater downgradient of the site contained chromium in concentrations similar to that in the "A" zone. Chromium concentrations in "B" zone groundwater downgradient of the site were also less than 15 ug/L.

Dissolved oxygen data collected from within the ISRM Treatment Wall indicates that an area of reducing conditions still exists implying the hexavalent chromium treatment zone is still active.

Sulfur/sulfate concentrations within the ISRM Treatment Wall have decreased while sulfur/sulfate concentrations downgradient of the ISRM Treatment Wall have increased. Sulfur/sulfate concentrations in wells B87-8 and B85-4 located across East 1st Street (downgradient of the site) have increased by a factor of approximately six since February 2004. This increase indicates that the treatment reagents are migrating in a southerly direction with the

groundwater. Sulfur and sulfate concentrations were less than 300 mg/L and 760 mg/L in all locations sampled.

SECTION 3

ANALYTICAL METHODS AND DATA VALIDATION

3.1 ANALYTICAL METHODS REQUIREMENTS AND DATA VALIDATION

Analyses of samples collected during the field event were performed by an EPA CLP laboratory. The Event 2 samples were analyzed by Sentinel, Inc., in Huntsville, Alabama.

Data was validated by EPAs CADRE program and reviewed by Weston. A data validation memorandum prepared by Weston is provided in Appendix B.

The laboratory data quality assurance review of 40 water samples was completed. Samples were collected 04/05/2004 – 04/22/2004 from the Frontier Hard Chrome site Long-Term Monitoring project. Samples were analyzed for Target Analyte List (TAL) metals and hexavalent chromium (in the field).

A data review was performed on laboratory quality control results summary sheets to ensure they met data quality objectives for the project. All laboratory quality assurance results as applicable (e.g., holding times, blank sample analysis, matrix spike/duplicate analysis, laboratory control sample analysis) supplied to Weston for the analyses met acceptance criteria specified in the work plan (Weston 2004), with the following exceptions.

Aluminum, arsenic, beryllium, calcium, chromium, copper, iron, selenium, vanadium, and zinc were detected in one or more preparation blanks. Lead recovery from one interference check sample (ICS) exceeded the upper control limit. Aluminum, potassium, and sodium were detected in one rinse blank sample.

All affected data were qualified appropriately. No other QA/QC exceptions were noted in the data review. These exceedances did not adversely affect the project DQOs.

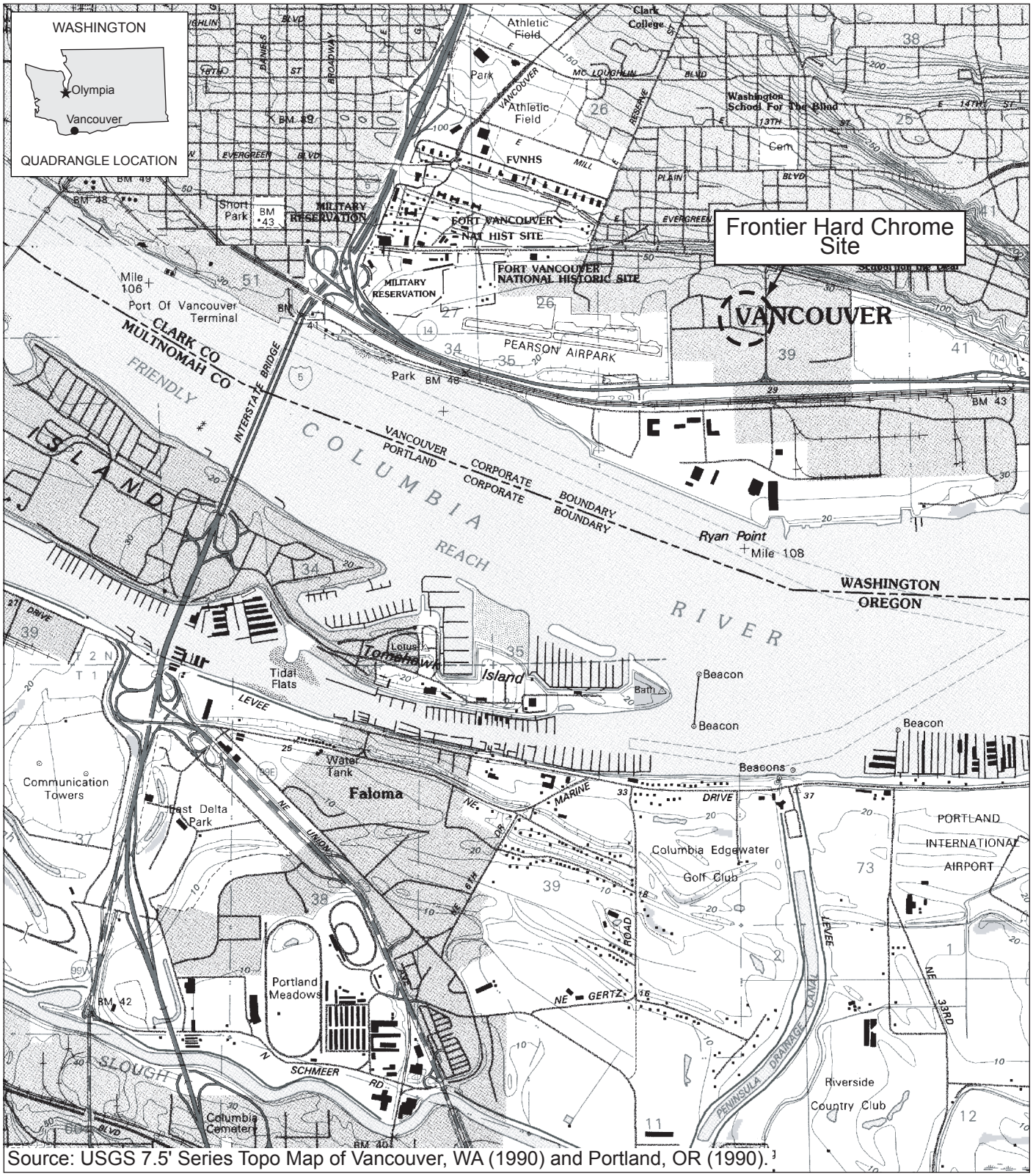
SECTION 4

REFERENCES

EPA (United States Environmental Protection Agency), 2003. Statement of Work for Long Term Response Action. Frontier Hard Chrome, Vancouver, WA. December 30th, 2003.

Weston (Weston Solutions, Inc.), 2004. Frontier Hard Chrome Long Term Monitoring Plan. Prepared for the U.S. Environmental Protection Agency, Region 10, Seattle, Washington. February.

FIGURES



Source: USGS 7.5' Series Topo Map of Vancouver, WA (1990) and Portland, OR (1990).

0 1000 2000

Scale in Feet

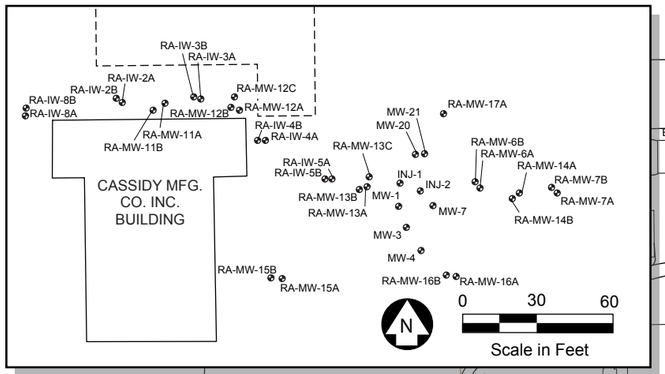
Frontier Hard Chrome
Vancouver, Washington
Vicinity Map

Figure

1

WESTON SOLUTIONS

04-0126/Event 2 Fig1.ai



LEGEND

W85-5B — Monitoring Well Location and ID

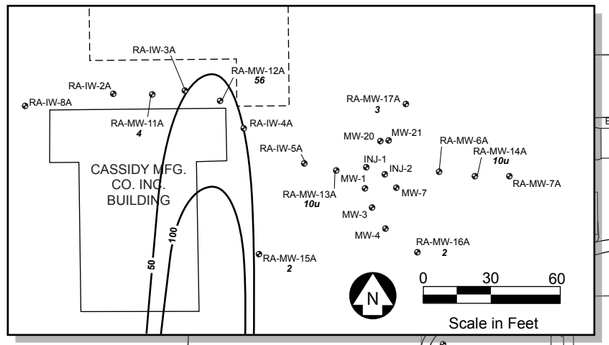
Fence

Frontier Hard Chrome
Vancouver, Washington
Monitoring Well Locations

Figure
2

WESTON SOLUTIONS

04-0126/Event 2 Fig2.ai



LEGEND

- W85-7A — Monitoring Well Location and ID
- 1.7 — Chromium Concentration (µg/L)
- —10— Concentration Contour (µg/L)

0 150 300

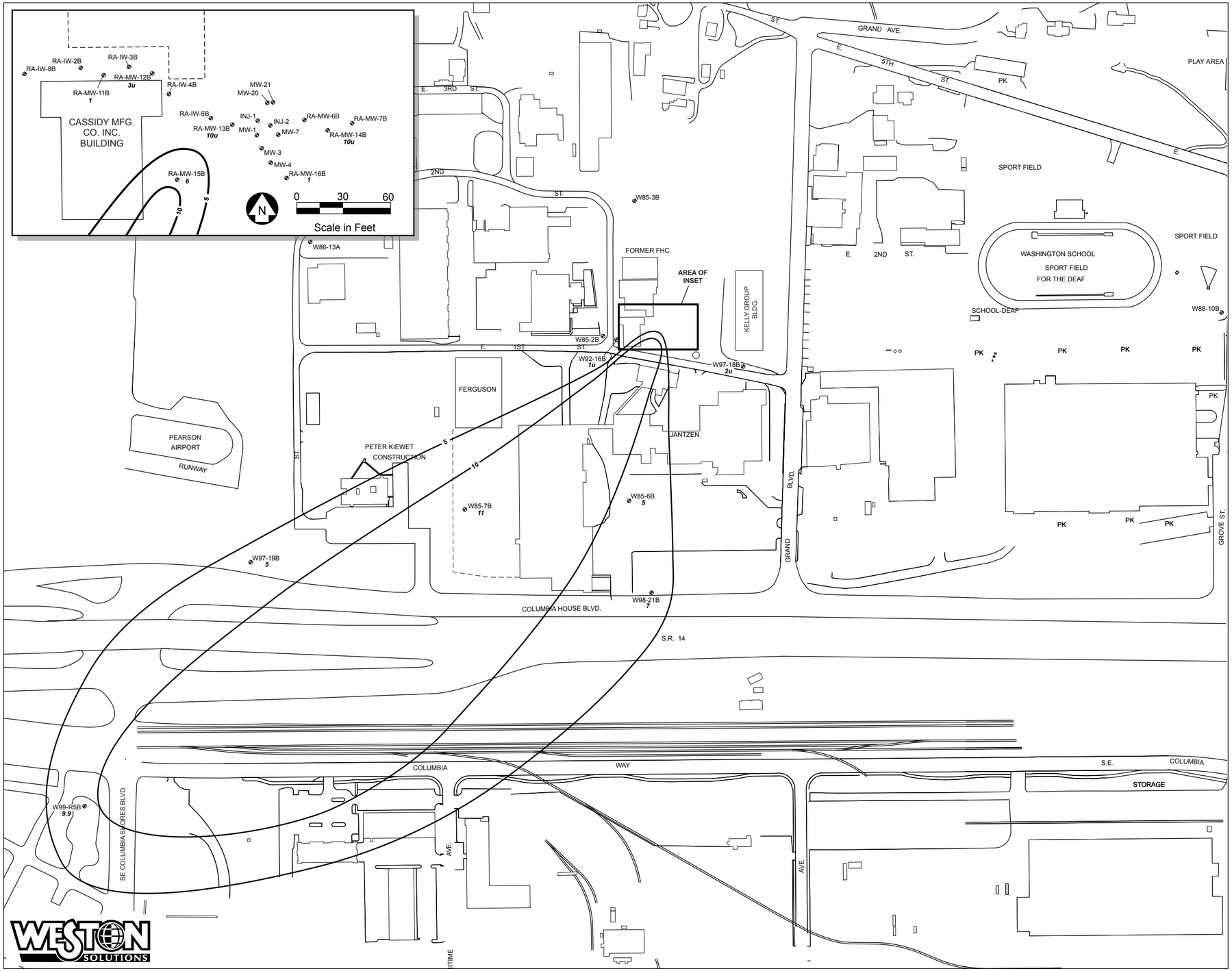
Scale in Feet

Frontier Hard Chrome
Vancouver, Washington
Chromium Concentrations in Zone A Groundwater
April 2004

Figure
3

WESTON SOLUTIONS

04-0126/Event 2 Fig3.ai



LEGEND

- W85-7B — Monitoring Well Location and ID
- *18* — Chromium Concentration (µg/L)
- —10— Concentration Contour (µg/L)

N

0 150 300

Scale in Feet

Frontier Hard Chrome Vancouver, Washington Chromium Concentrations in Zone B Groundwater April 2004

Figure **4**

WESTON SOLUTIONS

04-0126/Event 2 Fig4.ai

LEGEND

- W85-7A — Monitoring Well Location and ID
- 6.32 — Groundwater Elevation (ft. AMSL)
- 6.40 — Groundwater Elevation Contour
- Fence

N

0 150 300

Scale in Feet

Frontier Hard Chrome
Vancouver, Washington
Groundwater Elevations
April 5, 2004

Figure
5

WESTON SOLUTIONS

04-0126/Event 2 Fig5.ai

TABLES

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID:	B85-3	B85-4	B87-8	MW-11A	MW-11B	MW-12A
	Sample ID:	GW2-B85-3-0000	GW2-B85-4-0000	GW2-B87-8-0000	GW2-RA-MW-11A-0000	GW2-RA-MW-11B-0000	GW2-RA-MW-12A-0000
	Sample Date:	04/07/2004	04/07/2004	04/07/2004	04/06/2004	04/07/2004	04/06/2004
Inorganics (Total) (ug/l)							
Aluminum		216	120 U	1060	200 U	200 U	298
Antimony		60.0 U	60.0 U	60.0 U	60.0 U	60.0 U	60.0 U
Arsenic		10.0 U	10.0 U	10.0 U	23.5	4.3 J	9.8 J
Barium		116 J	87.0 J	50.7 J	163 J	93.6 J	697
Beryllium		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Cadmium		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Calcium		98100	163000	62600	260000	299000	1010000
Chromium		1.4 U	8.1 J	241	9.7 J	5.7 J	139
Cobalt		5.7 J	3.4 J	4.2 J	14.4 J	8.9 J	3.1 J
Copper		25.0 U	17.7 J	4.1 U	25.0 U	25.0 U	2.5 U
Hexavalent Chromium		40 UF	40 UF	250 F	800 UF	40 UF	40 UF
Iron		12300	38.0 U	923	260	798	434
Lead		2.7 J	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Magnesium		32800	42400	20300	36100	33000	838 J
Manganese		16300	3500	4190	7290	2830	20.4
Nickel		40.0 U	30.0 J	7.0 J	38.3 J	21.5 J	67.9
Potassium		9860	6200	2160 J	58900	71700	230000
Selenium		35.0 U	35.0 U	35.0 U	35.0 U	35.0 U	35.0 U
Silver		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Sodium		11000	35800	16000	115000	67800	128000
Thallium		25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
Vanadium		50.0 U	2.7 J	3.9 J	6.6 J	1.5 J	2.3 J
Zinc		8.5 U	8.6 U	4.3 U	9.9 U	32.5 J	269
Inorganics (Dissolved) (ug/l)							
Aluminum					91.5 U	73.4 U	56.5 U
Antimony					60.0 U	60.0 U	13.8 J
Arsenic					28.1	19.3	90.7

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID: / Sample ID: / Sample Date:	B85-3 GW2-B85-3-0000 04/07/2004	B85-4 GW2-B85-4-0000 04/07/2004	B87-8 GW2-B87-8-0000 04/07/2004	MW-11A GW2-RA-MW-11A-0000 04/06/2004	MW-11B GW2-RA-MW-11B-0000 04/07/2004	MW-12A GW2-RA-MW-12A-0000 04/06/2004
Barium					171 J	100 J	727
Beryllium					5.0 U	5.0 U	5.0 U
Cadmium					5.0 U	5.0 U	5.0 U
Calcium					260000	303000	1030000
Chromium					4.3 J	0.76 J	55.8
Chromium VI					800 UF	40 UF	
Cobalt					6.6 J	9.1 J	4.3 J
Copper					2.3 U	7.1 U	6.7 U
Iron					51.0 J	68.9 J	131
Lead					10.0 U	10.0 U	10.0 U
Magnesium					37600	35300	793 J
Manganese					7710	3010	13.1 J
Nickel					30.7 J	22.8 J	96.0
Potassium					60100 J	74500 J	228000 J
Selenium					35.0 U	35.0 U	35.0 U
Silver					10.0 U	10.0 U	10.0 U
Sodium					116000	70100	127000
Thallium					25.0 U	25.0 U	8.7 J
Vanadium					6.9 J	1.9 U	1.7 U
Zinc					60.0 U	13.8 J	196
Conventional Parameters							
Sulfate (SO4) (mg/l)			410	137	751		
Sulfur (mg/l)			150	52	296		

