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River Corridor
Closure Contract

Groundwater, Leachate, and Lysimeter Monitoring and Sampling at the ERDF, CY 2011

June 2012

Washington Closure Hanford

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Authors:
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EXECUTIVE SUMMARY

This document reports the findings of the groundwater, leachate, and lysimeter monitoring and sampling at the Environmental Restoration Disposal Facility (ERDF) for calendar year (CY) 2011. The ERDF is a Hanford Site low-level mixed waste disposal facility that was brought into service on July 1, 1996. Baseline sampling and analytical data obtained from monitoring wells and the ERDF leachate collection system were used to determine contaminants of concern (COCs) and background conditions for long-term monitoring as described in the *Groundwater Protection Plan for the Environmental Restoration Disposal Facility*[1] and to meet the requirements of the ERDF Record of Decision (ROD)[2].

The purpose of this annual monitoring report is to evaluate the conditions of and identify trends for groundwater beneath the ERDF and report leachate results in fulfillment of the requirements specified in the ERDF ROD[2] and the ERDF Amended ROD[3]. The overall objective of the groundwater monitoring program is to determine whether ERDF has impacted the groundwater. This objective is complicated by the fact that the ERDF is situated downgradient of the numerous groundwater contamination plumes originating from the 200 West Area.

Each of the ERDF cells is constructed with a double-liner system for the purpose of collecting liquids, or leachate, that may travel through the waste materials stored at the disposal site. These liquids are typically generated from natural precipitation and the application of dust control water that percolates downward through the disposed waste materials and collects on the surface of the lining material. The primary liners and the secondary liners each are designed to deliver leachate to sump areas. Sumps for the primary liners are independent from the sumps associated with the secondary liners. The primary and secondary sumps at each of the cells are routinely evacuated, and the leachate is stored in holding tanks prior to transfer to the Effluent Treatment Facility.

[1] BHI-00079, 1996, *Groundwater Protection Plan for the Environmental Restoration Disposal Facility*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

[2] EPA, 1995, *Record of Decision for the Environmental Restoration Disposal Facility, Hanford Site, 200 Area, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

[3] EPA, 1999, *Amended Record of Decision, Decision Summary and Responsiveness Summary for the Environmental Restoration Disposal Facility, Hanford Site – 200 Area, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

The leachate in the storage tanks are sampled semiannually to provide data to maintain leachate delisting status, to provide confirmation that Effluent Treatment Facility acceptance criteria are continuing to be met, and to assess whether additional COCs should be added to the routine ERDF groundwater monitoring program.

The ERDF groundwater monitoring program is part of the larger Hanford Site groundwater monitoring program, in which groundwater sampling is conducted across the entire Hanford Site. Groundwater samples are collected semiannually from four monitoring wells in the vicinity of the ERDF. The monitoring well network consists of one upgradient well (699-36-70A) and three downgradient wells (699-37-66, 699-35-66A, and 699-36-66B). Groundwater monitoring wells in the ERDF well network have exhibited a gradual rate of decline in water levels since monitoring was initiated in September 1995. Water-level measurements collected during CY 2011 from wells 699-35-66A and 699-36-70A show a rate of decline that may be starting to stabilize.

Based on the CY 2011 analytical results, the statistical analysis of monitoring data, an evaluation of the groundwater, leachate, and lysimeters monitoring data, and a review of the water-level measurement data, the following information is offered:

Nitrogen, carbon tetrachloride, gross beta, technetium-99, iodine-129, and uranium present in samples collected from the ERDF monitoring wells are due to the migration of contaminants from non-ERDF sources in the 200 West Area. The two new groundwater wells (699-37-66 and 699-36-66B) appear to have been placed within the existing groundwater contamination plume that has been slowly moving in the downgradient direction underneath ERDF. This may extend the time period needed to allow contaminant peaks from historical releases in the 200 West Area to pass the downgradient wells due to the increased travel time of the groundwater between monitoring locations. The contaminant peak appears to have passed the upgradient well around CY 2005, establishing a slight downward trend in contamination levels there.

Groundwater activity from gross beta indicates a long-term upward trend in the downgradient wells with the upgradient well showing some decline after peaking in 2000 and 2001 and has remained below the upper tolerance level following 2004. Groundwater activity from uranium has remained stable with a downward trend. Levels of technetium-99 in the downgradient wells have shown a trend of increasing concentrations, while the upgradient well has shown a trend of decreasing concentrations. This is a good indication that the groundwater contaminant plume from the 200 West Area is moving in the easterly direction and beginning to impact the downgradient wells. Groundwater activity from uranium, technetium-99, gross alpha, and gross beta will continue to be monitored in future sampling to evaluate the data for adverse impacts from ERDF leachate to the groundwater at this location.

Arsenic concentrations remain well below Hanford Site background reference values. Historical analysis has shown periodic spikes in the groundwater data, while September 2009 samples show concentrations in the wells back within the general trend line. No Hanford Site-derived sources for arsenic have been identified for potential impact in the groundwater under ERDF. Pre-Hanford use of arsenic in agriculture may be the source of this contamination.

Chromium levels in the downgradient well 699-35-66A have historically been elevated, and after slightly increasing appear to have stabilized at a level greater than the upper tolerance interval. All other wells are stable at a level below the upper tolerance interval. The source of the elevated levels do not appear to be ERDF related and appear to be related to the groundwater contaminant plume from the 200 West Area.

Total organic halide concentrations significantly spiked in downgradient wells during CY 2006 monitoring and were detected again in the newly installed downgradient wells in CY 2008 sampling. The two new groundwater wells (699-37-66 and 699-36-66B) appear to have been placed within the existing groundwater contamination plume that has been slowly moving in the downgradient direction from ERDF. Analysis has shown periodic spikes in the groundwater data in the past. No correlations can be seen between total organic halide results and the volatile organic analyses (VOA) performed at the same time (VOA will report unexpected detections of chlorinated organics, the most likely contributor to total organic halide results). Total organic halide analysis is only an indicator analysis. Any future indication of consistent contamination will be evaluated to establish the source and composition of the compounds.

Trends in the leachate indicate decreasing gross alpha, gross beta, and uranium activity in samples collected over the past 3 years. Groundwater monitoring data for these constituents were examined to determine potential impacts to groundwater from ERDF operations.

Based on this CY 2011 data evaluation, there has been no correlation between leachate COC levels and groundwater COC levels that would indicate the leachate is impacting the groundwater under ERDF. Therefore, no additional analytes are recommended for the groundwater monitoring program or the routine leachate sampling. The current monitoring frequency appears to be appropriate for future monitoring needs.

The source of the liquid within the lysimeters is from the vadose zone located beneath the ERDF cell liner and is made up of compaction moisture from the admix layer located immediately above the lysimeter, construction water, consolidation water, and/or condensation water. The absence of technetium-99 within the lysimeter liquid is a very good indicator that the leachate collection system located above the lysimeters is not leaking liquid into the lysimeters. This is based on technetium-99's high solubility and ease of mobility through soils when soluble; there are no detectable levels of technetium-99 within the lysimeter liquid. Additional supporting evidence is the high sulfate concentration in the lysimeter liquid in comparison to the leachate, indicating there is no effective dilution of the lysimeter liquid.