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID: / Sample ID: / Sample Date:	MW-12B GW2-RA-MW-12B-0000 04/06/2004	MW-12C GW2-RA-MW-12C-0000 04/06/2004	MW-13A GW2-RA-MW-13A-0000 04/06/2004	MW-13B GW2-RA-MW-13B-0000 04/06/2004	MW-13C GW2-RA-MW-13C-0000 04/06/2004	MW-14A GW2-RA-MW-14A-0000 04/05/2004
Inorganics (Total) (ug/l)							
Aluminum		128 J	135 J	112 J	105 J	145 J	98.6 J
Antimony		60.0 U	60.0 U	60.0 U	60.0 U	60.0 U	60.0 U
Arsenic		5.1 J	10.0 U	3.1 U	4.0 U	10.0 U	2.4 U
Barium		105 J	77.6 J	59.5 J	45.7 J	77.5 J	146 J
Beryllium		5.0 U	5.0 U	0.09 U	0.10 U	5.0 U	0.16 U
Cadmium		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Calcium		46500	36900	142000	34300	78600	222000
Chromium		3.3 U	2.7 U	10.0 U	10.0 U	1.4 J	10.0 U
Cobalt		8.1 J	19.1 J	18.6 J	27.1 J	32.6 J	11.3 J
Copper		25.0 U	25.0 U	1.8 U	25.0 U	25.0 U	1.9 U
Hexavalent Chromium		40 UF	40 UF	40 UF	40 UF	40 UF	40 UF
Iron		72.8 J	638	8950	1320	3340	15200
Lead		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Magnesium		15700	10600	39900	9420	22000	33100
Manganese		459	688	3970	1030	1920	11800
Nickel		6.4 J	14.8 J	44.2	17.4 J	28.6 J	26.3 J
Potassium		170000	170000	222000 J	189000 J	185000 J	86600 J
Selenium		35.0 U	35.0 U	35.0 U	5.4 U	35.0 U	10.5 J
Silver		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	1.4 J
Sodium		35600	68000	147000	86200	147000	59700
Thallium		25.0 U	25.0 U	10.5 J	25.0 U	25.0 U	7.7 J
Vanadium		50.0 U	50.0 U	50.0 U	50.0 U	0.53 U	50.0 U
Zinc		6.1 U	60.0 U	60.0 U	1.0 U	5.5 U	60.0 U
Inorganics (Dissolved) (ug/l)							
Aluminum							
Antimony							
Arsenic							

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID:	MW-12B	MW-12C	MW-13A	MW-13B	MW-13C	MW-14A
	Sample ID:	GW2-RA-MW-12B-0000	GW2-RA-MW-12C-0000	GW2-RA-MW-13A-0000	GW2-RA-MW-13B-0000	GW2-RA-MW-13C-0000	GW2-RA-MW-14A-0000
	Sample Date:	04/06/2004	04/06/2004	04/06/2004	04/06/2004	04/06/2004	04/05/2004
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Chromium VI							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Nickel							
Potassium							
Selenium							
Silver							
Sodium							
Thallium							
Vanadium							
Zinc							
Conventional Parameters							
Sulfate (SO4) (mg/l)				712			635
Sulfur (mg/l)				246			228

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID:	MW-14A	MW-14B	MW-15A	MW-15B	MW-16A	MW-16B
	Sample ID:	GW2-RA-MW-14A-1000	GW2-RA-MW-14B-0000	GW2-RA-MW-15A-0000	GW2-RA-MW-15B-0000	GW2-RA-MW-16A-0000	GW2-RA-MW-16B-0000
	Sample Date:	04/05/2004	04/05/2004	04/05/2004	04/05/2004	04/05/2004	04/05/2004
Inorganics (Total) (ug/l)							
Aluminum		100 J	117 J	105 J	105 J	135 J	115 J
Antimony		60.0 U	60.0 U	60.0 U	60.0 U	60.0 U	60.0 U
Arsenic		1.8 U	2.1 U	10.0 U	1.4 U	3.0 U	1.6 U
Barium		147 J	79.4 J	71.1 J	64.2 J	97.4 J	59.5 J
Beryllium		0.12 U	5.0 U	5.0 U	0.13 U	0.10 U	0.10 U
Cadmium		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Calcium		224000	103000	132000	102000	148000	80100
Chromium		10.0 U	10.0 U	1.8 J	5.5 J	2.0 J	2.1 J
Cobalt		10.8 J	10.4 J	11.4 J	35.3 J	12.8 J	54.0
Copper		25.0 U	25.0 U	1.8 U	32.4	25.0 U	25.0 U
Hexavalent Chromium		40 UF	40 UF	40 UF	40 UF	40 UF	40 UF
Iron		15300	6430	2860	320	10300	1220
Lead		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Magnesium		33400	21100	44500	31300	26100	24000
Manganese		11900	4370	5410	1750	8490	1860
Nickel		25.6 J	10.5 J	63.3	14.5 J	56.2	20.3 J
Potassium		87100 J	106000 J	5790 J	7910 J	103000 J	96300 J
Selenium		8.4 J	7.8 U	35.0 U	35.0 U	8.3 U	35.0 U
Silver		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Sodium		60200	50100	44500	56400	79800	102000
Thallium		7.4 J	25.0 U	6.0 J	6.1 J	7.7 J	25.0 U
Vanadium		50.0 U	0.44 U	50.0 U	2.4 U	50.0 U	50.0 U
Zinc		60.0 U	0.54 U	1.7 U	3.9 U	60.0 U	0.99 U
Inorganics (Dissolved) (ug/l)							
Aluminum					112 U		129 U
Antimony					60.0 U		60.0 U
Arsenic					10.0 U		10.0 U

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID: / Sample ID: / Sample Date:	MW-14A GW2-RA-MW-14A-1000 04/05/2004	MW-14B GW2-RA-MW-14B-0000 04/05/2004	MW-15A GW2-RA-MW-15A-0000 04/05/2004	MW-15B GW2-RA-MW-15B-0000 04/05/2004	MW-16A GW2-RA-MW-16A-0000 04/05/2004	MW-16B GW2-RA-MW-16B-0000 04/05/2004
Barium					65.1 J		58.9 J
Beryllium					5.0 U		5.0 U
Cadmium					5.0 U		5.0 U
Calcium					101000		78400
Chromium					10.0 U		1.0 J
Chromium VI					40 UF		40 UF
Cobalt					36.1 J		53.3
Copper					34.2		5.3 U
Iron					246		1190
Lead					10.0 U		10.0 U
Magnesium					30900		23600
Manganese					1680		1820
Nickel					13.0 J		20.7 J
Potassium					8070 J		94000 J
Selenium					35.0 U		35.0 U
Silver					10.0 U		10.0 U
Sodium					57100		99600
Thallium					25.0 U		25.0 U
Vanadium					2.3 U		50.0 U
Zinc					3.9 U		13.1 J
Conventional Parameters							
Sulfate (SO4) (mg/l)		633					
Sulfur (mg/l)		229					

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID:	MW-17A	W85-6A	W85-6B	W85-7A	W85-7B	W92-16A
	Sample ID:	GW2-RA-MW-17A-0000	GW2-W85-6A-0000	GW2-W85-6B-0000	GW2-W85-7A-0000	GW2-W85-7B-0000	GW2-W92-16A-0000
	Sample Date:	04/06/2004	04/08/2004	04/08/2004	04/08/2004	04/08/2004	04/07/2004
Inorganics (Total) (ug/l)							
Aluminum		113 J	133 U	135 U	122 U	184 U	159 J
Antimony		60.0 U	60.0 U	60.0 U	60.0 U	60.0 U	60.0 U
Arsenic		1.4 U	10.0 U	2.9 U	10.0 U	10.0 U	10.0 U
Barium		111 J	16.9 J	17.8 J	7.3 J	20.5 J	19.7 J
Beryllium		5.0 U	5.0 U	5.0 U	0.11 U	0.24 U	5.0 U
Cadmium		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Calcium		247000	40500	47900	16600	38900	26700
Chromium		2.6 J	14.3	4.7 J	3.9 U	10.7	0.95 U
Cobalt		20.0 J	50.0 U	12.0 J	50.0 U	4.3 J	50.0 U
Copper		3.9 U	2.4 J	12.8 J	1.7 J	4.3 J	25.0 U
Hexavalent Chromium		40 UF	40 UF	40 UF	40 UF	40 UF	40 UF
Iron		5500	18.4 U	25.2 U	100 U	186	216
Lead		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Magnesium		37700	13700	14800	5370	12000	10700
Manganese		12800	15.0 U	15.0 U	1.4 J	7.1 J	3190
Nickel		90.4	40.0 U	5.5 J	40.0 U	3.2 J	40.0 U
Potassium		69200 J	2720 J	4740 J	1750 J	3800 J	2150 J
Selenium		10.9 U	35.0 U	35.0 U	35.0 U	35.0 U	35.0 U
Silver		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Sodium		85600	8560	13300	4570 J	8500	9880
Thallium		25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
Vanadium		50.0 U	4.5 J	6.8 J	3.3 J	7.1 J	1.4 J
Zinc		60.0 U	1.2 U	0.91 U	4.4 U	70.9	3.0 U
Inorganics (Dissolved) (ug/l)							
Aluminum							
Antimony							
Arsenic							

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID:	MW-17A	W85-6A	W85-6B	W85-7A	W85-7B	W92-16A
	Sample ID:	GW2-RA-MW-17A-0000	GW2-W85-6A-0000	GW2-W85-6B-0000	GW2-W85-7A-0000	GW2-W85-7B-0000	GW2-W92-16A-0000
	Sample Date:	04/06/2004	04/08/2004	04/08/2004	04/08/2004	04/08/2004	04/07/2004
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Chromium VI							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Nickel							
Potassium							
Selenium							
Silver							
Sodium							
Thallium							
Vanadium							
Zinc							
Conventional Parameters							
Sulfate (SO4) (mg/l)			36.0		8.63		
Sulfur (mg/l)			15		4		

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID:	W92-16B	W92-16B	W97-18A	W97-18B	W97-19A	W97-19B
	Sample ID:	GW2-W92-16B-0000	GW2-W92-16B-1000	GW2-W97-18A-0000	GW2-W97-18B-0000	GW2-W97-19A-0000	GW2-W97-19B-0000
	Sample Date:	04/07/2004	04/07/2004	04/07/2004	04/07/2004	04/08/2004	04/08/2004
Inorganics (Total) (ug/l)							
Aluminum		232	207	231 U	151 U	455 U	256 U
Antimony		60.0 U	60.0 U	60.0 U	60.0 U	60.0 U	60.0 U
Arsenic		10.0 U	10.0 U	10.0 U	1.9 J	10.0 U	10.0 U
Barium		170 J	168 J	14.0 J	13.4 J	13.9 J	15.1 J
Beryllium		5.0 U	5.0 U	5.0 U	5.0 U	0.10 U	5.0 U
Cadmium		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Calcium		123000	122000	10500	28000	31400	31500
Chromium		1.3 U	1.0 U	10.0 U	1.5 U	7.9 J	5.1 J
Cobalt		30.8 J	31.0 J	50.0 U	50.0 U	50.0 U	50.0 U
Copper		25.0 U	25.0 U	25.0 U	25.0 U	2.2 J	3.5 J
Hexavalent Chromium		40 UF	40 UF	40 UF	40 UF	40 UF	40 UF
Iron		638	571	80.4 U	73.3 U	364	709
Lead		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Magnesium		25900	25900	2580 J	8600	10000	10000
Manganese		2800	2770	1.6 J	14.0 J	12.0 J	8.7 J
Nickel		9.8 J	8.7 J	40.0 U	40.0 U	40.0 U	40.0 U
Potassium		114000	114000	1910 J	3650 J	3460 J	3870 J
Selenium		35.0 U	35.0 U	35.0 U	35.0 U	35.0 U	7.5 U
Silver		10.0 U	10.0 U	10.0 U	10.0 U	1.3 J	10.0 U
Sodium		54900	54800	5110	7710	7140	8330
Thallium		25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
Vanadium		1.3 J	1.4 J	2.5 J	5.9 J	7.4 J	6.0 J
Zinc		4.3 U	3.1 U	2.4 U	3.3 U	5.2 U	106
Inorganics (Dissolved) (ug/l)							
Aluminum							
Antimony							
Arsenic							

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID:	W92-16B	W92-16B	W97-18A	W97-18B	W97-19A	W97-19B
	Sample ID:	GW2-W92-16B-0000	GW2-W92-16B-1000	GW2-W97-18A-0000	GW2-W97-18B-0000	GW2-W97-19A-0000	GW2-W97-19B-0000
	Sample Date:	04/07/2004	04/07/2004	04/07/2004	04/07/2004	04/08/2004	04/08/2004
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Chromium VI							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Nickel							
Potassium							
Selenium							
Silver							
Sodium							
Thallium							
Vanadium							
Zinc							
Conventional Parameters							
Sulfate (SO4) (mg/l)							
Sulfur (mg/l)							

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID:	W98-20A	W98-21A	W98-21B	W99-R5A	W99-R5B
	Sample ID:	GW2-W98-20A-0000	GW2-W98-21A-0000	GW2-W98-21B-0000	GW2-W99-R5A-0000	GW2-W99-R5B-0000
	Sample Date:	04/09/2004	04/08/2004	04/08/2004	04/09/2004	04/09/2004
Inorganics (Total) (ug/l)						
Aluminum		122 U	132 U	133 U	112 U	126 U
Antimony		60.0 U	60.0 U	60.0 U	60.0 U	60.0 U
Arsenic		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Barium		8.2 J	12.6 J	12.5 J	15.3 J	11.8 J
Beryllium		0.12 U	0.16 U	5.0 U	5.0 U	0.15 U
Cadmium		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Calcium		17600	27700	31900	28700	31900
Chromium		4.8 J	7.1 J	6.6 J	4.1 J	9.9 J
Cobalt		50.0 U	50.0 U	50.0 U	50.0 U	50.0 U
Copper		25.0 U	25.0 U	2.1 J	25.0 U	1.7 J
Hexavalent Chromium		40 UF	40 UF	40 UF	40 UF	40 UF
Iron		100 U	100 U	100 U	100 U	28.2 U
Lead		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Magnesium		5740	8750	10200	9150	10100
Manganese		15.0 U	15.0 U	0.26 J	15.0 U	0.32 J
Nickel		40.0 U	40.0 U	40.0 U	40.0 U	40.0 U
Potassium		2040 J	2910 J	3360 J	3400 J	3610 J
Selenium		35.0 U	35.0 U	35.0 U	5.4 U	35.0 U
Silver		10.0 U	10.0 U	1.7 J	10.0 U	10.0 U
Sodium		4720 J	7870	7880	8640	7950
Thallium		25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
Vanadium		3.7 J	3.5 J	6.1 J	4.9 J	7.2 J
Zinc		1.4 U	3.0 U	1.1 U	1.2 U	1.5 U
Inorganics (Dissolved) (ug/l)						
Aluminum						
Antimony						
Arsenic						

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 1 - Frontier Hardchrome Long Term Monitoring, Event 2 Comprehensive Groundwater Data Listing, April 2004

Constituent	Station ID:	W98-20A	W98-21A	W98-21B	W99-R5A	W99-R5B
	Sample ID:	GW2-W98-20A-0000	GW2-W98-21A-0000	GW2-W98-21B-0000	GW2-W99-R5A-0000	GW2-W99-R5B-0000
	Sample Date:	04/09/2004	04/08/2004	04/08/2004	04/09/2004	04/09/2004
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Chromium VI						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Nickel						
Potassium						
Selenium						
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						
Conventional Parameters						
Sulfate (SO4) (mg/l)					11.8	
Sulfur (mg/l)					6	

A blank cell indicates analysis was not performed. U - Analyte not detected. J - Value estimated. R - Data rejected. For additional descriptions see EPA CLP RAS Validation SOP

Table 2—Frontier Hard Chrome—Event 2 Monitoring Field Parameters

Well Number	Temp C	Spec. Cond. mS/cm	DO mg/L	pH	ORP mV	Sulfur[1] (mg/L)	Sulfate[1] (mg/L)	Cr^{+6} (mg/L)
RA-MW-12A	15.9	5.4	0.09	8.73	-466			<0.04
RA-MW-12C	16.5	1.34	0.14	7.92	-179			<0.04
RA-MW-11B	16.3	2.08	0.15	7.9	-393			<0.04
RA-MW-12B	16.6	1.19	0.07	7.83	-321			<0.04
W92-16B	14.7	1.37	0.53	7.58	-61			<0.04
RA-MW-13B	14.7	1.38	0.16	7.56	-123			<0.04
RA-MW-11A	16.5	1.89	0.10	7.53	-391	296	751	<0.8
RA-MW-13C	15	1.82	0.15	7.35	-126			<0.04
RA-MW-13A	14.6	2.42	0.17	7.15	-102	246	712	<0.04
RA-MW-14B	14.9	1.21	0.10	7.14	-95			<0.04
RA-MW-16B	14.6	1.19	0.15	7.12	-70			<0.04
RA-MW-15B	14.4	0.86	0.10	6.83	28			<0.04
RA-MW-14A	14.3	1.71	0.22	6.81	-41	228	635	<0.04
B85-3	14.8	0.90	0.16	6.68	-107			<0.04
RA-MW-16A	14.9	1.46	0.27	6.61	-45			<0.04
W85-7B	13.0	0.31	5.11	6.51	73			<0.04
W97-19B	13.3	0.26	1.31	6.49	86			<0.04
RA-MW-17A	15.3	1.8	0.19	6.43	-40			<0.04
W85-6B	13.8	0.41	6.13	6.42	76			<0.04
W92-16A	15.6	0.25	0.13	6.42	-14			<0.04
RA-MW-15A	14.5	1.04	0.21	6.37	4			<0.04
W97-18B	12.4	0.24	5.56	6.35	63			<0.04
B87-8	14.7	0.55	1.03	6.31	31	52	137	0.25
B85-4	14.4	1.17	1.37	6.26	41	150	410	<0.04
W97-19A	13.3	0.26	1.79	6.24	94			<0.04
W99-R5B	14.4	0.26	2.71	6.23	78			<0.04
W85-6A	14.1	0.33	0.43	6.22	57	15	36	<0.04
W98-21B	13.6	0.27	3.29	6.07	72			<0.04
W98-21A	14.3	0.23	1.49	6.07	69			<0.04
W85-7A	12.6	0.14	3.17	6.04	83	4	8.6	<0.04
W99-R5A	14.9	0.25	4.26	5.98	96	6	11.8	<0.04
W97-18A	11.0	0.09	0.74	5.96	57			<0.04
W98-20A	12.5	0.15	3.76	5.91	116			<0.04

Notes:
[1]Sulfur and sulfate data obtained from laboratory analyses.

Table 3—Frontier Hard Chrome—Event 2 Ground Water Elevations April 5, 2004

Well No.	Date/Time	Casing Elevation (feet)	Depth to Water (feet)	Water level Elevation (AMSL)
W85-3A	1126	26.40	19.96	6.44
W85-3B	1121	26.77	20.31	6.46
W97-18A	1204	25.44	19.11	6.33
W97-18B	1159	25.36	18.79	6.57
B87-8	1145	25.95	19.60	6.35
B85-4	1151	25.38	19.07	6.31
B85-3	1212	24.90	18.45	6.45[1]
W92-16B	1139	25.51	19.15	6.36
W92-16A	1133	25.62	19.25	6.37
W98-21A	1317	25.28[2]	18.97	6.31
W98-21B	1314	25.50[2]	19.17	6.33
W85-6A	1305	25.38	19.07	6.31
W85-6B	1309	25.24	18.92	6.32
W85-7B	1225	23.00	16.69	6.31
W85-7A	1222	22.83	16.51	6.32
W97-19A	1235	22.45[2]	16.18	6.27
W97-19B	1238	21.72[2]	15.51	6.21
W98-20A	1245	23.57[2]	17.24	6.33
W99-R5B	1253	32.33	26.03	6.30
W99-R5A	1259	32.26	25.98	6.28
USGS 14144700 (Stage height of the Columbia River)	1200			5.55

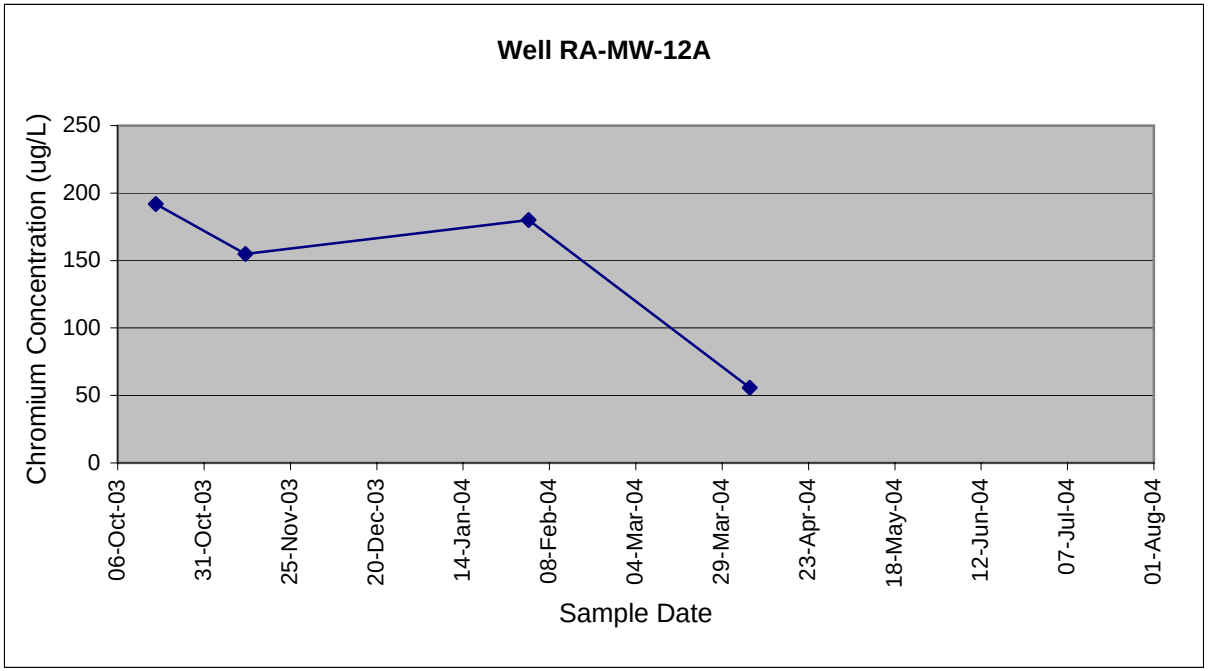
[1] This well has not been developed recently and is located adjacent to the area where reagent/cement was injected into the soil for chromium treatment. The accuracy of the water level measurement is inconsistent with surrounding wells and is suspect.

[2] Two different elevation datums have been used at Frontier Hard Chrome. Weston (12/03) Long-Term Monitoring plan has applied a correction factor (+3.76 feet) using the City of Vancouver's benchmark #108 located near FHC site.

APPENDIX A
GROUNDWATER CHROMIUM CONCENTRATION TRENDS

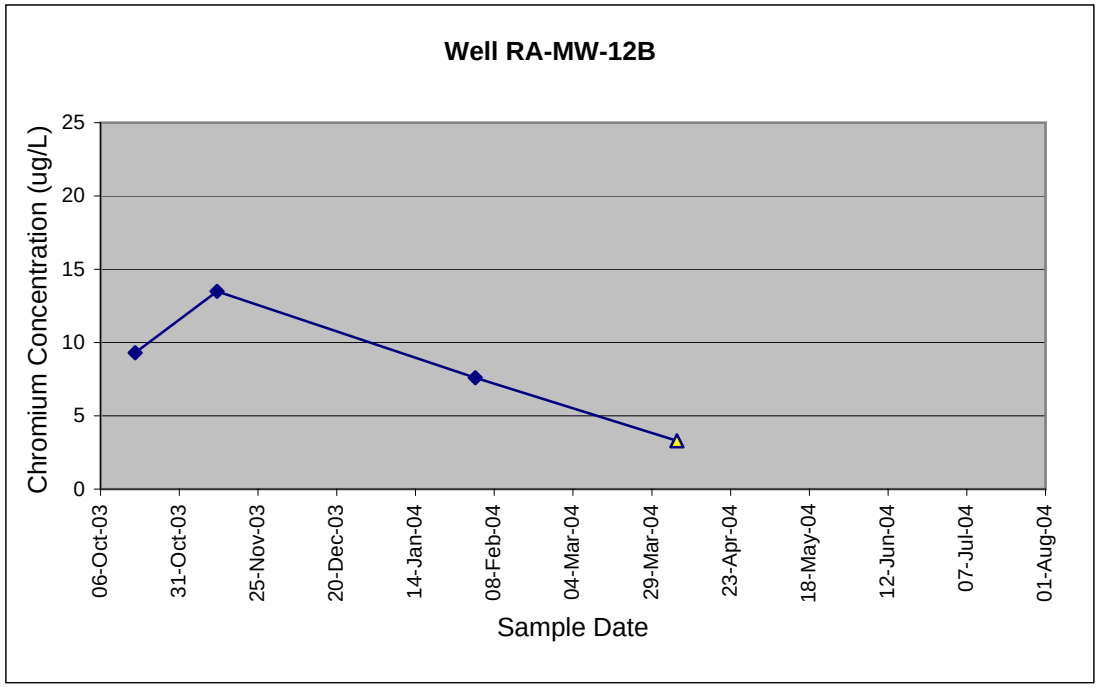
Well RA-MW-12A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2524	Water	17-Oct-03	CHROMIUM	192	UG/L		RA-MW-12A	Dissolved
MJ27F5	Water	12-Nov-03	CHROMIUM	155	UG/L		RA-MW-12A	Dissolved
MJ2AF0	Water	02-Feb-04	CHROMIUM	180	UG/L		RA-MW-12A	Total
MJ2BH9	Water	06-Apr-04	CHROMIUM	55.8	UG/L		RA-MW-12A	Dissolved



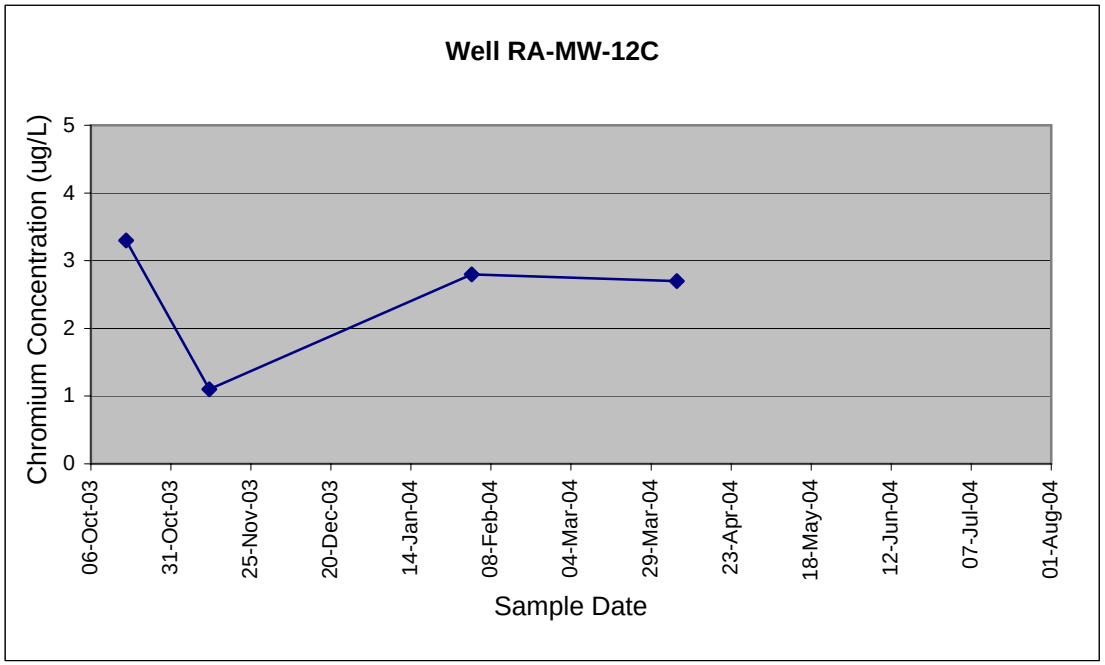
Well RA-MW-12B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2526	Water	17-Oct-03	CHROMIUM	9.3	UG/L	BJ	RA-MW-12B	Dissolved
MJ27F7	Water	12-Nov-03	CHROMIUM	13.5	UG/L		RA-MW-12B	Dissolved
MJ2AF1	Water	02-Feb-04	CHROMIUM	7.6	UG/L	J	RA-MW-12B	Total
MJ2BJ0	Water	06-Apr-04	CHROMIUM	3.3	UG/L	U	RA-MW-12B	Total



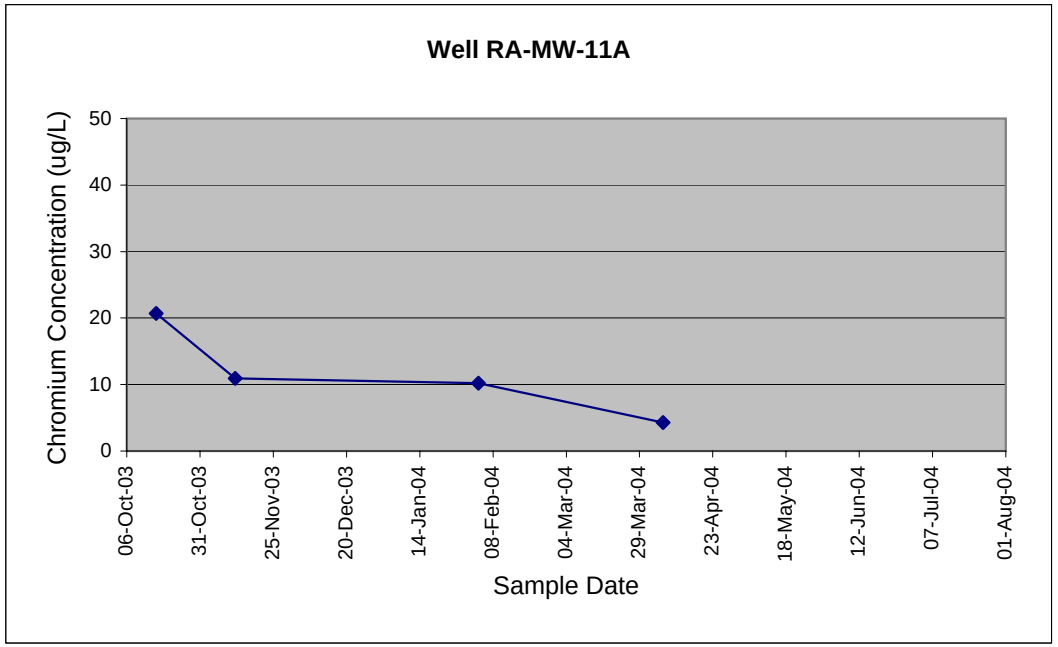
Well RA-MW-12C

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2528	Water	17-Oct-03	CHROMIUM	3.3	UG/L	BJ	RA-MW-12C	Dissolved
MJ27F9	Water	12-Nov-03	CHROMIUM	1.1	UG/L	BJ	RA-MW-12C	Dissolved
MJ2AF2	Water	02-Feb-04	CHROMIUM	2.8	UG/L	J	RA-MW-12C	Total
MJ2BJ1	Water	06-Apr-04	CHROMIUM	2.7	UG/L	J	RA-MW-12C	Total



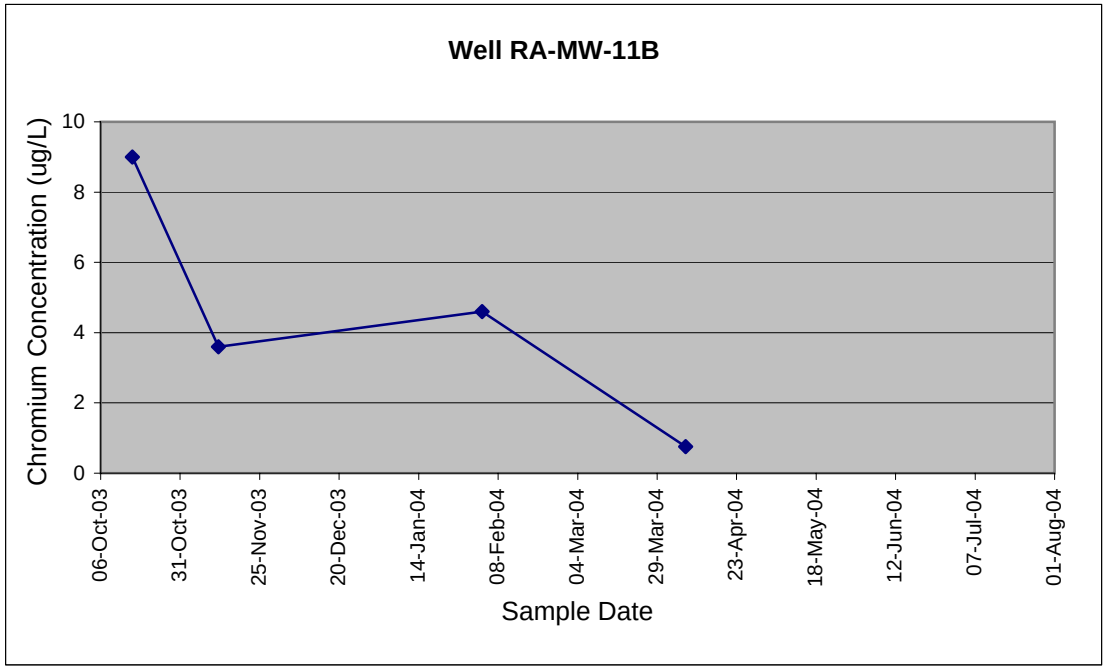
Well RA-MW-11A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2516	Water	16-Oct-03	CHROMIUM	20.7	UG/L		RA-MW-11A	Dissolved
MJ27G1	Water	12-Nov-03	CHROMIUM	10.9	UG/L	J	RA-MW-11A	Dissolved
MJ2AF4	Water	03-Feb-04	CHROMIUM	10.2	UG/L		RA-MW-11A	Dissolved
MJ2BJ3	Water	06-Apr-04	CHROMIUM	4.3	UG/L	J	RA-MW-11A	Dissolved