Dewatering activities appear to have reduced significant amounts of lysimeter water, total suspended solids, and total dissolved solids within the lysimeter sumps.

The Biennial Waste Stream Evaluation and Confirmatory Leachate Sampling report has been included in the annual report. In the confirmatory leachate sampling for all COCs, an evaluation of analytical data obtained from the ERDF leachate collection system is used to confirm that no constituents were present in the leachate at levels exceeding the established delisting values. Typically, this evaluation occurs after receipt of the results from the biennial "long list" analysis normally performed during the September leachate sampling in even numbered years.

No upward trends can be noted for any of the analytes for which delisting values have been established. The concentrations of contaminants in the ERDF leachate have not changed significantly in recent years and there are no indications for potential to exceed delisting levels for any constituent.

TABLE OF CONTENTS

1.0 INTRODUCTION ... 1-1

1.1 PURPOSE AND OBJECTIVES ... 1-1

2.0 BACKGROUND ... 2-1

2.1 GENERAL DESCRIPTION ... 2-1

2.2 ENVIRONMENTAL RESTORATION DISPOSAL FACILITY ... 2-1

2.2.1 Leachate System ... 2-1
2.2.2 Lysimeter System ... 2-4

3.0 GROUNDWATER AND LEACHATE MONITORING ... 3-1

3.1 GROUNDWATER SAMPLING ... 3-1

3.1.1 General Approach to Evaluating Results ... 3-2
3.1.2 Statistical Approach to Evaluating Results ... 3-3
3.1.3 Determination of Tolerance Intervals ... 3-4

3.1 SUMMARY OF GROUNDWATER ANALYSES ... 3-4

3.2 GROUNDWATER LEVELS ... 3-8

3.3 SUMMARY OF WATER LEVEL MEASUREMENTS ... 3-11

3.4 LEACHATE SAMPLING ... 3-11

3.5 SUMMARY OF LEACHATE ANALYSIS ... 3-11

4.0 LYSIMETER MONITORING AND SAMPLING ... 4-1

4.1 PURPOSE AND OBJECTIVES ... 4-1

4.2 LYSIMETER MONITORING AND SAMPLING ... 4-1

4.2.1 Camera Inspection and Dewatering ... 4-1

4.3 LYSIMETER SAMPLING ... 4-3

4.3.1 General Approach to Evaluating Results ... 4-3

4.4 SUMMARY OF LYSIMETER ANALYTICAL RESULTS ... 4-5

4.5 SUMMARY OF LYSIMETER ANALYSIS ... 4-6

5.0 ERDF BIENNIAL WASTE STREAM EVALUATION AND CONFIRMATORY LEACHATE SAMPLING RESULTS (NOVEMBER 2008 – OCTOBER 2010) ... 5-1

6.0 REFERENCES......6-1

APPENDICES

A GROUNDWATER SAMPLING RESULTS, 1996-2011......A-i
B GROUNDWATER SAMPLING TRENDS, 1996-2011......B-i
C LEACHATE SAMPLING RESULTS SUMMARY, 2009-2011...... C-i
D LEACHATE SAMPLING TRENDS, 1998-2011...... D-i
E LYSIMETER SAMPLING RESULTS SUMMARY, CY 2011 ......E-i
F ERDF LEACHATE DELISTING EVaLuATION, 2008 – 2010......F-i

FIGURES

2-1. Location of the Environmental Restoration Disposal Facility. 2-2
2-2. The ERDF Monitoring Well Location Map......2-3
3-1. Water-Level Contour Map. 3-9
3-2. Hydrograph from the ERDF Groundwater Monitoring Wells. 3-10

TABLES

3-1. List of Groundwater Analytes by Analytical Method......3-1
3-2. Summary of Tolerance Interval Comparisons and Trends......3-5
4-1. Lysimeter Dewatering Activity. 4-3
4-2. List of Baseline Lysimeter Analytes by Analytical Method 4-4

ACRONYMS

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
COC	contaminant of concern
CY	calendar year
ERDF	Environmental Restoration Disposal Facility
ERDF GPP	*Groundwater Protection Plan for the Environmental Restoration Disposal Facility*
ETF	Effluent Treatment Facility
RCRA	*Resource Conservation and Recovery Act of 1976*
ROD	Record of Decision
SAP	sampling and analysis plan

1.0 INTRODUCTION

The Environmental Restoration Disposal Facility (ERDF) is a Hanford Site low-level mixed waste disposal facility that was brought into service on July 1, 1996. Baseline sampling and analytical data obtained from monitoring wells and the ERDF leachate collection system were used to determine contaminants of concern (COCs) and background conditions for long-term monitoring as described in the *Groundwater Protection Plan for the Environmental Restoration Disposal Facility* (ERDF GPP) (BHI 1996) and to meet the requirements of the ERDF Record of Decision (ROD) (EPA 1995). Based on about 10 years of ERDF monitoring activities and statistical evaluations of the data, the ERDF GPP (WCH 2008b) was revised and a new *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan* (SAP) (WCH 2008a) was approved. Any new requirements or changes in evaluation that were recommended by the new ERDF GPP and SAP are included in this report and will be in future reports. Ongoing groundwater and leachate monitoring are performed to meet the requirements of the ERDF ROD, and details of the monitoring program are described in the revised ERDF GPP (WCH 2008b) and the ERDF Amended ROD (EPA 1999).

1.1 PURPOSE AND OBJECTIVES

The purpose of this annual monitoring report is to evaluate the conditions of and identify trends for groundwater beneath the ERDF, and to report leachate results in fulfillment of the requirements specified in the ERDF ROD (EPA 1995) and the ERDF Amended ROD (EPA 1999). The objectives of this report are as follows:

- Review routine groundwater sampling data to statistically evaluate if there have been changes in COC concentrations over time that may be attributed to ERDF operations
- Assess conditions that may indicate the presence of encroaching groundwater contaminant plumes originating from upgradient sources in the 200 West Area
- Assess data from routine ERDF leachate sampling to determine if additional constituents should be added to the ERDF groundwater monitoring COCs list and to confirm that leachate concentrations do not exceed delisting levels specified in the ERDF Amended ROD (EPA 1999)
- Evaluate the groundwater levels in the ERDF monitoring wells to determine if the existing wells need to be modified or replaced
- Biennially evaluate waste streams disposed at the ERDF as part of the delisted criteria for the leachate
- Describe and evaluate the conditions and identify trends of the ERDF lysimeter system as related to the vadose zone monitoring and changes in the volume of liquid in the lysimeters
- Describe and evaluate the sample data, identify changes or trends in the data, and incorporate a summary of the results.

Appendix A shows analytical results for groundwater samples that were collected from the ERDF monitoring well network from calendar year (CY) 1996 through CY 2011. Appendix B graphically shows trends in the monitoring data resulting from routine groundwater sampling in the ERDF well network. The most recent 3 years of leachate analytical results for samples collected from CY 2009 through CY 2011 are presented in Appendix C. Leachate data collected from CY 1996 through CY 2010 are contained in previous ERDF groundwater and leachate monitoring reports (Faurote 2000; BHI 2002, 2003, 2004, 2005; WCH 2006b, 2007, 2008a, 2009c, 2010b, 2011b). Lysimeter data collected from CY 1996 through CY 2010 are contained in previous ERDF lysimeter monitoring reports (WCH 2006a, 2009a, 2010a, 2011a).