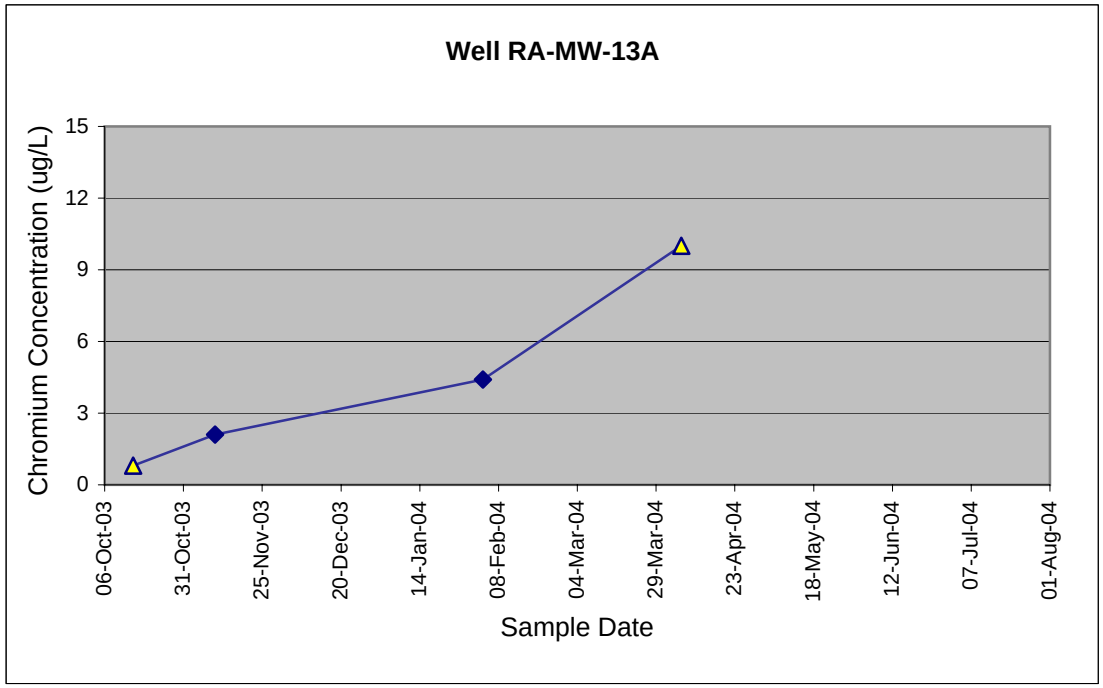
Well RA-MW-11B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2518	Water	16-Oct-03	CHROMIUM	9	UG/L	BJ	RA-MW-11B	Dissolved
MJ27G3	Water	12-Nov-03	CHROMIUM	3.6	UG/L	BJ	RA-MW-11B	Dissolved
MJ2AF6	Water	03-Feb-04	CHROMIUM	4.6	UG/L	J	RA-MW-11B	Dissolved
MJ2BJ5	Water	7-Apr-04	CHROMIUM	0.76	UG/L	J	RA-MW-11B	Dissolved



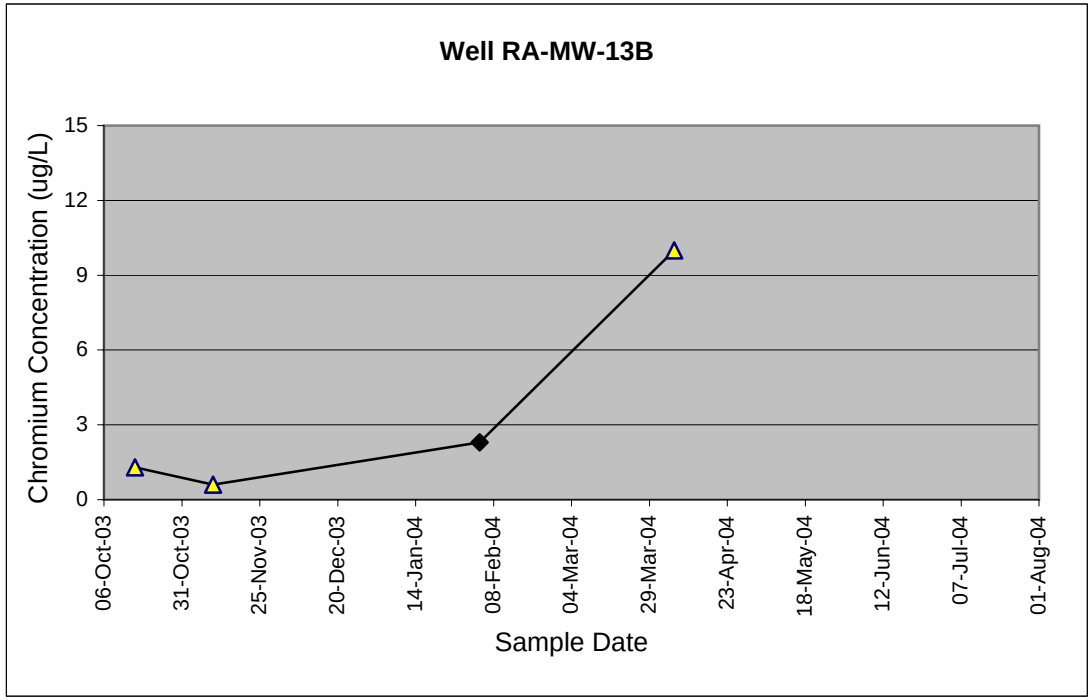
Well RA-MW-13A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2508	Water	15-Oct-03	CHROMIUM	0.8	UG/L	U	RA-MW-13A	Total
MJ27E2	Water	10-Nov-03	CHROMIUM	2.1	UG/L	BJ	RA-MW-13A	Total
MJ2AG1	Water	03-Feb-04	CHROMIUM	4.4	UG/L	J	RA-MW-13A	Total
MJ2BH4	Water	6-Apr-04	CHROMIUM	10	UG/L	U	RA-MW-13A	Total



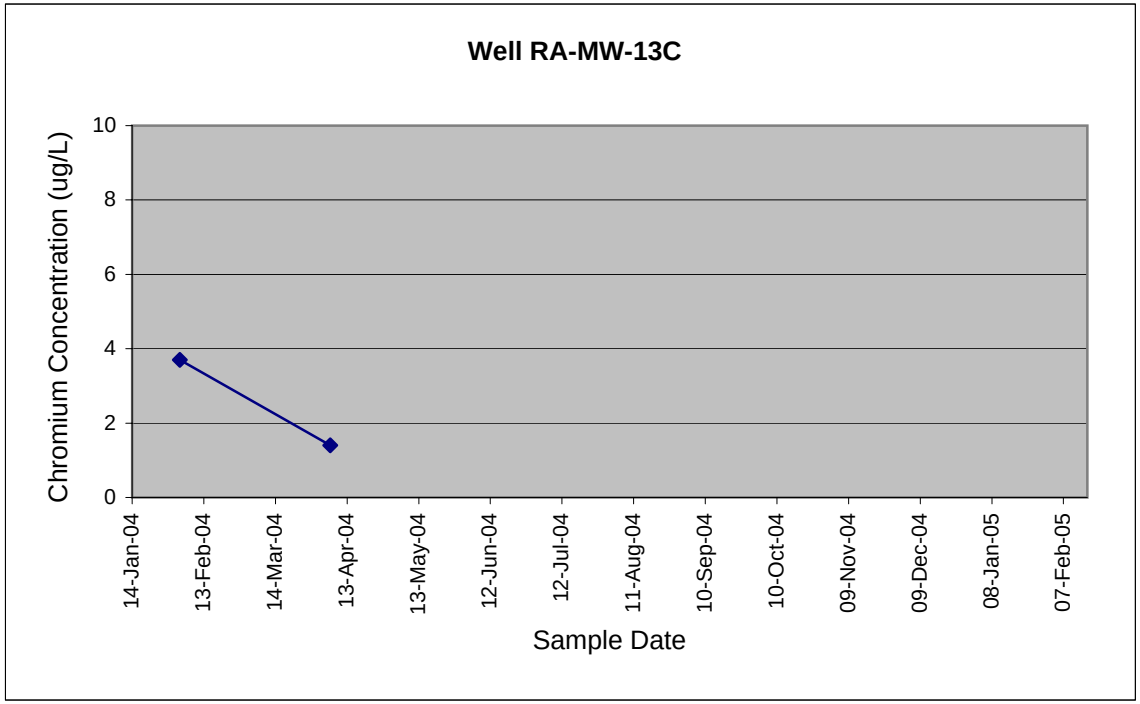
Well RA-MW-13B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2509	Water	16-Oct-03	CHROMIUM	1.3	UG/L	U	RA-MW-13B	Total
MJ27E3	Water	10-Nov-03	CHROMIUM	0.6	UG/L	UJ	RA-MW-13B	Total
MJ2AF8	Water	03-Feb-04	CHROMIUM	2.3	UG/L	J	RA-MW-13B	Total
MJ2BH5	Water	6-Apr-04	CHROMIUM	10	UG/L	U	RA-MW-13B	Total



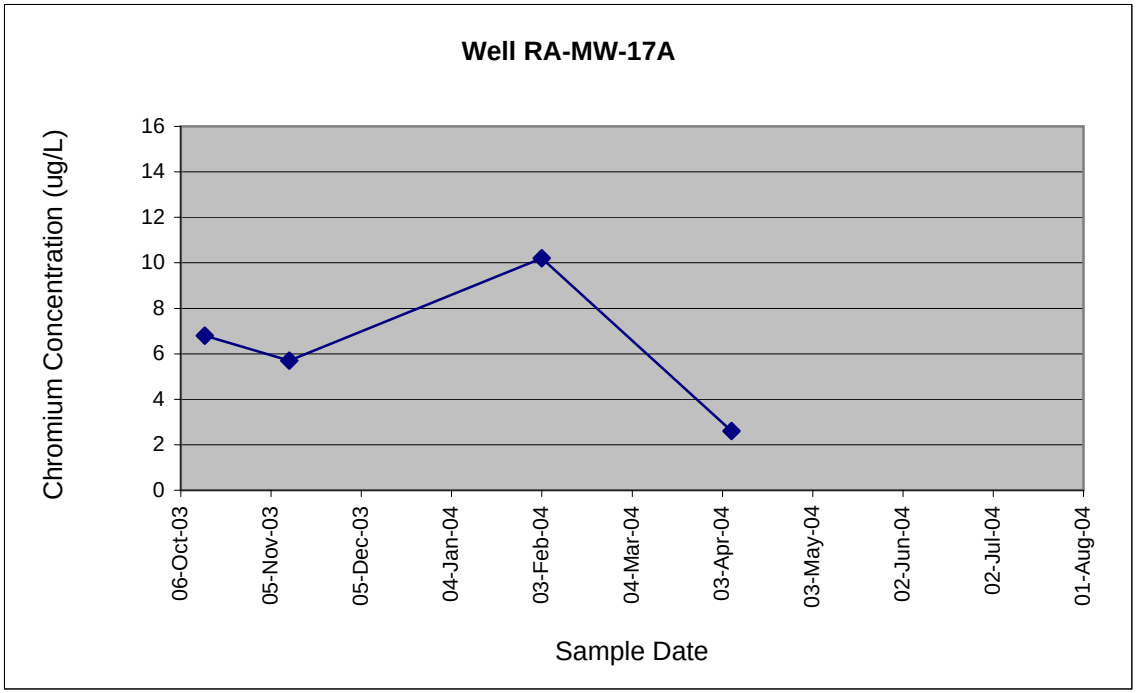
Well RA-MW-13C

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AF9	Water	03-Feb-04	CHROMIUM	3.7	UG/L	J	RA-MW-13C	Total
MJ2BH6	Water	6-Apr-04	CHROMIUM	1.4	UG/L	J	RA-MW-13C	Total



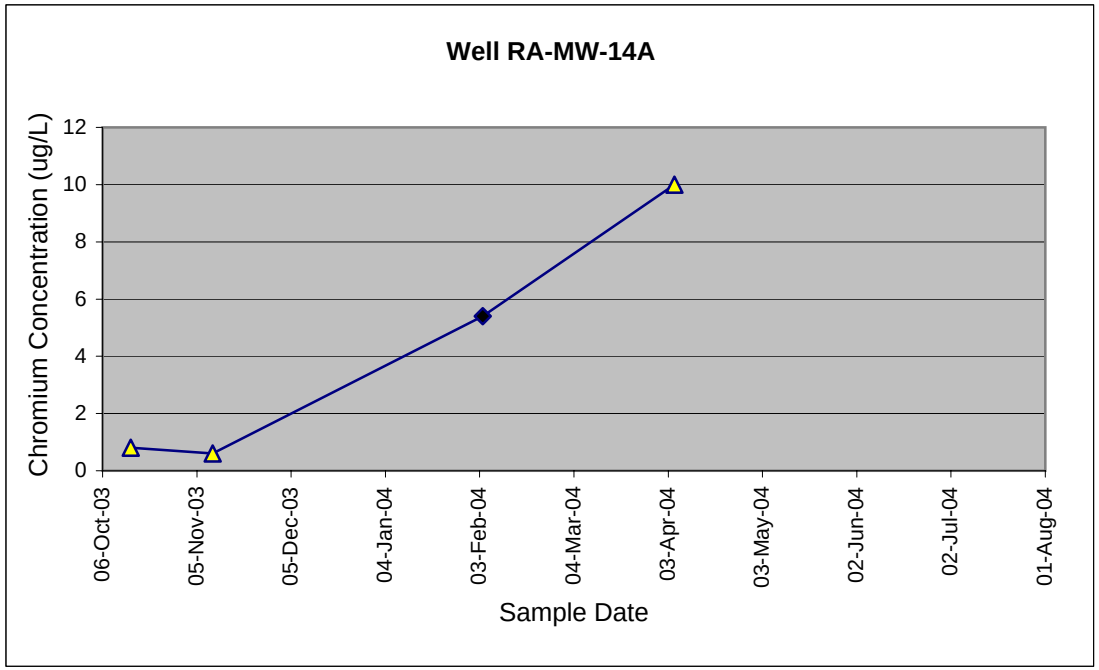
Well RA-MW-17A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2501	Water	14-Oct-03	CHROMIUM	6.8	UG/L	BJ	RA-MW-17A	Total
MJ27E5	Water	11-Nov-03	CHROMIUM	5.7	UG/L	BJ	RA-MW-17A	Total
MJ2AG0	Water	03-Feb-04	CHROMIUM	10.2	UG/L	J	RA-MW-17A	Total
MJ2BH7	Water	6-Apr-04	CHROMIUM	2.6	UG/L	J	RA-MW-17A	Total



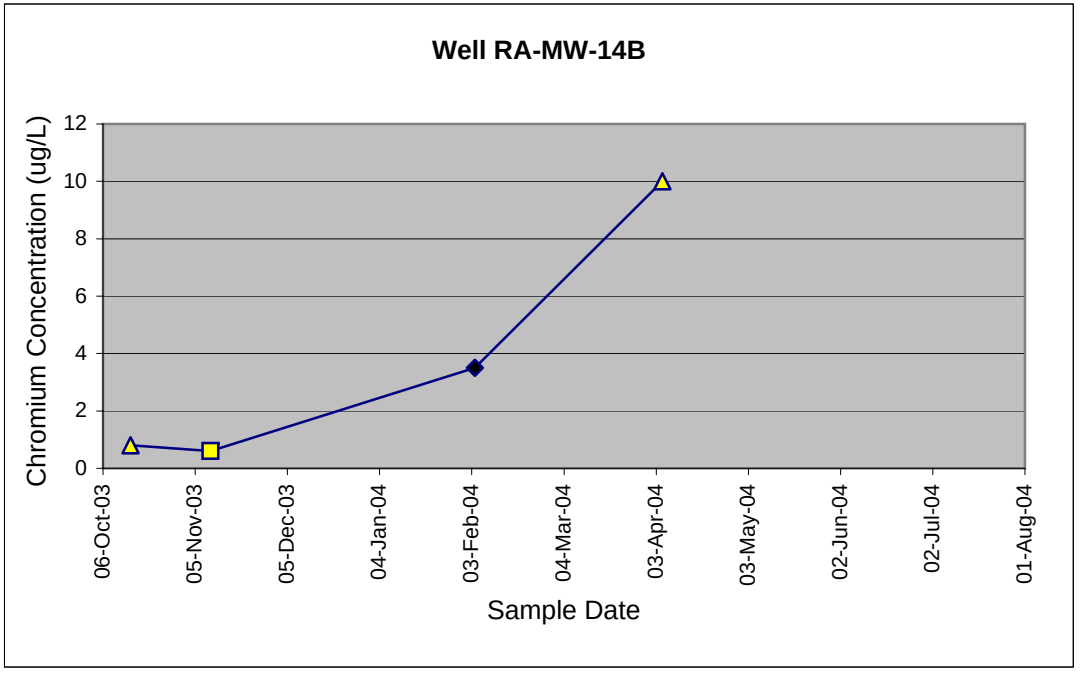
Well RA-MW-14A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2504	Water	15-Oct-03	CHROMIUM	0.8	UG/L	U	RA-MW-14A	Total
MJ27D8	Water	10-Nov-03	CHROMIUM	0.6	UG/L	UJ	RA-MW-14A	Total
MJ2AG2	Water	04-Feb-04	CHROMIUM	5.4	UG/L	J	RA-MW-14A	Total
MJ2BG5	Water	5-Apr-04	CHROMIUM	10	UG/L	U	RA-MW-14A	Total