2.0 BACKGROUND

2.1 GENERAL DESCRIPTION

The ERDF site is located between the 200 East and 200 West Areas of the Hanford Site (Figure 2-1). This location was selected for the ERDF over other possible locations because of the depth to groundwater in this area, its location above pre-existing groundwater plumes, the relatively flat topography in this area, and the compatibility of this location with stakeholder recommendations.

The ERDF landfill is authorized under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). The landfill was designed to meet the *Resource Conservation and Recovery Act of 1976* (RCRA) minimum technology requirements; however, the ERDF is not permitted as a RCRA facility. Wastes disposed at ERDF contain elevated levels of radionuclides and hazardous constituents originating from the 100, 200, and 300 Area waste sites.

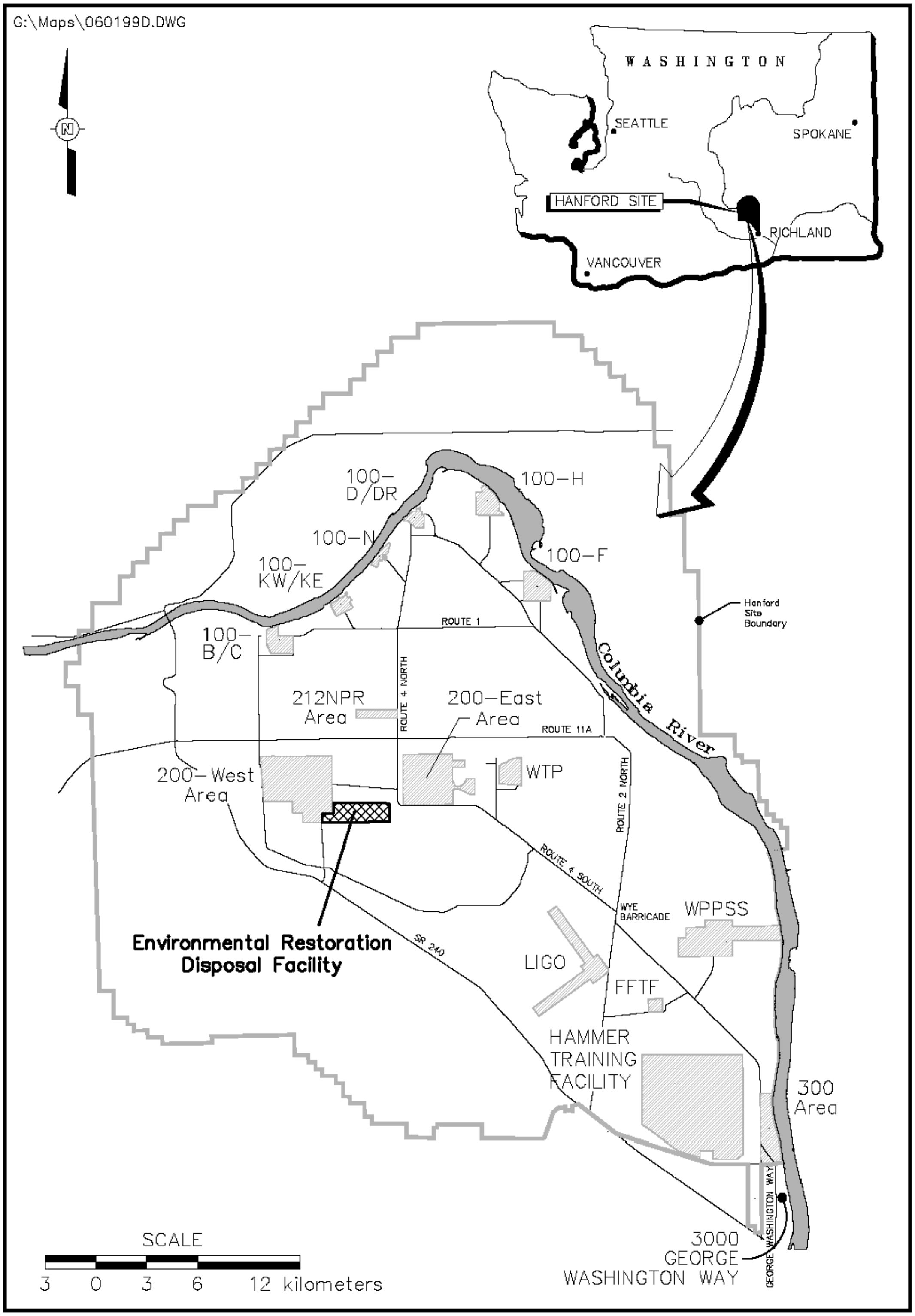
2.2 ENVIRONMENTAL RESTORATION DISPOSAL FACILITY

ERDF was designed as a series of side-by-side cells that measure 21.3 m (70 ft) in depth, 152.4 by 152.4 m (500 ft) wide at the base, with a wall slope of 3:1 to measure over 304 m (1,000 ft) wide at the surface. There are currently ten waste cells associated with the ERDF site. Initially, cells 1 and 2 were constructed and the placement of waste in these cells has since been completed. An interim cover has been constructed over these cells consisting of a plastic membrane and 30.5 m (1 ft) of soil. Cells 3 and 4 were constructed in 2000 and the placement of waste in these cells has been completed. Construction of cells 5 and 6 was completed during 2004 and cells 7 and 8 started receiving waste during the first half of CY 2009. Construction of super cells 9 and 10 was completed in early 2011. Figure 2-2 shows the ERDF as it is currently constructed. Throughout CY 2011, approximately 1,807,596 metric tons of remediation wastes were disposed at the facility.

2.2.1 Leachate System

Each of the ERDF cells was constructed with a double-liner system for the purpose of collecting liquids, or leachate, that may travel through the waste materials stored at the disposal site. These liquids are typically generated from natural precipitation and the application of dust control water that percolates downward through the disposed waste materials and collects on the surface of the lining material. The primary (upper) and secondary (lower) liners each are designed to deliver leachate to sump areas. Sumps for the upper liners are independent from the sumps associated with the lower liners. The upper and lower sumps at each of the cells are routinely evacuated, and the leachate is stored in holding tanks prior to transfer to the Effluent Treatment Facility (ETF).

Figure 2-1. Location of the Environmental Restoration Disposal Facility.



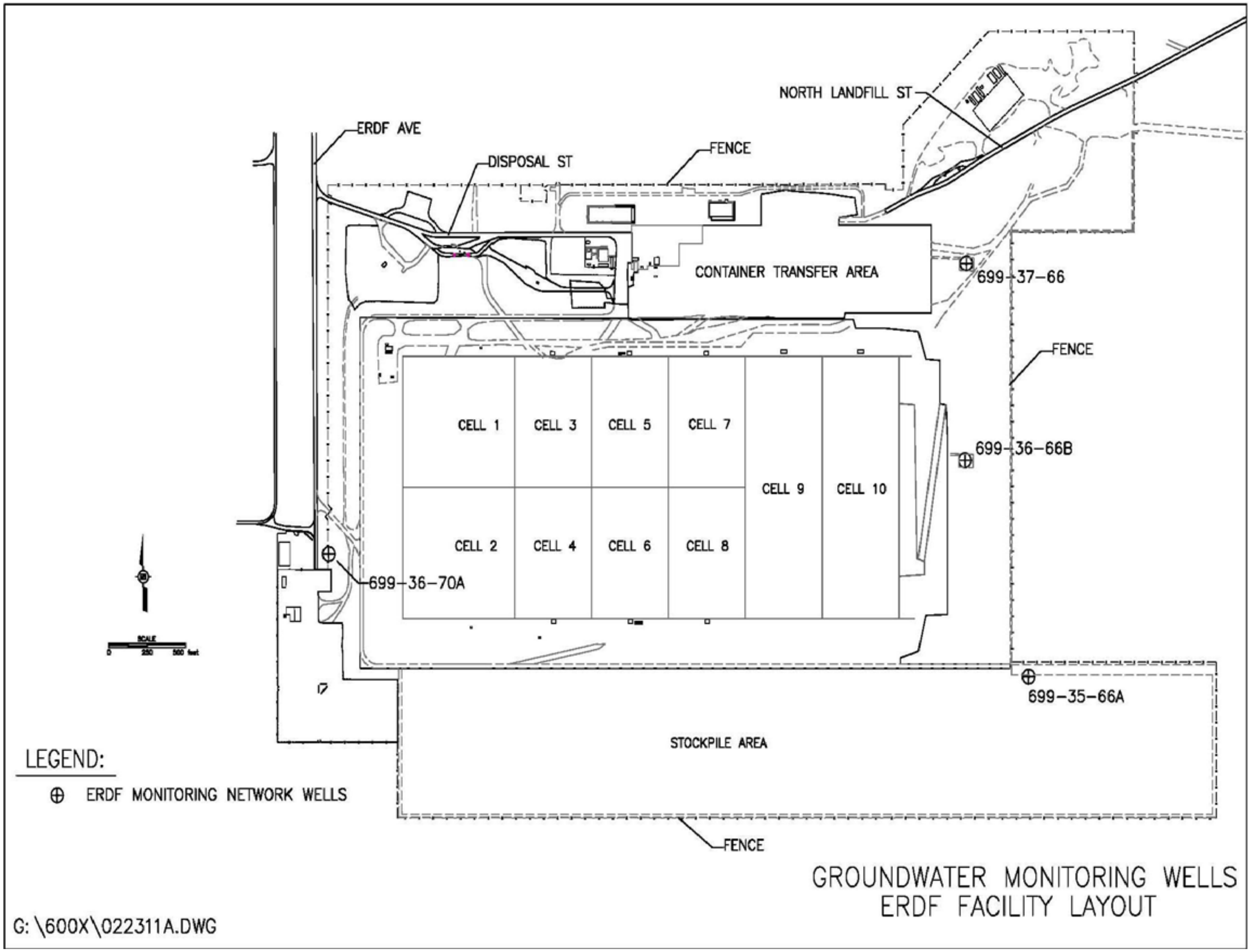


Figure 2-2. The ERDF Monitoring Well Location Map.

2.2.2 Lysimeter System

The gravity collection lysimeters (basin lysimeters) were constructed in response to the *Study of Vadose Zone Monitoring at the Hanford Site, Task 1, Use in New Cells at the Environmental Restoration Disposal Facility* (DOE-RL 2003). This study was performed by Fluor Hanford for the U.S. Department of Energy, Richland Operations Office (DOE-RL). The purpose of the study was to report on the status of vadose zone monitoring and to recommend measures that could be taken at the Hanford Site to further develop the technology of vadose zone monitoring.

The lysimeter design selected from the study for installation under the ERDF cells was a basin lysimeter. These are constructed by excavating a sloping recession within the cell sub-grade beneath the composite liner system and installing an approximate 380.9-m^2 (4,100-ft^2) liner into the area. A 15-cm (6-in.)-diameter perforated pipe section is laid atop the lysimeter liner and connected to a 15-cm (6-in.)-diameter high-density polyethylene piping that is installed to the upper edge of the cell area.

This type of lysimeter is not configured to detect small increases in liquid accumulation. A thick-walled, 15-cm (6-in.)-diameter pipe is laid flat on the bottom of a collection area of approximately 50.7 m^2 (546 ft^2) and increasing to 380.9 m^2 (4,100 ft^2) at the top of the lysimeter. The lysimeter has an approximate capacity to contain 181,699 L (48,000 gal) within the available pore space of the gravel.

The vadose zone monitoring activities described herein are expected to continue until after the final landfill cap is installed and the annual quantity of leachate collected in the secondary leachate collection and removal system is shown to be insignificant (i.e., less than the amount needed to activate the removal pumps).

3.0 GROUNDWATER AND LEACHATE MONITORING

The groundwater and leachate monitoring program is described in the ERDF GPP (WCH 2008b). This section provides an overview of these monitoring requirements.

3.1 GROUNDWATER SAMPLING

Groundwater samples are collected semiannually from four monitoring wells in the vicinity of the ERDF. This monitoring well network is scheduled for routine sampling during the first and third quarters of each year. The monitoring well network consists of one upgradient well (699-36-70A) and three downgradient wells (699-37-66, 699-35-66A, and 699-36-66B). During CY 2011, groundwater sampling was completed at all of the ERDF monitoring wells in April and November. Well locations are shown in Figure 2-2.

The COCs for routine monitoring were determined based on the results of preoperational baseline sampling, conducted in March 1996, and known contaminant plumes beneath the ERDF. Additional COCs may be added to the groundwater monitoring program if analytical results from leachate sampling indicate it is warranted. To date, no additional COCs have been identified for addition to the groundwater lists based on leachate analysis results. Table 3-1 lists the analytes for the groundwater monitoring program.

Routine groundwater sampling has been conducted since ERDF operations commenced. Sampling at the ERDF groundwater wells was not completed during March 2000 due to a Hanford Site moratorium on groundwater sampling. Well 699-37-68 was not sampled during September 2000 because of problems with a dedicated monitoring well pump (BHI 2004). Groundwater wells 699-37-68 and 699-36-67 were decommissioned in 2007 due to construction of ERDF waste cells 7 and 8. Groundwater monitoring wells 699-37-66 and 699-36-66B were installed as replacement downgradient wells.