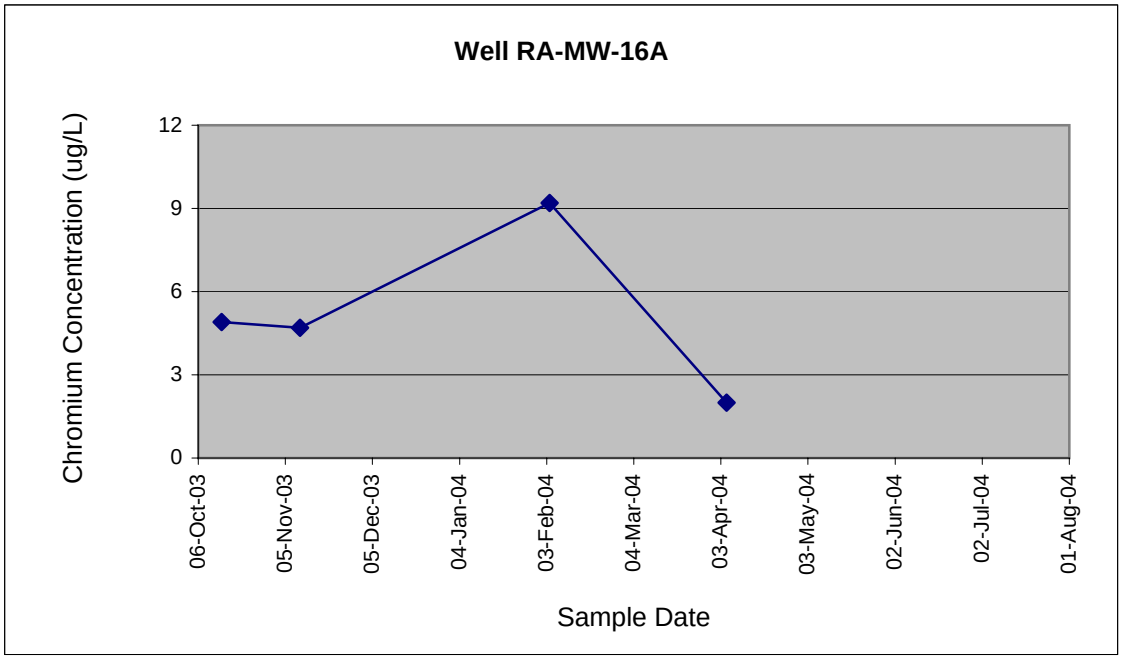
Well RA-MW-14B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2505	Water	15-Oct-03	CHROMIUM	0.8	UG/L	U	RA-MW-14B	Total
MJ27D9	Water	10-Nov-03	CHROMIUM	0.6	UG/L	R	RA-MW-14B	Total
MJ2AG4	Water	04-Feb-04	CHROMIUM	3.5	UG/L	J	RA-MW-14B	Total
MJ2BG7	Water	5-Apr-04	CHROMIUM	10	UG/L	U	RA-MW-14B	Total



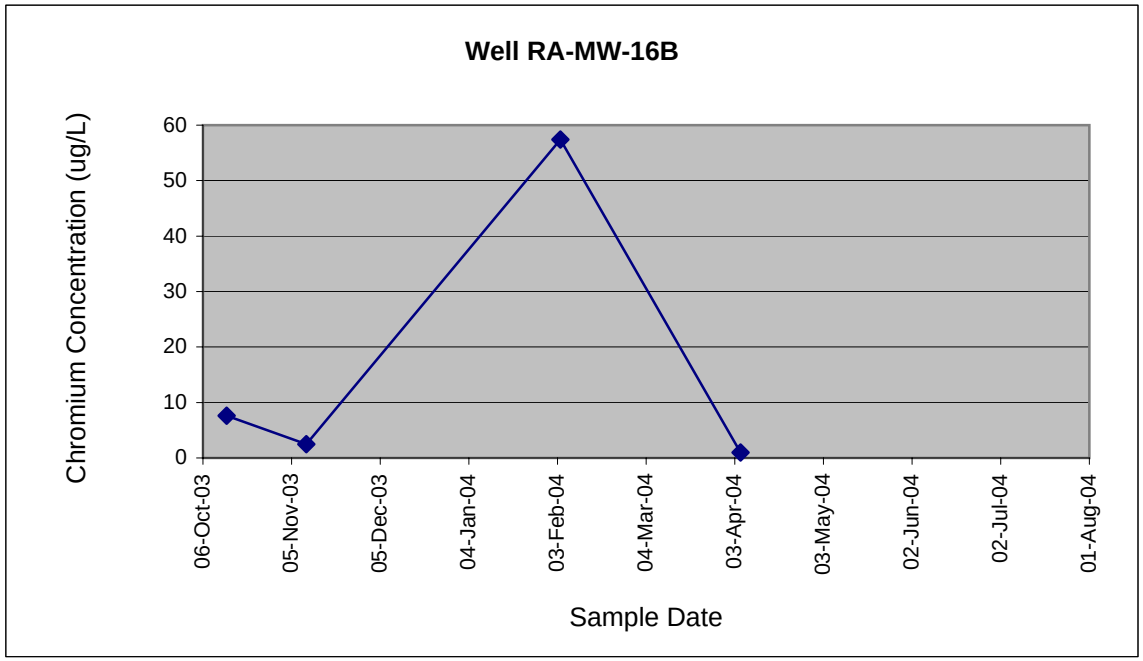
Well RA-MW-16A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2502	Water	14-Oct-03	CHROMIUM	4.9	UG/L	BJ	RA-MW-16A	Total
MJ27E0	Water	10-Nov-03	CHROMIUM	4.7	UG/L	BJ	RA-MW-16A	Total
MJ2AG5	Water	04-Feb-04	CHROMIUM	9.2	UG/L	J	RA-MW-16A	Total
MJ2BG8	Water	5-Apr-04	CHROMIUM	2	UG/L	J	RA-MW-16A	Total



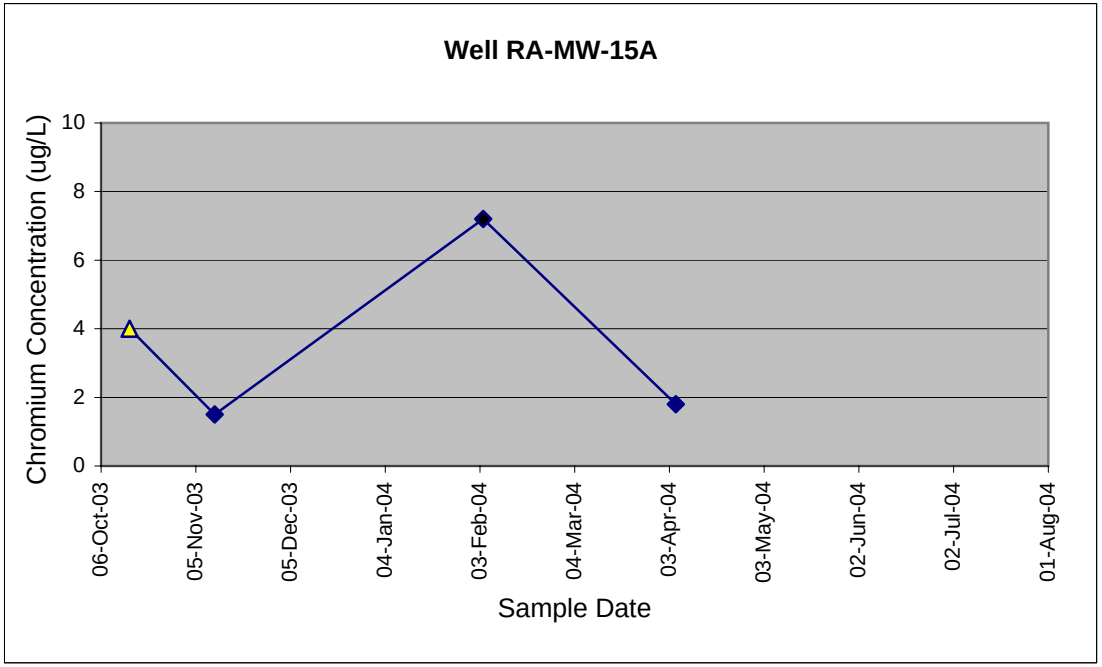
Well RA-MW-16B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2503	Water	14-Oct-03	CHROMIUM	7.6	UG/L	BJ	RA-MW-16B	Total
MJ27E1	Water	10-Nov-03	CHROMIUM	2.5	UG/L	BJ	RA-MW-16B	Total
MJ2AG6	Water	04-Feb-04	CHROMIUM	57.4	UG/L	BJ	RA-MW-16B	Total
MJ2BH0	Water	5-Apr-04	CHROMIUM	1	UG/L	J	RA-MW-16B	Dissolved



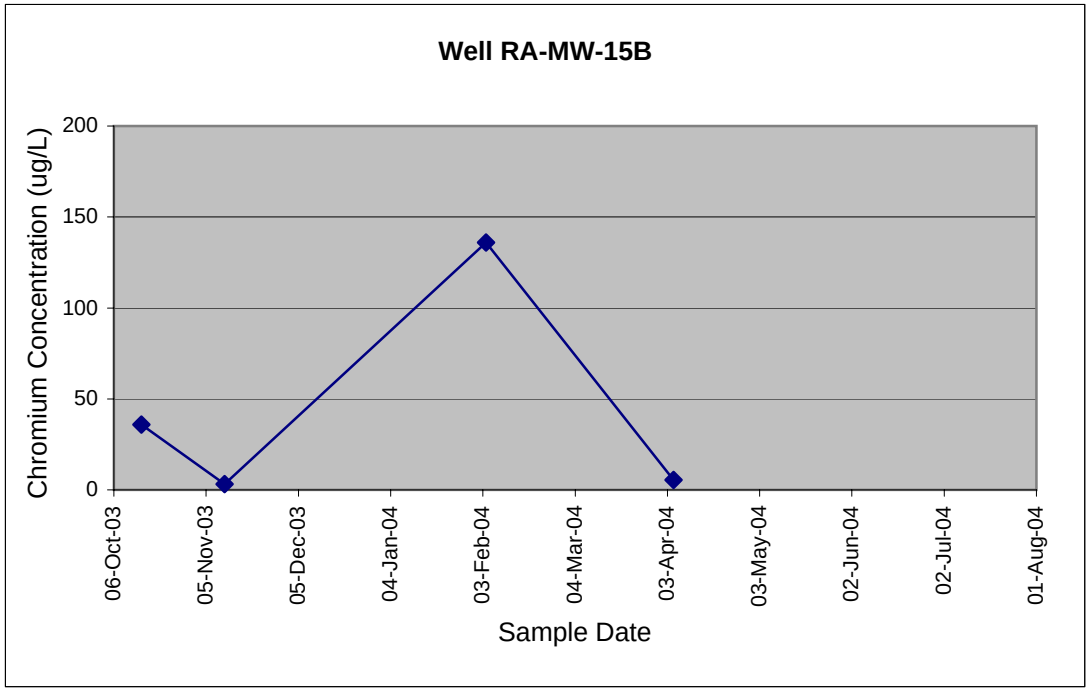
Well RA-MW-15A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2506	Water	15-Oct-03	CHROMIUM	4	UG/L	U	RA-MW-15A	Total
MJ27E8	Water	11-Nov-03	CHROMIUM	1.5	UG/L	BJ	RA-MW-15A	Total
MJ2AG7	Water	04-Feb-04	CHROMIUM	7.2	UG/L	J	RA-MW-15A	Total
MJ2BH1	Water	5-Apr-04	CHROMIUM	1.8	UG/L	J	RA-MW-15A	Total



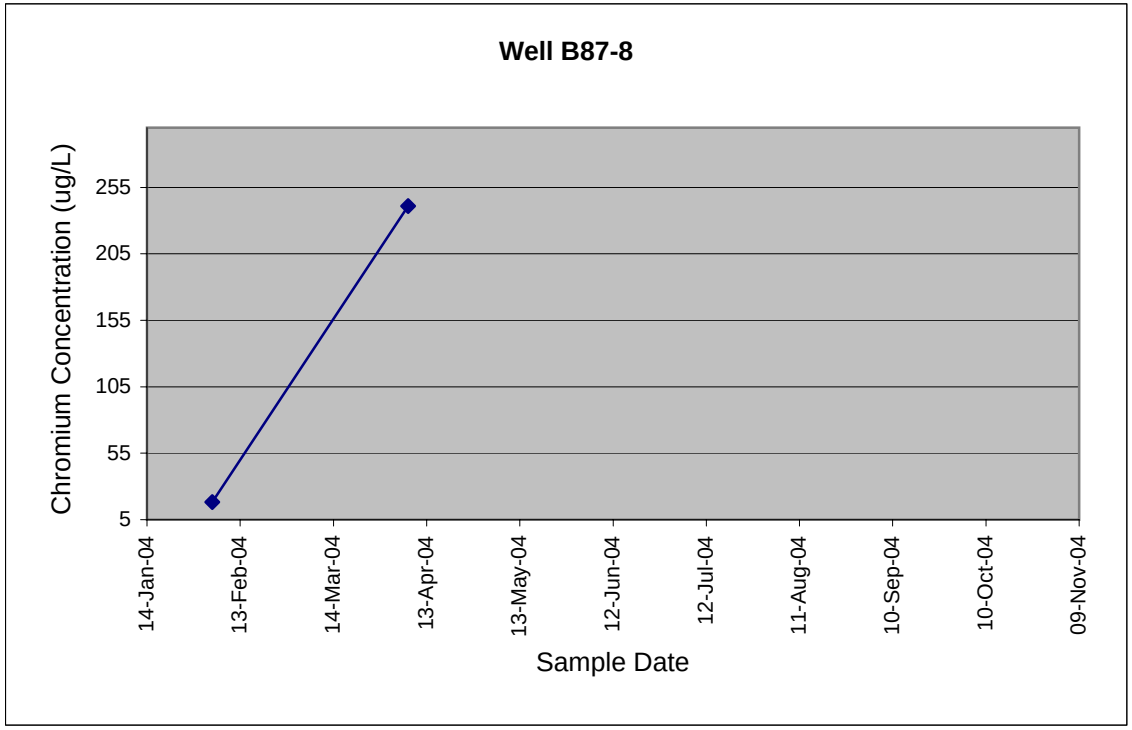
Well RA-MW-15B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2507	Water	15-Oct-03	CHROMIUM	35.8	UG/L		RA-MW-15B	Total
MJ27E9	Water	11-Nov-03	CHROMIUM	3.2	UG/L	BJ	RA-MW-15B	Total
MJ2AG8	Water	04-Feb-04	CHROMIUM	136	UG/L		RA-MW-15B	Total
MJ2BH2	Water	5-Apr-04	CHROMIUM	5.5	UG/L	J	RA-MW-15B	Total



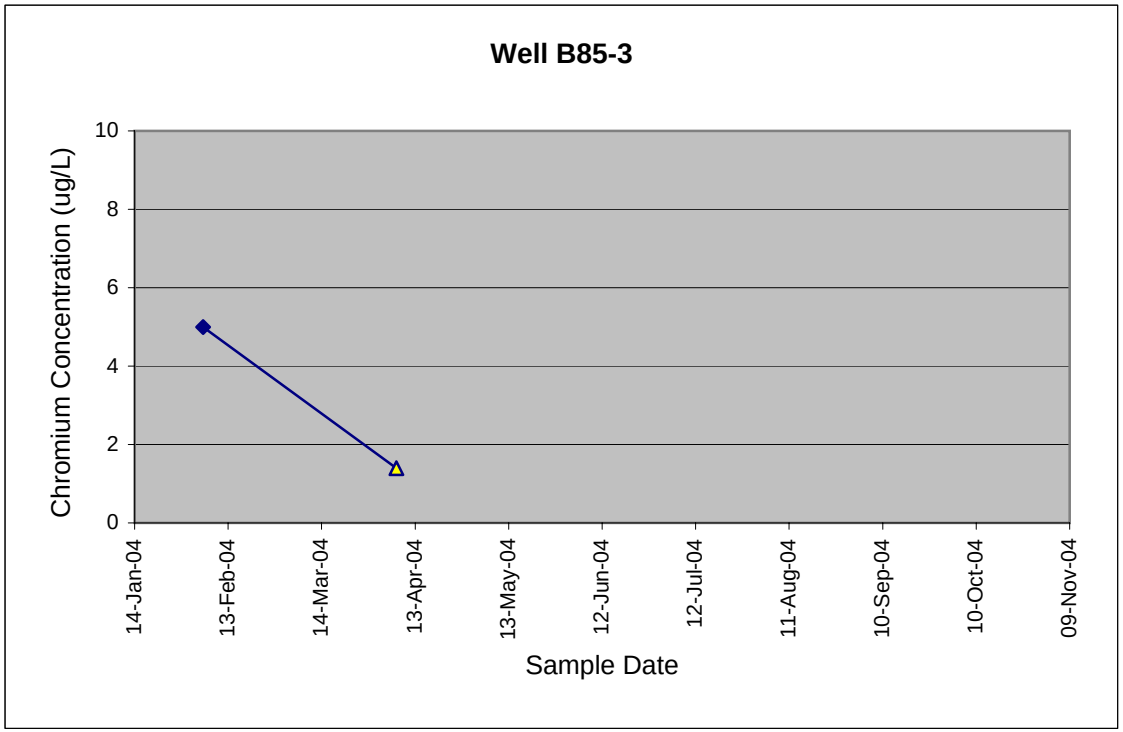
Well B87-8

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AG9	Water	04-Feb-04	CHROMIUM	18.2	UG/L		B87-8	Total
MJ2BK0	Water	7-Apr-04	CHROMIUM	241	UG/L		B87-8	Total