Table 3-1. List of Groundwater Analytes by Analytical Method. (2 Pages)

Analyte	Method[a]	Practical Quantitation Limit	Accuracy[b] (%)	Precision[b] (%)
Arsenic	6010A	10 μg/L	±25	±25
Barium	6010A	20 μg/L	±25	±25
Chromium	6010A	70 μg/L	±25	±25
Lead	6010A	40 μg/L	±25	±25
Selenium	6010A	750 μg/L	±25	±25
Tin	6010A	30 μg/L	±25	±25
Vanadium	6010A	80 μg/L	±25	±25
Zinc	6010A	20 μg/L	±25	±25
Carbon tetrachloride	8260B	5 μg/L	±25	±25
Alkalinity	310.1[c]	10,000 μg/L	±20	±25

Table 3-1. List of Groundwater Analytes by Analytical Method. (2 Pages)

Analyte	Method[a]	Practical Quantitation Limit	Accuracy[b] (%)	Precision[b] (%)
Chloride	300[d]	10,000 μg/L	±20	±25
Fluoride	300[d]	100 μg/L	±20	±25
Nitrogen (in nitrite/nitrate)	353.1	0.05 μg/L	±20	±25
Sulfate	300[d]	2,000 μg/L	±20	±25
Total dissolved solids	160.1[c]	10,000 μg/L	±20	NA
Total organic halides	9020	5 μg/L	±20	NA
Carbon-14	[e]	200 pCi/L	±20	±25
Iodine-129	[e]	5 pCi/L	±20	±25
Technetium-99	[e]	10 pCi/L	±20	±25
Radium	903.1[f]	1 pCi/L	±20	±25
Total uranium	[e]	0.1 μg/L	±20	±25
Gross alpha	900.0[f]	3 pCi/L	±20	±25
Gross beta	900.0[f]	4 pCi/L	±20	±25
pH	[g]	NA	NA	NA
Specific conductance	[g]	25 μS/cm	±20	NA
Turbidity	180.1[c]	0.05 NTU	±0.05 NTU	NA

[a] Method number indicated is from *Test Method for Evaluating Solid Wastes: Physical Chemical Methods* (SW-846) (EPA 1986), unless otherwise specified.
[b] Accuracy is expressed as percent recovery; precision is expressed as a percent relative difference.
[c] Method specified is from *Methods for Chemical Analysis of Water and Wastes* (Kopp and McKee 1983).
[d] Method specified is from *Determination of Inorganic Anions in Aqueous and Solids Samples by Ion Chromatography* (Lindahl 1984), and is a modification of EPA Method 300.0 (EPA 1993).
[e] Industry standard method, laboratory-specific, based on acceptance by Washington Closure Hanford.
[f] Method specified is from *Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA 1989).
[g] Parameter will be measured in the field.

NA = not available, or not applicable
NTU = nephelometric turbidity units

3.1.1 General Approach to Evaluating Results

Groundwater samples collected from the ERDF monitoring well network were analyzed in accordance with the requirements of the U.S. Environmental Protection Agency (EPA) SW-846 (EPA 1986), industry standard, or laboratory-specific test methods (Table 3-1). Laboratory results for these samples were entered into the Hanford Environmental Information System, a Hanford Site database that contains environmental analytical data. Groundwater monitoring data contained in the Hanford Environmental Information System were evaluated to identify the analytical results needed for inclusion in this report. The following data selection and evaluation criteria were applied:

- Quality assurance/quality control data were evaluated for the purpose of identifying potential collection or analytical problems. However, unless a problem with the data was identified during this review, the results or discussion regarding the quality assurance/quality control data were not included in this report.

- All data qualifiers were recorded.

- If the relative percent difference between values reported for main and duplicate samples was greater than 20%, the samples were flagged in the data spreadsheet and the data evaluated to determine their applicability.

- Data acceptance based on a less than 20% relative difference criterion was relaxed for analytical results reported at or near the method detection limit (e.g., typically within five times the detection limit). This allows for an expected increased analytical error when values are close to the detection limit.

- Only analytical results for metals from filtered groundwater samples were used for metals evaluation.

3.1.2 Statistical Approach to Evaluating Results

The statistical analysis of ERDF groundwater monitoring data is based on the ERDF GPP (WCH 2008b) and *Hanford Site Groundwater Monitoring: Setting, Sources and Methods* (PNNL 2000). The ERDF GPP requires that background water quality be established from four consecutive groundwater sampling events using one of two methods. The groundwater quality background conditions can be determined using either facility-wide data or historical data from each well in the monitoring network. The first approach (facility-wide) results in a single background value for the site for each constituent to which subsequent groundwater quality data are compared; this is referred to as an interwell comparison (PNNL 2000).

The second approach (historical) results in background water quality data for each well to which the subsequent groundwater quality data are compared; this approach is referred to as an intrawell comparison (PNNL 2000).

The interwell approach has been selected and used for the ERDF groundwater monitoring program. This method will allow for the consideration of impacts from non-ERDF sources.

For each analyte of interest identified in the ERDF GPP, data from four pre-operational sampling events at each of the four ERDF monitoring wells were grouped together into data sets. The average concentration, activity, or other appropriate measure for each analyte was determined, and the tolerance interval for each analyte was calculated. Data from the subsequent semiannual monitoring events are compared to background levels and tolerance intervals. Those constituents observed to have levels outside of the tolerance interval are evaluated to determine whether the deviation may be related to an ERDF or non-ERDF source(s).

Where analytical results report a nondetect, the detection limit value is used in this assessment. If a current measurement exceeds a tolerance interval based on the reported detection limit, it is not considered to be a confirmed exceedance and is discussed qualitatively.

3.1.3 Determination of Tolerance Intervals

The tolerance interval represents a concentration range that contains a specified proportion of the population with a specified probability (PNNL 2000). Both the upper and lower bounds of the interval (two-sided) were calculated. The parametric tolerance interval was determined using the following equation:

$$TI = X_b + k * S_b \text{ (two-sided)}$$

where:

k	=	normal tolerance factor, which depends on the number of background samples (n), coverage (P%), and the confidence level (Y)
X_b	=	mean of background concentrations
S_b	=	sample standard deviation
TI	=	tolerance interval.

Coverage of 95% and a confidence level of 95% were used to determine the parametric tolerance interval. Application of this equation assumes that a normal (or lognormal) distribution is a reasonable approximation of the background concentrations.

3.2 SUMMARY OF GROUNDWATER ANALYSES

The groundwater results were used to measure analytical and statistical variability. The statistical basis for comparison of the groundwater analysis results is presented in Section 3.1.2 of this report. Analytical results reported for groundwater samples, collected from the ERDF monitoring well network are presented in Appendix A. The analyte trend plots summarizing groundwater monitoring results are included in Appendix B and have been revised to reflect the new tolerance limits for CY 2007 data onward (WCH 2008b). The tolerance limits show an overlap in the graphical presentations in Appendix B to better show changes. The original tolerance intervals apply to pre-2007 sampling; the new tolerance limits apply only to CY 2007 and later sampling.

Groundwater monitoring results and apparent trends based on CY 2011 data are summarized in Table 3-2.

Table 3-2. Summary of Tolerance Interval Comparisons and Trends. (3 Pages)

Analyte	Upper Tolerance Interval[a]	Well(s) Exceeding Upper Tolerance Interval in CY 2011[b]				Comments
		70A	66A	66B	66	
Arsenic	4.2 μg/L	No	No	No	No	Arsenic concentrations in all wells 66 and 66B had non-detectable levels that exceeded the tolerance level for the September 2011 sample event. All arsenic detections are very close to analytical detection limits (i.e., higher analytical uncertainty). It should also be noted that the reported arsenic detects for CY 2011 remained below the Hanford Site background levels listed in the ERDF GPP (WCH 2008b) for arsenic (11.8 μg/L).
Barium	122.3 μg/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval and stable with regards to previous years for the established wells. Well 66 showed the highest recordable levels of all the wells, but remains below the tolerance level.
Chromium	13.4 μg/L	No	Yes	No	No	Chromium levels in 66A are elevated relative to the tolerance limit, but have not changed significantly from previous years. The other wells were all below the upper tolerance level.
Lead	5 μg/L	Yes	Yes	Yes	Yes	Lead concentrations for CY 2011 sampling were detected slightly above the upper tolerance level in the March 2011 samples; however, lead was not detected during the September 2011 samples. Levels have been consistent with previous analyses and appear stable.
Selenium	5.6 μg/L	No	No	No	No	Nondetect results exceeding the tolerance were noted. All detected selenium results had concentrations below the tolerance interval.
Tin	10 μg/L	No	No	No	No	Tin levels in CY 2011 sampling were not detected.
Uranium	3.4 μg/L	No	No	No	No	All wells exhibited stable uranium concentrations below the tolerance interval.
Vanadium	40 μg/L	Yes	Yes	No	Yes	All wells exhibited vanadium concentrations below the tolerance interval.
Zinc	26.5 μg/L	No	No	No	No	All wells exhibited stable zinc concentrations below the tolerance interval.
Alkalinity	152.9 mg/L	No	No	No	No	All wells exhibited alkalinity concentrations below the tolerance interval and stable with regards to previous years.
Chloride	26 mg/L	No	No	No	No	All wells exhibited chloride concentrations below the tolerance interval and stable with regards to previous years.
Fluoride	0.45 mg/L	Yes	No	No	No	Fluoride levels in 70A are elevated relative to the tolerance limit in the September 2011 sample event, but have not changed significantly from previous years. The remaining wells exhibited fluoride concentrations below the tolerance interval and stable with regards to previous years.
Sulfate	37.8 mg/L	No	No	No	No	All wells exhibited sulfate concentrations below the tolerance interval. Wells 66, 66A, and 66B appear stable with regards to previous years.
Gross Alpha	2.98 pCi/L	No	No	No	No	The wells were below the tolerance interval. No apparent trending in the data was seen.

Table 3-2. Summary of Tolerance Interval Comparisons and Trends. (3 Pages)

Analyte	Upper Tolerance Interval[a]	Well(s) Exceeding Upper Tolerance Interval in CY 2011[b]				Comments
		70A	66A	66B	66	
Gross Beta	31.5 pCi/L	No	Yes	Yes	Yes	Gross beta activity was above tolerance limits in all downgradient wells (66, 66A, and 66B). Well 66A appears to be upward trending while wells 66 and 66B have shown general downward trends over the last 3 years. The maximum values in upgradient well 70A remained below the tolerance level.
Carbon-14	58.1 pCi/L	No	No	No	No	Carbon-14 levels in CY 2011 sampling were not detected.
Iodine-129	21.1 pCi/L	No	No	No	No	All wells exhibited iodine-129 concentrations below the tolerance level and stable.
Technetium-99	93.8 pCi/L	No	Yes	No	No	Downgradient well 66A appears to be upward trending and exceeded the tolerance interval in the CY 2011 samples. The two new downgradient wells (66 & 66B) have elevated levels but remained below the tolerance limit. A determination on trending could not be reached due to lack of historical data. This is expected as the plume that appears to have peaked in the upgradient well 70A is now continuing to pass beneath the site.
Radium	0.695 pCi/L	No	No	No	No	Radium was not detected in any of the wells during the CY 2011 monitoring events; all detection limits were below the tolerance interval and all of the wells appear to be stable relative to previous years.
Carbon Tetrachloride	11 μg/L	No	No	No	No	All wells exhibited carbon tetrachloride concentrations below the tolerance interval with no significant trends identified.
Nitrogen in Nitrite and Nitrate	51.1 mg/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval and appear stable with regards to previous years with an indication of down trending. The new downgradient well 66 displayed elevated levels but remained below the tolerance limit, and a determination on trending could not be reached due to lack of historical data.
Total Organic Halides	5 μg/L	No	No	Yes	No	Reported values for all wells had nondetectable levels that exceeded the tolerance level. No functional evaluation to tolerance levels or trending could be performed. Discussion will be made with the laboratory on achieving necessary detection limits.
Total Dissolved Solids	570 mg/L	No	No	No	No	All wells exhibited concentrations below the tolerance interval and appear stable with regards to previous years. The new downgradient well 66 displayed elevated levels, but remained below the tolerance limit, and a determination on trending could not be reached due to lack of historical data.
Turbidity	49.8 NTU	No	No	No	No	All wells exhibited concentrations below the tolerance interval and appear stable with regards to previous years.
pH	8.01 units/ 7.48 units[c]	Yes	No	No	No	The pH levels in 66A were elevated relative to the tolerance limit in the March 2011 sampling. The remaining wells exhibited pH concentrations below the upper tolerance interval.
Specific Conductance	774 μS/m	No	No	No	No	All wells exhibited concentrations below the tolerance interval and appear stable with regards to previous years.

Table 3-2. Summary of Tolerance Interval Comparisons and Trends. (3 Pages)

Analyte	Upper Tolerance Interval[a]	Well(s) Exceeding Upper Tolerance Interval in CY 2011[b]				Comments
		70A	66A	66B	66	

[a] New upper tolerance levels have been set for 2007 onward in the revised ERDF GPP (WCH 2008b).
[b] Well identification:
70A = upgradient monitoring well 699-36-70A
66 = downgradient monitoring well 699-37-66
66A = downgradient monitoring well 699-35-66A
66B = downgradient monitoring well 699-36-66B
[c] pH tolerance interval includes upper and lower limits.
CY = calendar year
ERDF GPP = *Groundwater Protection Plan for the Environmental Restoration Disposal Facility*
NTU = nephelometric turbidity units

Numerous contaminant plumes that originated from past activities in the 200 West Area are near or beneath the ERDF site. Chemical processing activities of uranium and plutonium in the 200 West Area are known to have introduced contaminants in the groundwater upgradient from ERDF. Plumes originating from 200 West Area sources detected in ERDF monitoring wells include nitrogen (nitrate plus nitrite), carbon tetrachloride, gross alpha, gross beta, technetium-99, iodine-129, and uranium. Detailed descriptions of the sources for these constituents are contained in the ERDF GPP (WCH 2008b). Due to the elevated readings of COCs, the newly established monitoring wells appear to indicate the contaminate plumes are migrating eastward. The apparent trends in groundwater concentrations of these constituents are as follows:

- **Nitrogen**. Concentrations for nitrogen (nitrate plus nitrite) have remained stable and continue to show a long-term downward trend for well 699-36-70A. Well 699-37-66 exhibits elevated but stable readings; no long-term trending data is available.

- **Carbon Tetrachloride**. Carbon tetrachloride concentrations have remained fairly consistent at levels below the upper tolerance interval within the ERDF monitoring wells.

- **Gross Alpha Activity**. Gross alpha activity concentrations have been slightly variable, but generally within the calculated tolerance intervals, since monitoring at the ERDF well network was initiated.