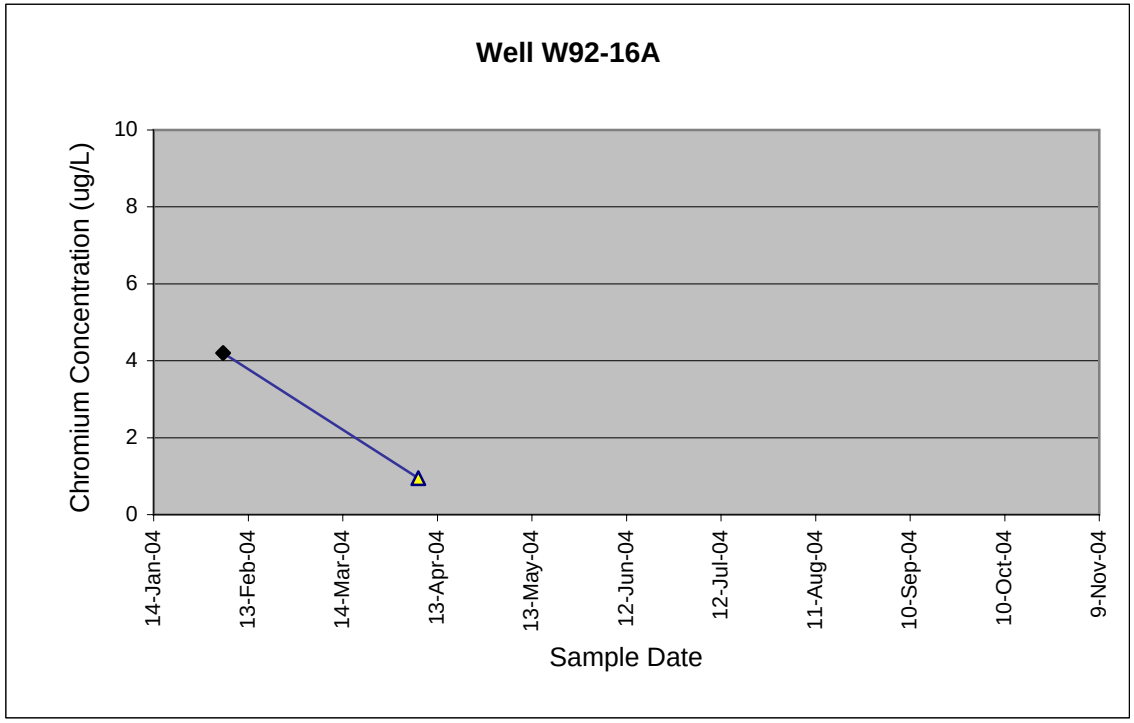
Well B85-3

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AH0	Water	05-Feb-04	CHROMIUM	5	UG/L	J	B85-3	Total
MJ2BJ6	Water	7-Apr-04	CHROMIUM	1.4	UG/L	U	B85-3	Total



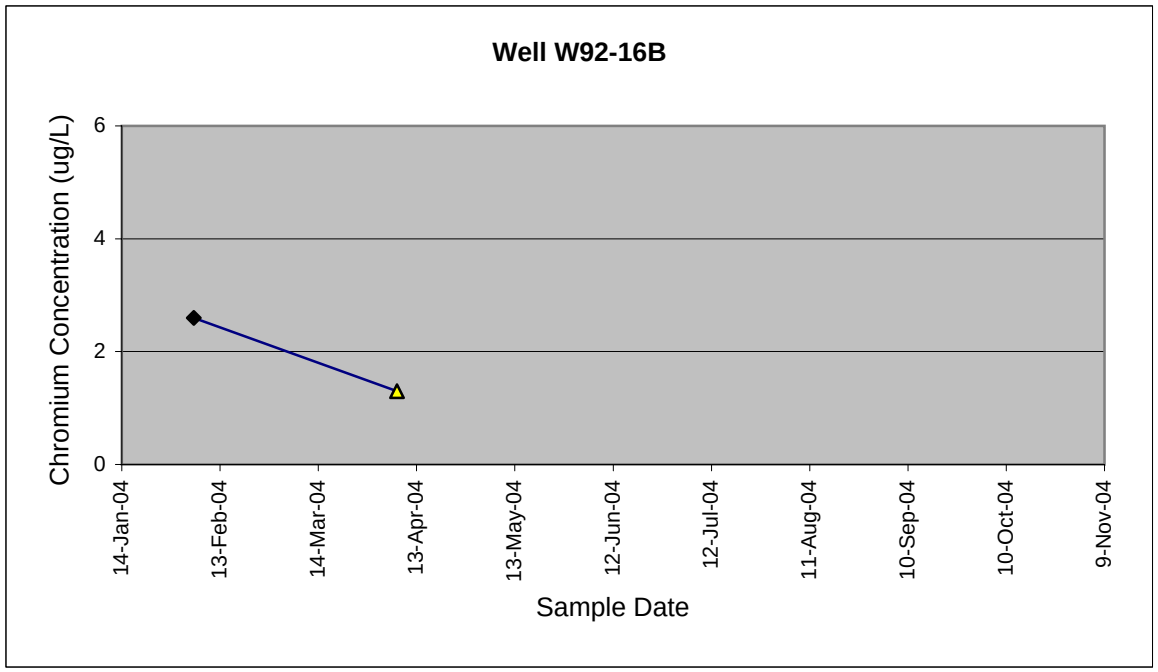
Well W92-16A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AH1	Water	05-Feb-04	CHROMIUM	4.2	UG/L	J	W92-16A	Total
MJ2BJ7	Water	7-Apr-04	CHROMIUM	0.95	UG/L	U	W92-16A	Total



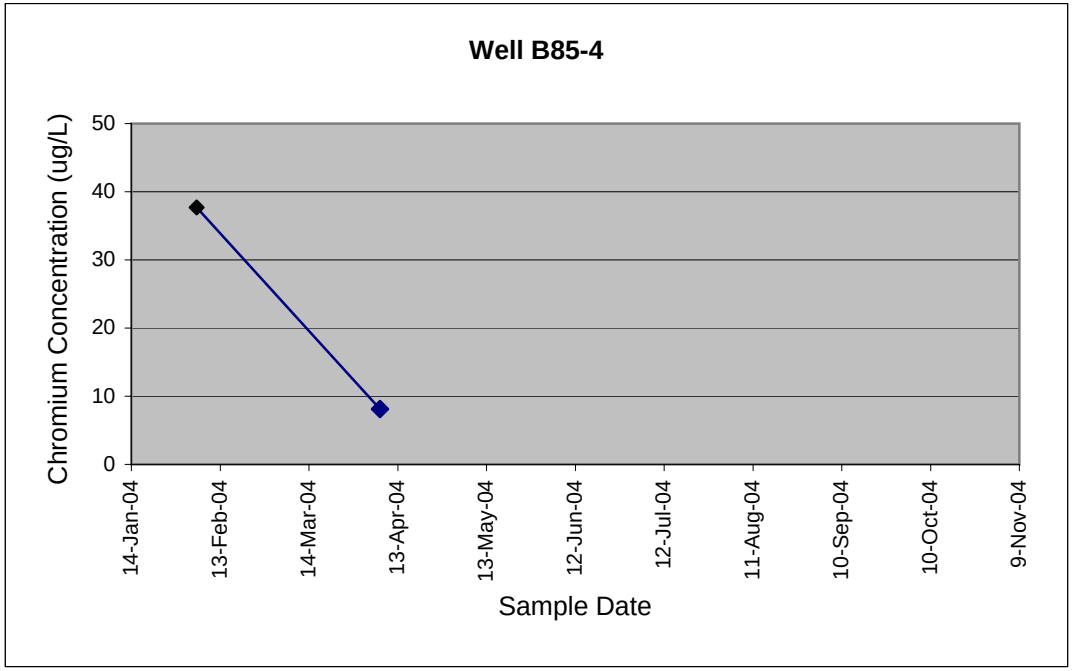
Well W92-16B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AH3	Water	05-Feb-04	CHROMIUM	2.6	UG/L	J	W92-16B	Total
MJ2BJ8	Water	7-Apr-04	CHROMIUM	1.3	UG/L	U	W92-16B	Total



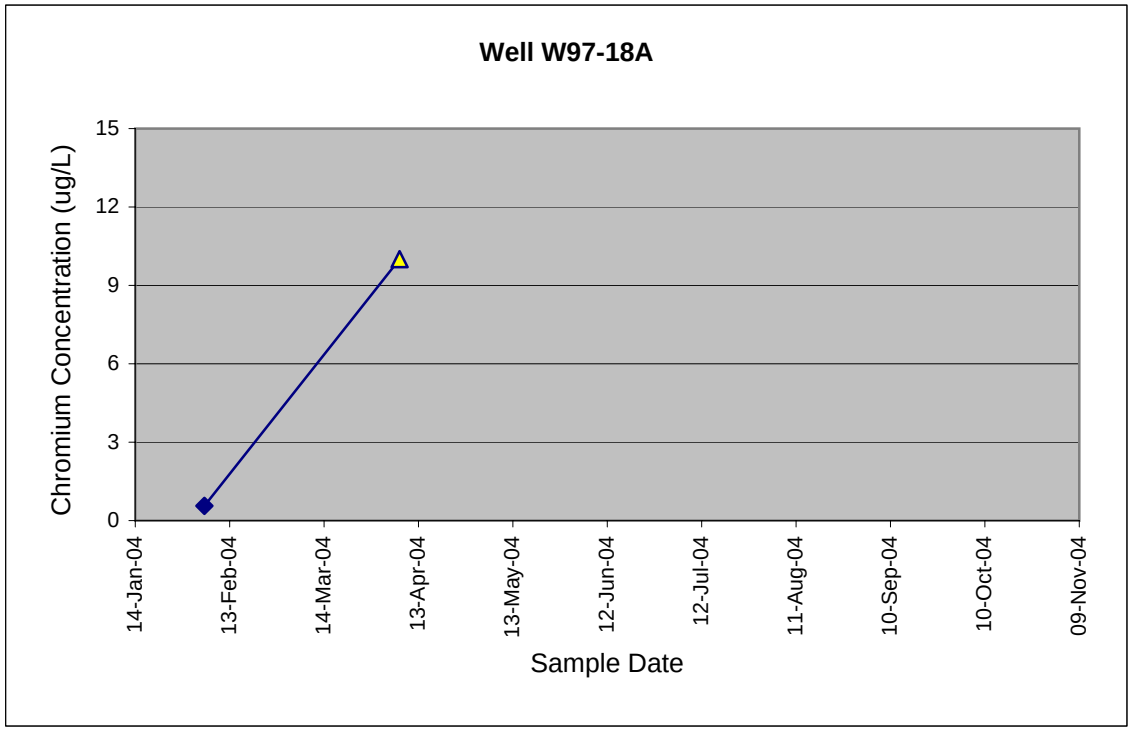
Well B85-4

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AH4	Water	05-Feb-04	CHROMIUM	37.7	UG/L		B85-4	Total
MJ2BK1	Water	7-Apr-04	CHROMIUM	8.1	UG/L	J	B85-4	Total



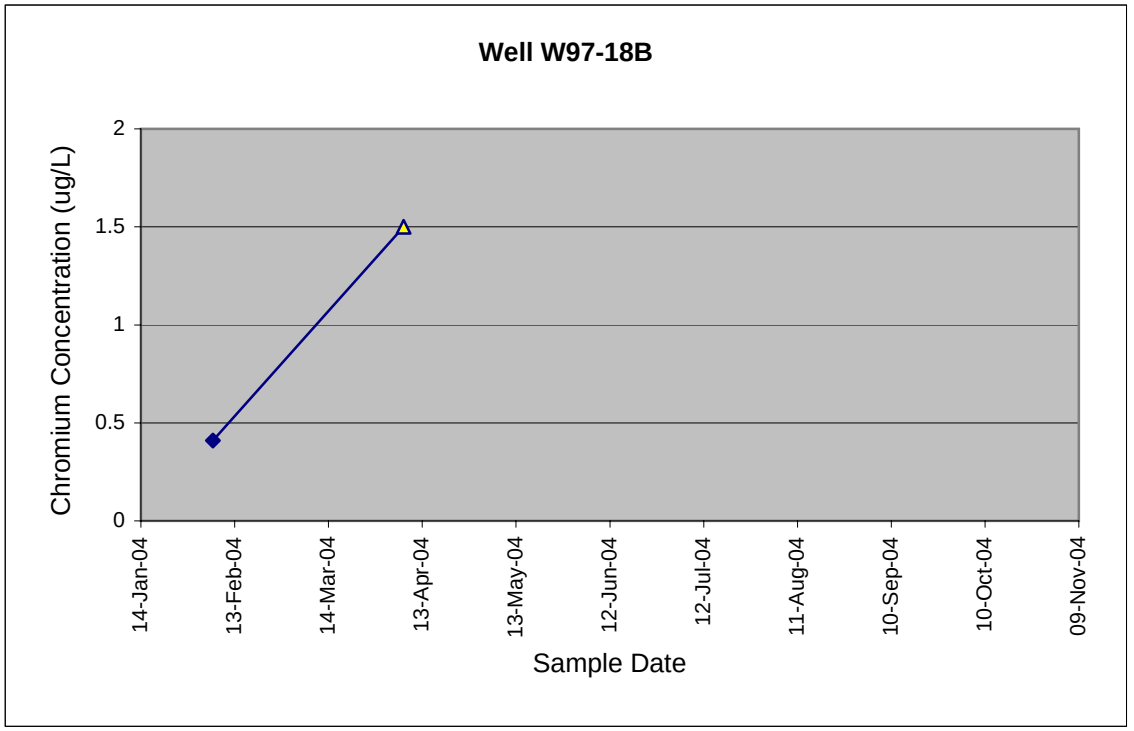
Well W97-18A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AH5	Water	05-Feb-04	CHROMIUM	0.56	UG/L	J	W97-18A	Total
MJ2BK2	Water	7-Apr-04	CHROMIUM	10	UG/L	U	W97-18A	Total



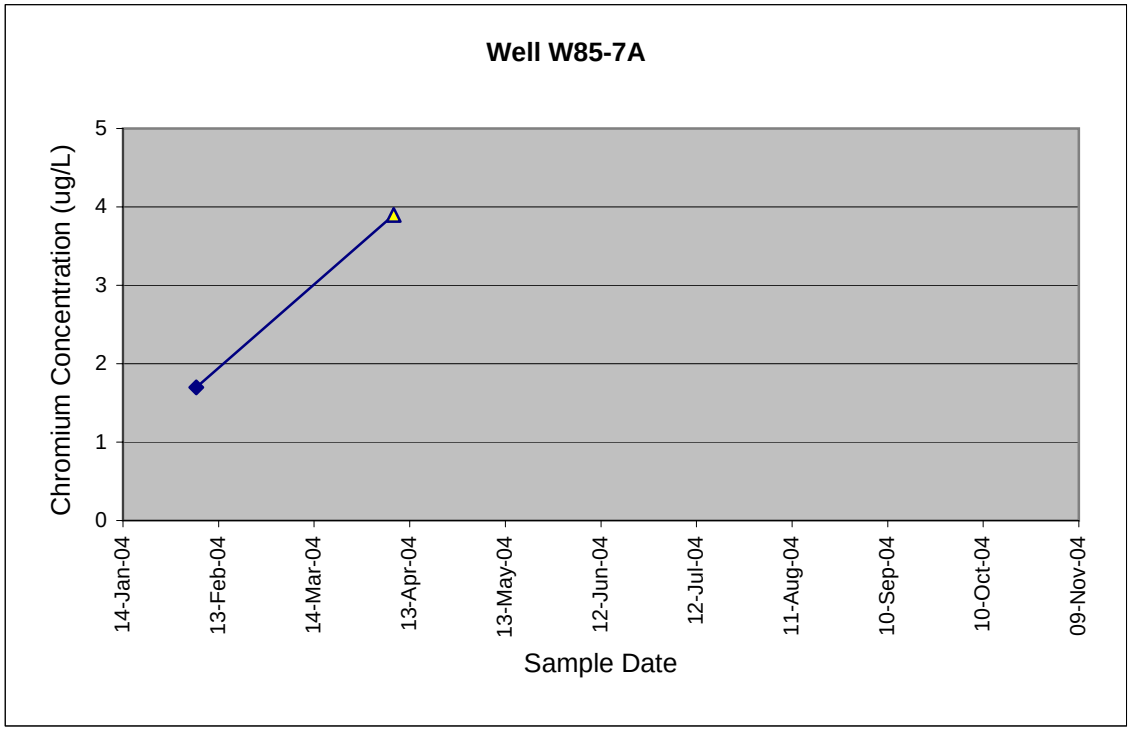
Well W97-18B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AH7	Water	06-Feb-04	CHROMIUM	0.41	UG/L	J	W97-18B	Total
MJ2BK3	Water	7-Apr-04	CHROMIUM	1.5	UG/L	U	W97-18B	Total



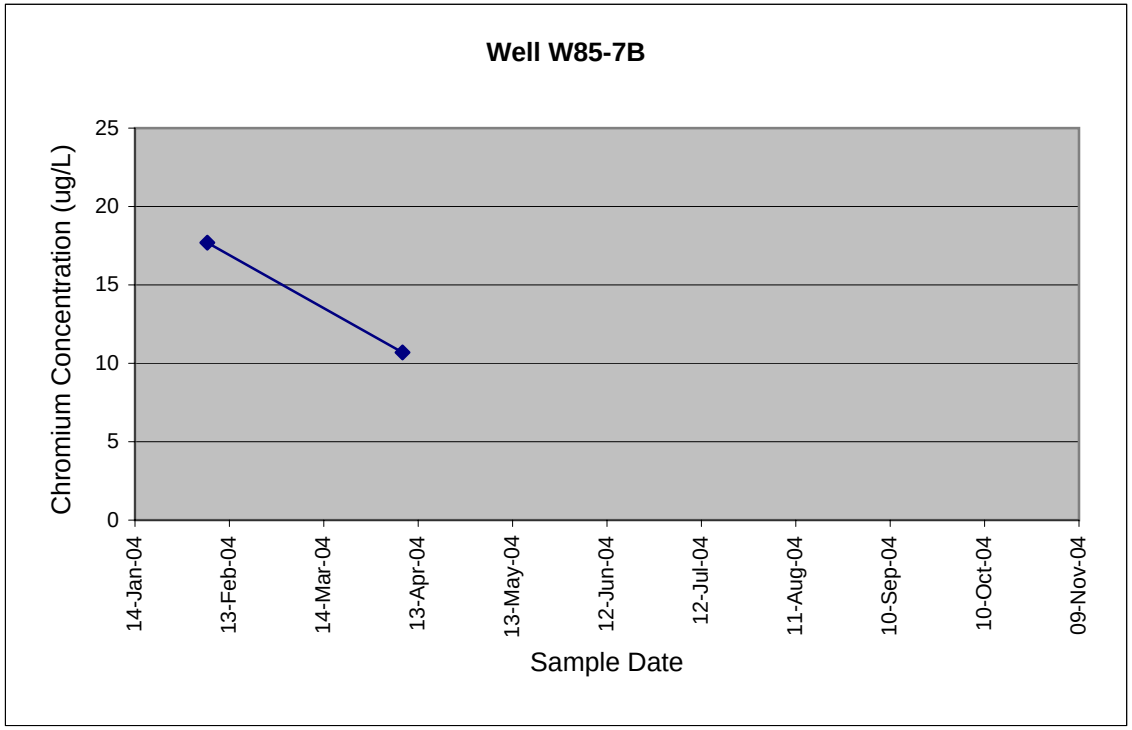
Well W85-7A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AH8	Water	06-Feb-04	CHROMIUM	1.7	UG/L	J	W85-7A	Total
MJ2BK6	Water	8-Apr-04	CHROMIUM	3.9	UG/L	U	W85-7A	Total



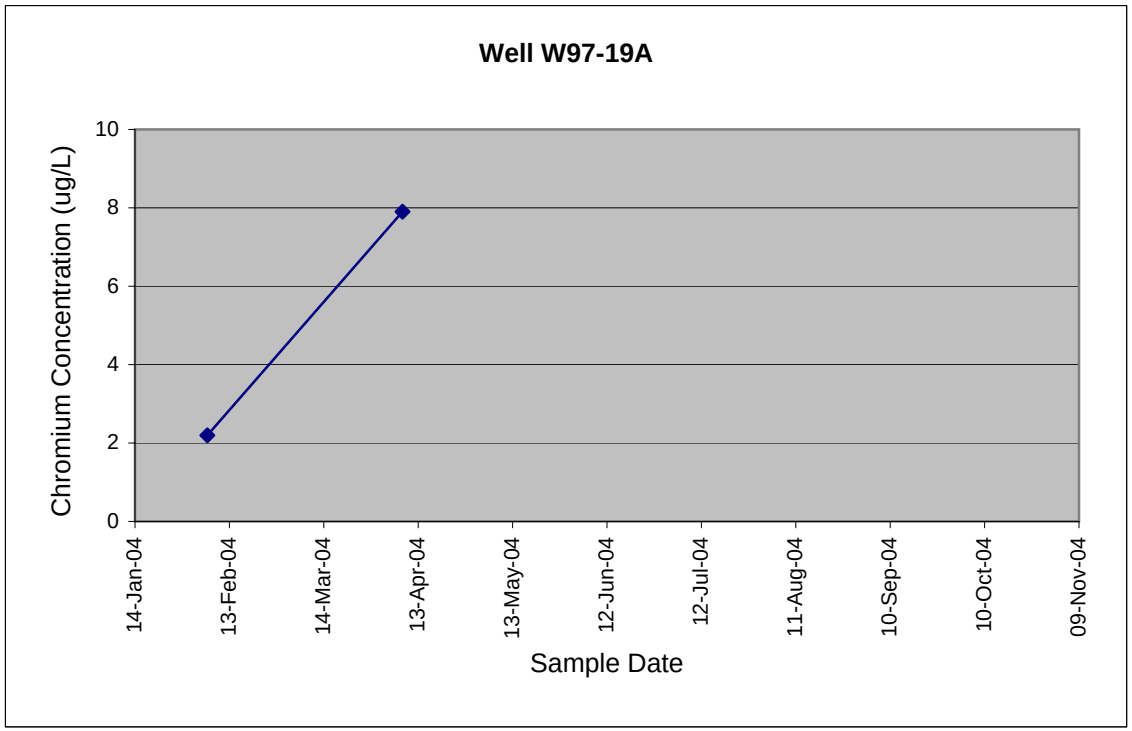
Well W85-7B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AH9	Water	06-Feb-04	CHROMIUM	17.7	UG/L		W85-7B	Total
MJ2BK7	Water	8-Apr-04	CHROMIUM	10.7	UG/L		W85-7B	Total



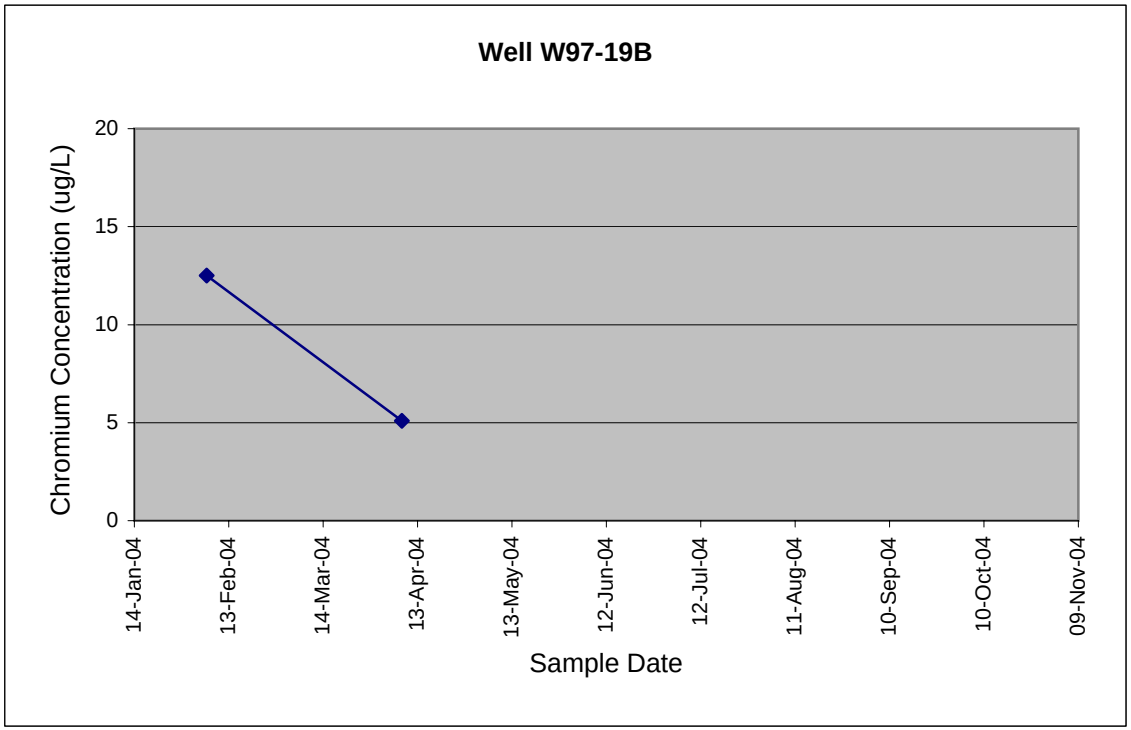
Well W97-19A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AJ0	Water	06-Feb-04	CHROMIUM	2.2	UG/L	J	W97-19A	Total
MJ2BK4	Water	8-Apr-04	CHROMIUM	7.9	UG/L	J	W97-19A	Total



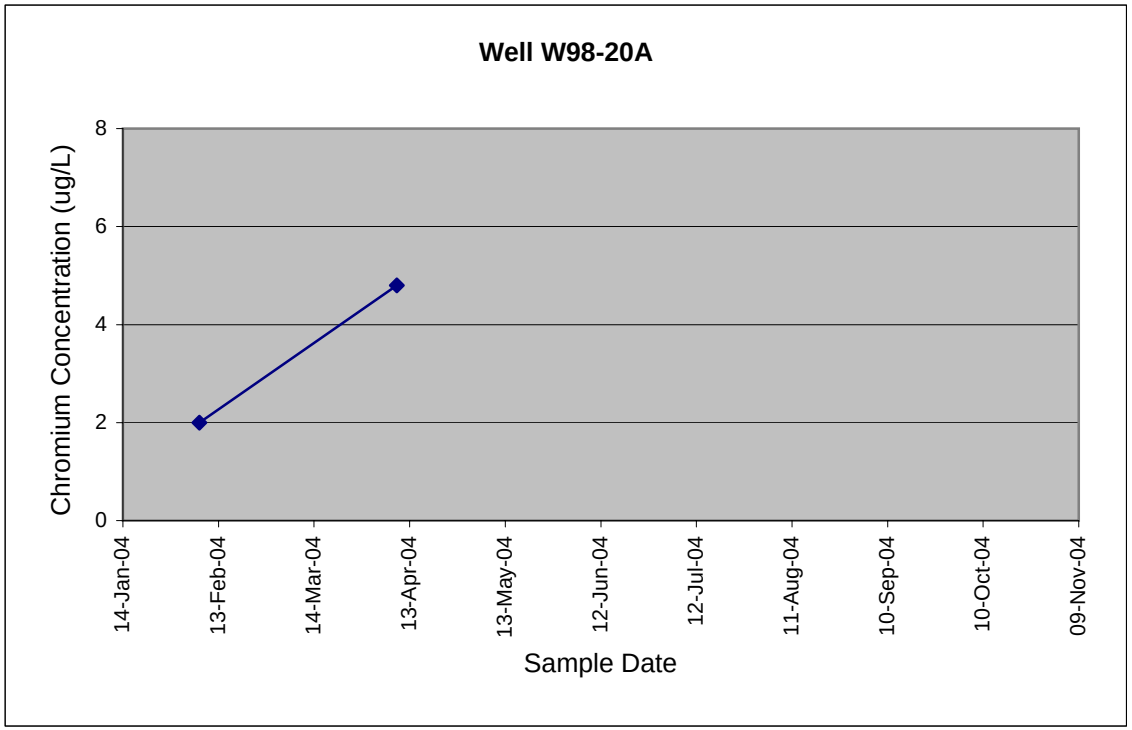
Well W97-19B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AJ1	Water	06-Feb-04	CHROMIUM	12.5	UG/L	J	W97-19B	Total
MJ2BK5	Water	8-Apr-04	CHROMIUM	5.1	UG/L	J	W97-19B	Total



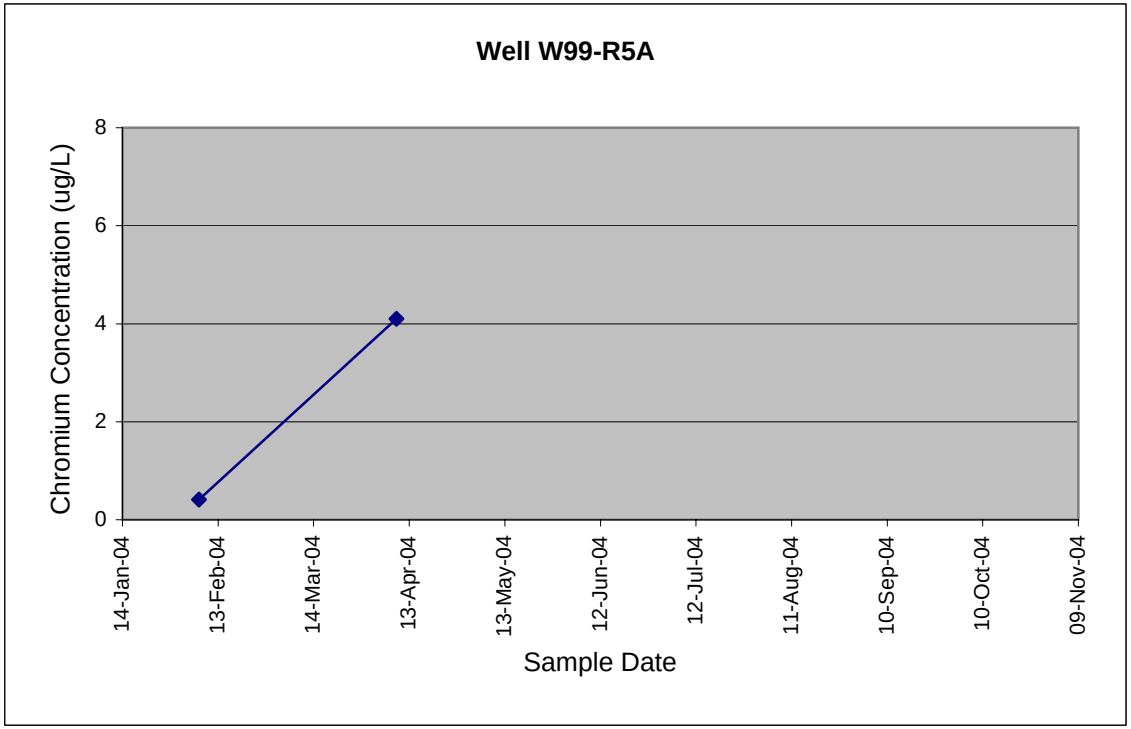
Well W98-20A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AJ2	Water	07-Feb-04	CHROMIUM	2	UG/L	J	W98-20A	Total
MJ2BL2	Water	9-Apr-04	CHROMIUM	4.8	UG/L	J	W98-20A	Total



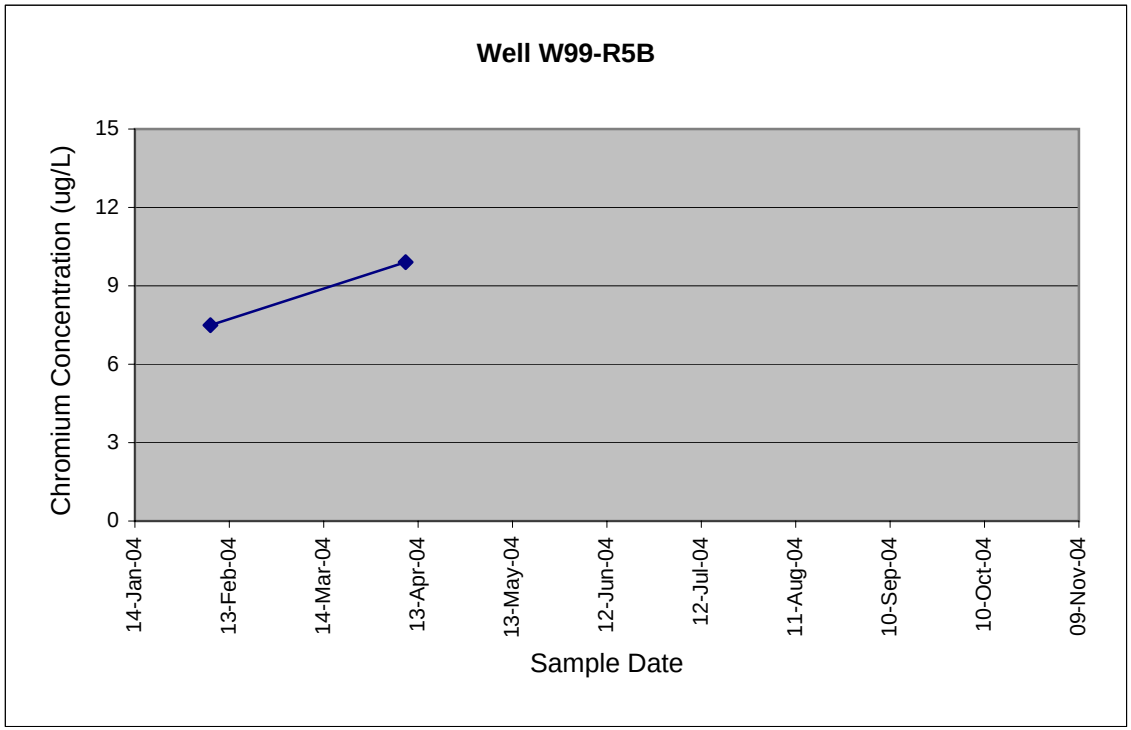
Well W99-R5A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AJ3	Water	07-Feb-04	CHROMIUM	0.41	UG/L	J	W99-R5A	Total
MJ2BL3	Water	9-Apr-04	CHROMIUM	4.1	UG/L	J	W99-R5A	Total