- **Gross Beta Activity**. Activity for gross beta generally increased over the course of the ERDF monitoring activities for all wells through CY 2003. Recent sampling results suggest that gross beta activity in the upgradient well (699-36-70A) has entered a downward trend. Downgradient well 699-35-66A is showing a continuing long-term upward trend. Downgradient wells 699-37-66 and 699-36-66B show gross beta activity above the tolerance limit. A determination on trending for wells 699-37-66 and 699-36-66B is not possible due to the limited historical data available; however, the values are similar to the retired down gradient wells.

- **Technetium-99**. Technetium-99 activity concentrations in the ERDF monitoring wells have remained stable and generally been within tolerance intervals over the course of ERDF monitoring activities. Recent sampling results suggest activity in well 699-36-70A may be entering a downward trend, and well 699-35-66A shows an upward trend over the long term. Technetium-99 activity concentrations in well 699-35-66A exceeded the interval tolerance during the CY 2011 sample events. Down-gradient wells 699-37-66 and 699-36-66B show elevated levels of technetium-99 below the tolerance limit and similar to past results from the retired down gradient wells, but a determination on trending is not possible due to the limited historical data available. This is expected as the plume which appears to have peaked in the up-gradient well is now continuing to pass beneath the site.

- **Iodine-129**. Iodine-129 activity has remained stable in all monitoring wells over the course of ERDF monitoring activities; no wells have exceeded the upper tolerance interval.

- **Uranium**. Uranium activity in groundwater has generally been stable in the ERDF monitoring wells with a slight long-term downward trend.

3.3 GROUNDWATER LEVELS

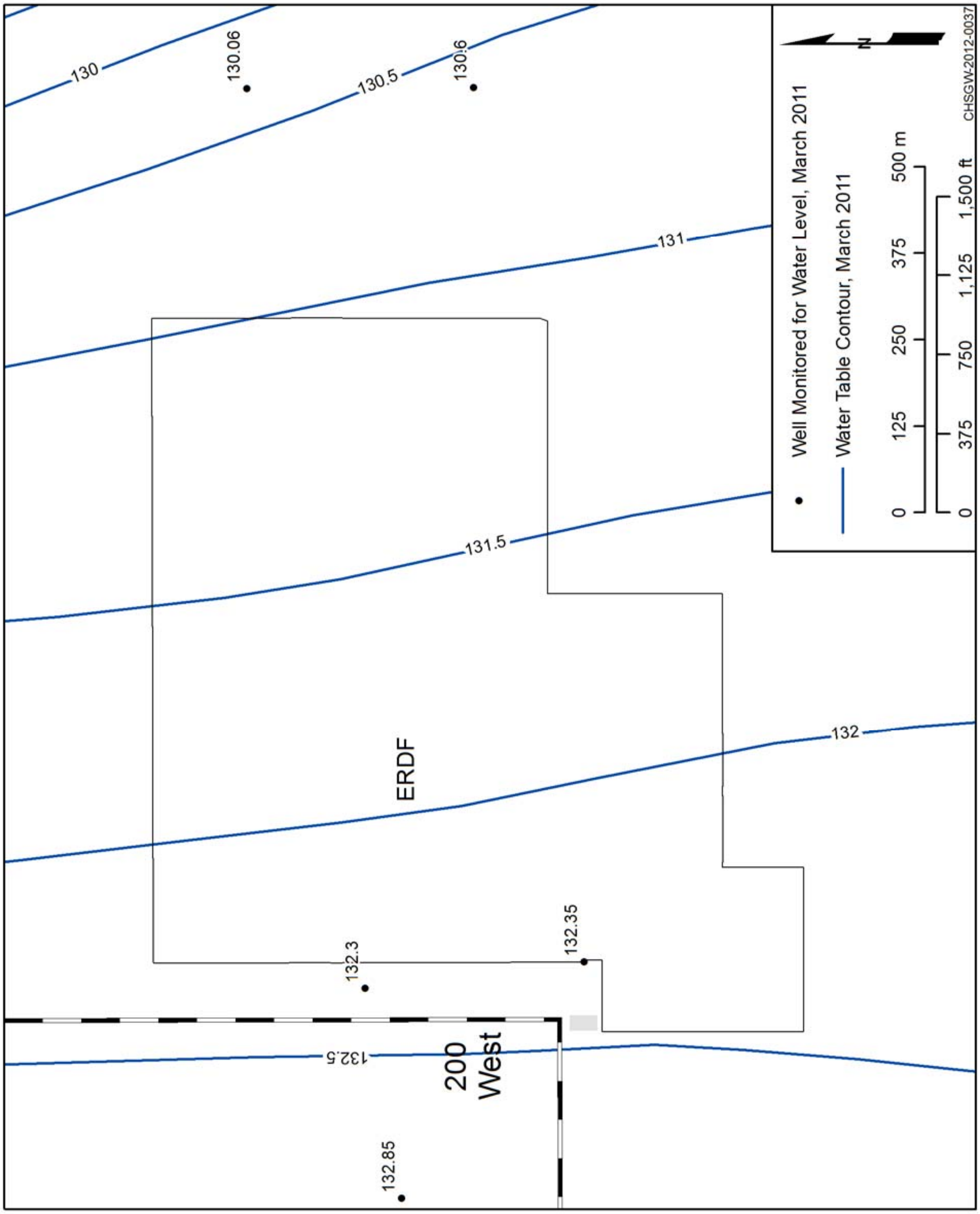
Water level measurements were collected from each of the four monitoring wells during the semiannual groundwater sampling events to determine groundwater accessibility during future monitoring events. Water level measurements were taken during each routine groundwater monitoring event immediately prior to purging the well for sample collection.

Note: During the September 2005 monitoring event, the exact water level in monitoring well 699-36-67 could not be determined because the electronic tape measure (e-tape) did not appear to reach the top of the water in the well. The e-tape apparently did not sound indicating that water had been reached and appeared to be dry when removed from the well. Based on the length of the e-tape used, the water level in this well was more than 3.5 m (11.5 ft) lower than anticipated. Sampling at this well took place as planned, and the well produced a sufficient amount of water for sample collection. This measurement was treated as an anomaly and not used to evaluate water levels and future accessibility. Prior to the decommissioning of well 699-36-67 in 2007, subsequent samples have returned to expected levels.

Based on a water table map (Figure 3-1), groundwater in the vicinity of the ERDF generally moves from the west across the site to the east-northeast at approximately 91 m (298.5 ft) below the surface. The hydraulic gradient is about 0.001 m/m on the west end of ERDF and averages 0.003 m/m across the entire width of ERDF with the east end being considerably greater. The average hydraulic gradient for the operable unit (200 West) that included the ERDF is 0.002 m/m. The groundwater table in and near the 200 West Area has been steadily declining since discharges to the 200 West Area pond and trench systems were discontinued during the mid-1980s.

The current hydrograph for the ERDF monitoring wells presented in Figure 3-2 indicates an annual decline of less than 0.4 m/yr (1.31 ft/yr), which is consistent with the regional hydrologic changes reported for the area (Swanson et al. 1999, Hartman et al. 2005).

Figure 3-1. Water-Level Contour Map.