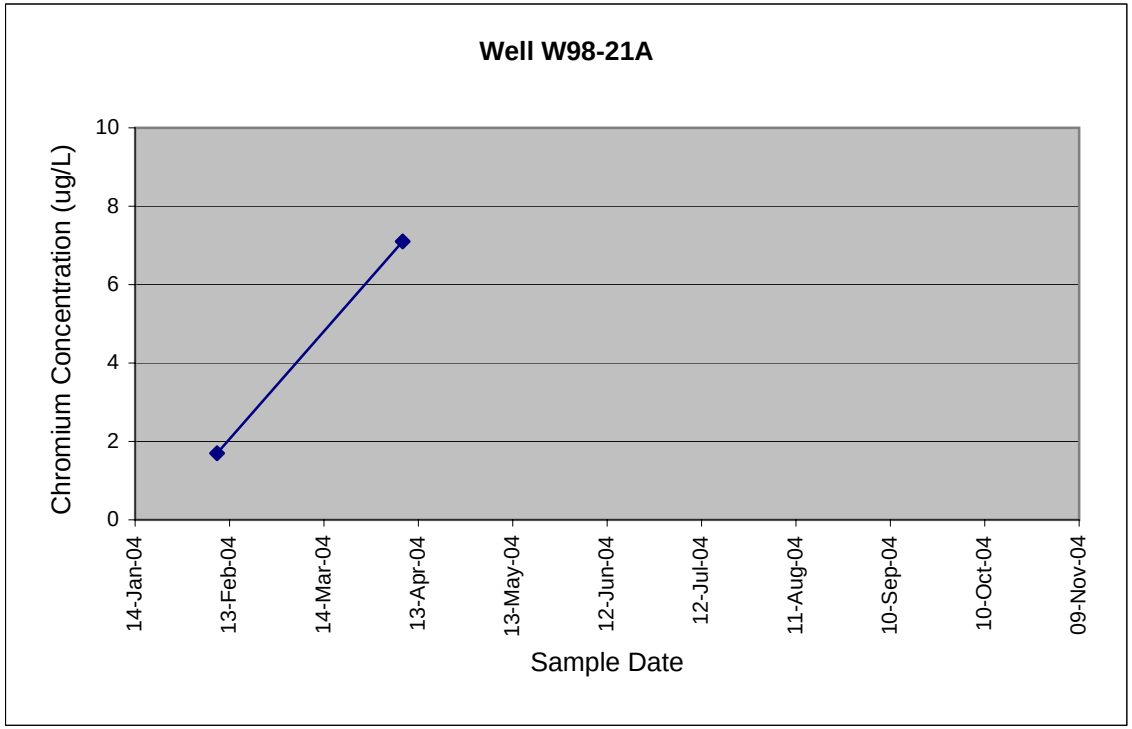
Well W99-R5B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AJ5	Water	07-Feb-04	CHROMIUM	7.5	UG/L	J	W99-R5B	Total
MJ2BL4	Water	9-Apr-04	CHROMIUM	9.9	UG/L	J	W99-R5B	Total



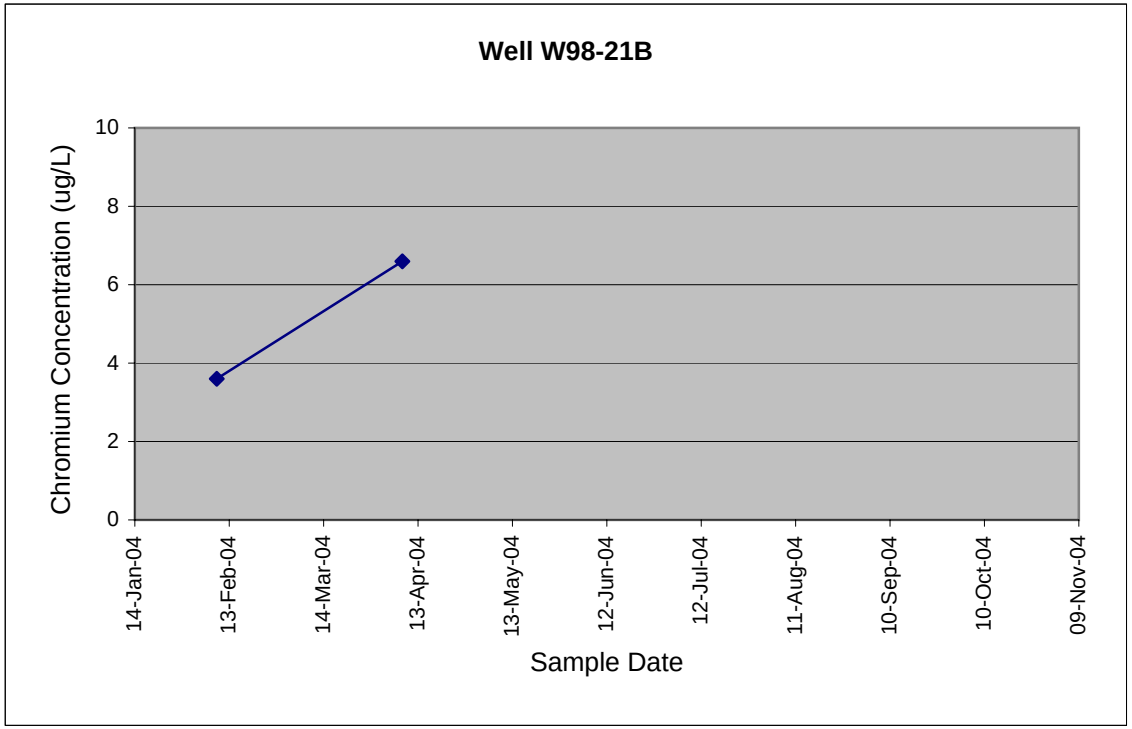
Well W98-21A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AJ6	Water	09-Feb-04	CHROMIUM	1.7	UG/L	J	W98-21A	Total
MJ2BK8	Water	8-Apr-04	CHROMIUM	7.1	UG/L	J	W98-21A	Total



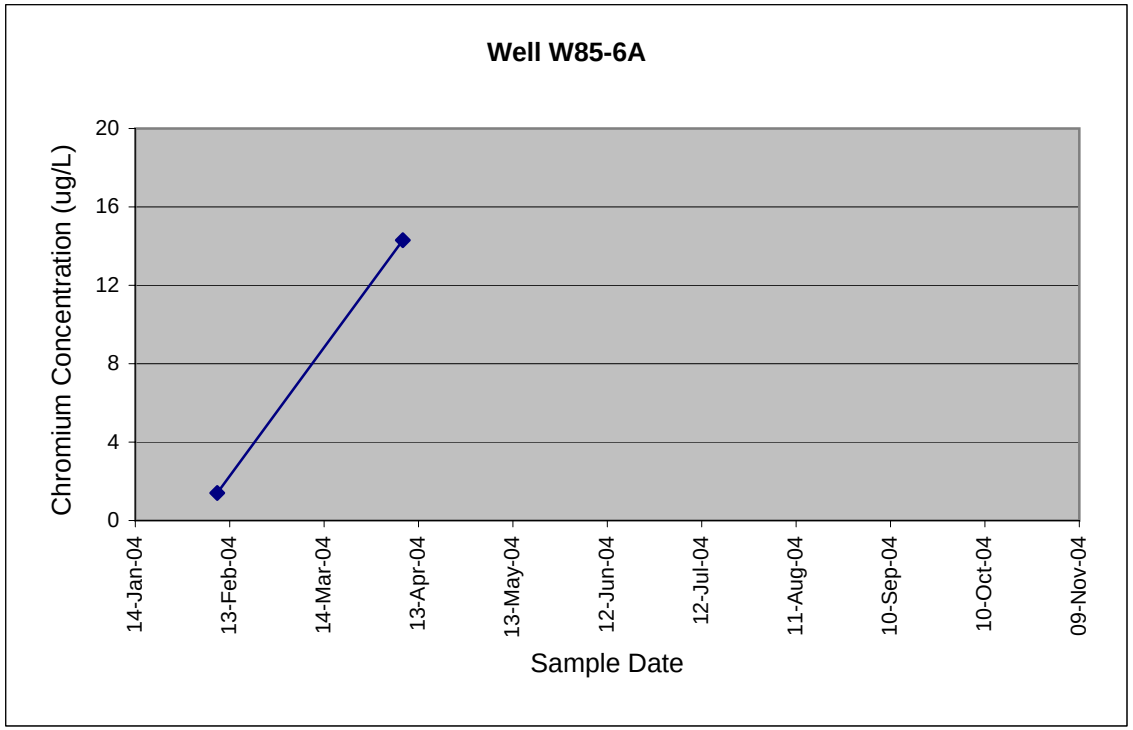
Well W98-21B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AJ7	Water	09-Feb-04	CHROMIUM	3.6	UG/L	J	W98-21B	Total
MJ2BK9	Water	8-Apr-04	CHROMIUM	6.6	UG/L	J	W98-21B	Total



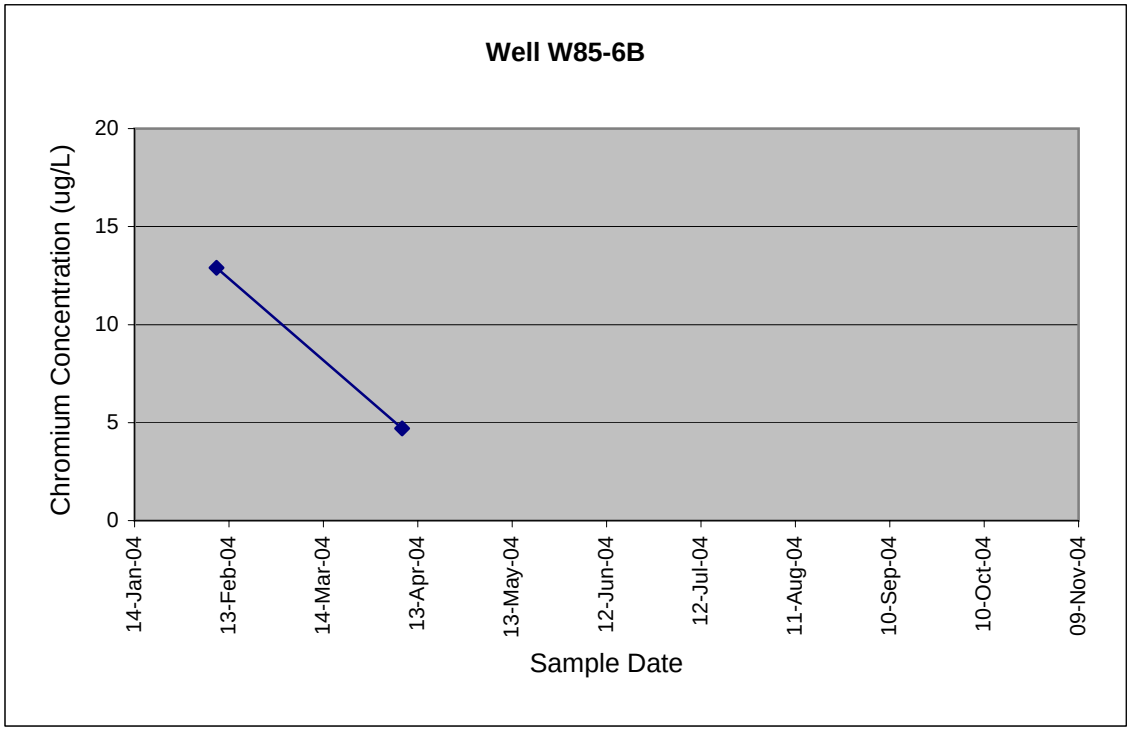
Well W85-6A

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AJ8	Water	09-Feb-04	CHROMIUM	1.4	UG/L	J	W85-6A	Total
MJ2BL0	Water	8-Apr-04	CHROMIUM	14.3	UG/L		W85-6A	Total



Well W85-6B

EPA Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes
MJ2AJ9	Water	09-Feb-04	CHROMIUM	12.9	UG/L		W85-6B	Total
MJ2BL1	Water	8-Apr-04	CHROMIUM	4.7	UG/L	J	W85-6B	Total



APPENDIX B

DATA VALIDATION MEMORANDUM

EXCEPTION SUMMARY FOR LABORATORY DATA QUALITY ASSURANCE REVIEW

1. DATA SUMMARY

The laboratory data quality assurance review and validation of 41 water samples, laboratory groups MJ2BG5, MJ2BH0, MJ2BH8, and (CLP), A04-0410 (Sentinel) and TEC-410Y (ESAT/MEL) analyzed between 04/05/2004 and 04/22/2004 following collection from the Frontier Hard Chrome site Long-Term Monitoring project, has been completed. Samples were analyzed for:

- Target Analyte List (TAL) metals by Sentinel, Inc., of Huntsville, Alabama, following EPA CLP SOW ILM05.2,
- Hexavalent chromium by the EPA Region 10 ESAT team on-site, following the ESAT SOP for Hach test kit #26672 (colorimetry),

Quality assurance/quality control (QA/QC) reviews of laboratory procedures were performed on an ongoing basis by the laboratory. A data review was performed on laboratory quality control results summary sheets to ensure they met data quality objectives for the project. Data review followed the format outlined in the *National Functional Guidelines for Inorganic Data Review* (EPA 1994) modified to include specific criteria of the individual analytical methods. Raw laboratory data including calibrations, sample login forms, sample preparation logs and bench sheets, quantitation reports, mass spectra, and chromatograms are kept on file at the laboratory.

This is an exception summary. All laboratory quality assurance results as applicable (e.g., holding times, blank sample analysis, matrix spike/duplicate analysis, laboratory control sample analysis) supplied to Weston for the analyses met acceptance criteria specified in the *Frontier Hard Chrome Long-Term Monitoring Plan* (Weston 2004), with the following exceptions:

2. TAL METALS

1) Aluminum, arsenic, beryllium, calcium, chromium, copper, iron, selenium, vanadium, and zinc were detected in one or more preparation blanks. Associated analyte results were qualified as non-detected (U) at an elevated reporting limit.

2) Potassium exceeded the control criterion in one or more serial dilution samples. Detected potassium results were qualified as estimated (J).

3) Lead recovery from one interference check sample (ICS) exceeded the upper control limit. Lead was not detected in any samples. One detected lead result was qualified as estimated (J).

4) Based on the validation review of results from SDG MJ2BK1, additional data qualifiers were added. Aluminum, potassium, and zinc were detected in the rinse blank associated with this SDG. Sample results less than five-times the blank concentrations of these analytes were flagged as non-detected (J).

No other QA/QC exceptions were noted in the data review. Upon consideration of the data qualifications noted above and the project data quality objectives specified in the QAPP, the data are ACCEPTABLE for use except where flagged with data qualifiers that modify the usefulness of the individual values.

3. DATA QUALIFIERS

Any data qualifiers applied by the laboratory have been removed from the data summary sheets and superceded by data validation qualifiers as follow:

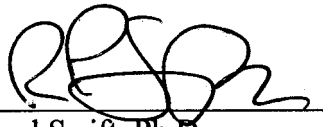
The following qualifiers were used to modify the data quality and usefulness of individual analytical results.

U	The analyte was not detected at the given quantitation limit.
J	The analyte was positively identified and detected; however, the concentration is an estimated value because the result is less than the quantitation limit or quality control criteria were not met.
UJ	The analyte was not detected; the associated quantitation limit is an estimated value.

4. DATA ASSESSMENT

Data review was performed by an experienced quality assurance chemist independent of the analytical laboratory and not directly involved in the project.

This is to certify that I have examined the analytical data and based on the information provided to me by the laboratory, in my professional judgment the data are acceptable for use except where qualified with qualifiers that modify the usefulness of those individual values.



06/07/2004

R. Paul Swift, Ph.D. Date
Chief Chemist