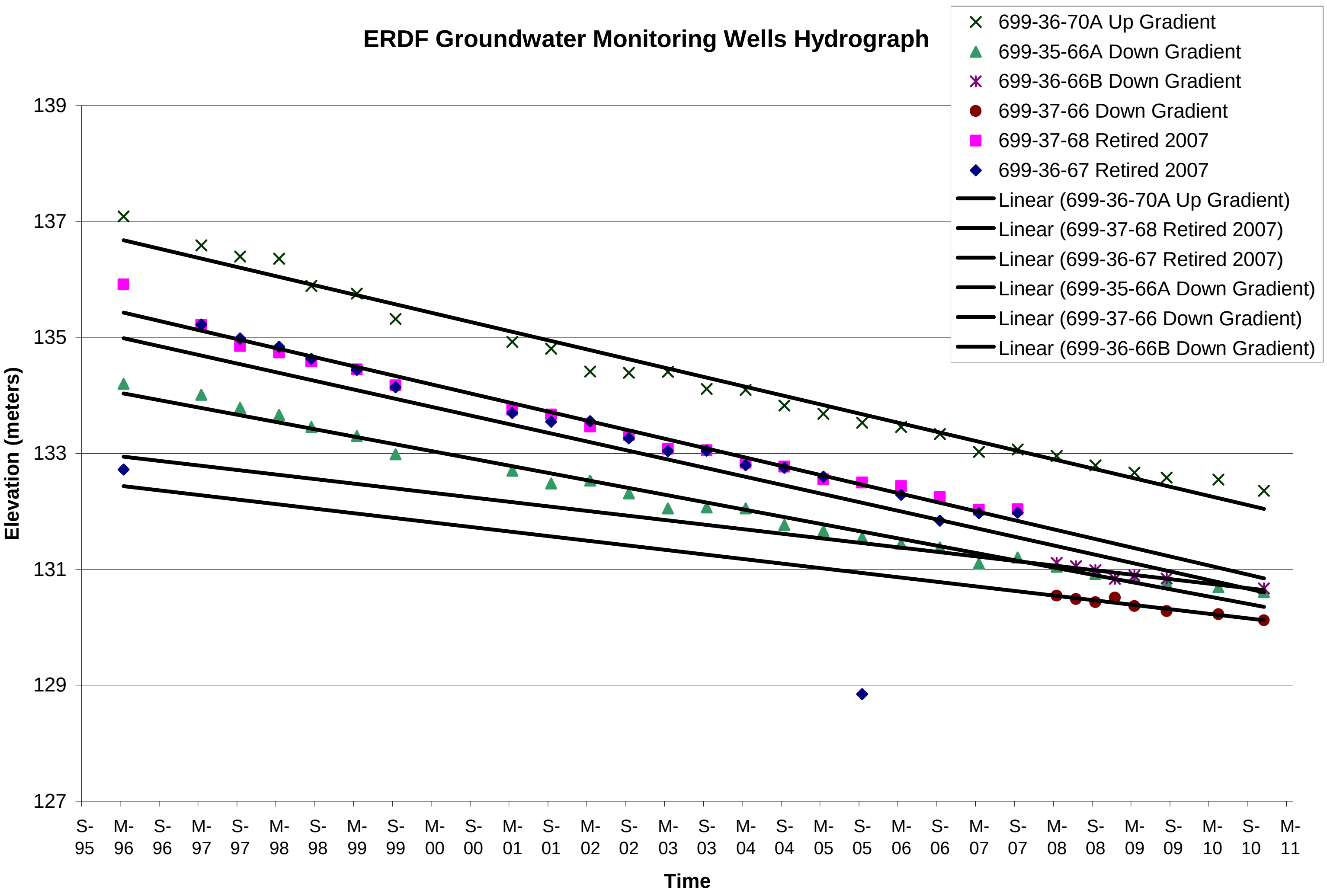


Figure 3-2. Hydrograph from the ERDF Groundwater Monitoring Wells.

3.4 SUMMARY OF WATER LEVEL MEASUREMENTS

Groundwater monitoring wells in the ERDF well network have exhibited a gradual rate of decline in water levels since monitoring was initiated in September 1995. Water-level measurements collected during CY 2011 from wells 699-35-66A and 699-36-70A show a rate of decline that may be starting to stabilize. The newly installed well 699-37-66 appears to be fairly stable with little to no water level change between the April and September measurements.
Well 699-36-66B exhibited a gradual rate of decline during CY 2011 monitoring.

Based on the measured water levels in the four ERDF monitoring wells, it was determined that the height of the water column in the ERDF upgradient monitoring well 699-36-70A is 4.1 m (13 ft). The downgradient monitoring wells had water column levels of 3.4 m (11 ft) at well 699-35-66A, 9.5 m (31 ft) at well 699-37-66, and 9.6 m (31 ft) at well 699-36-66B. At the current average rate of decline, the monitoring wells would be available for use as they are currently constructed for approximately 15 to 22 years.

3.5 LEACHATE SAMPLING

The leachate is sampled semi-annually to provide data for leachate delisting analyses and to assess whether additional COCs should be added to the routine ERDF groundwater monitoring program. Although separate leachate sampling may also be performed to verify that waste acceptance criteria for the ETF continue to be met, ETF is currently relying on the semi-annual sampling results to monitor acceptance. The evaluation and reporting of any ETF-specific sampling data are outside the scope of this report.

Initial leachate sampling was performed quarterly through the end of CY 2000 for an extensive list of analytes as defined by the ERDF Amended ROD (EPA 1999). This “long list” of analytes is shown in Appendix C. At the end of the initial baseline sampling, the analyte list was revised (short list) and leachate sampling was reduced to a semiannual basis. The short list of analytes is identified in Appendix C. Once every 2 years (biennial), sampling of the long list of analytes is performed on the leachate as identified in the ERDF Amended ROD (EPA 1999).

The ERDF project continued routine sampling and analysis of landfill leachate during CY 2011. Composite leachate samples for the short list of analytes were collected during 2011. Historically, a composite sample of leachate media was collected in duplicate from the sumps (cells 1 through 6) associated with the upper landfill liners. Subsequent to that sampling, the decision had been made to take composite samples from the leachate storage tanks. This was done for the 2011 sampling events. Data for the current year and from the two prior years of leachate sampling (i.e., CYs 2008 to 2010) are used to identify trends that may indicate if additional laboratory analysis for groundwater samples is warranted.

3.6 SUMMARY OF LEACHATE ANALYSIS

Data associated with leachate sampling conducted from CY 2009 through CY 2011 are presented in Appendix C. Only analytical results that were reported as significant detects (>1 ppb), or as nondetected values, but which are on the routine short list and long list or groundwater monitoring COCs lists, are included in this report. Leachate sampling trends are presented in Appendix D.

Many of the metals showed concentration spikes in the March sampling event, but none of the results approached delisting levels. Except for lead, all of the results had returned to at or below CY 2010 values during the October sampling. While the lead results remained elevated in the October sample results, concentrations remained below 10% of the delisting level. The nitrate results for March showed a similar spike to the metals but remained below previous maximum values. The October nitrate values were the lowest in over 10 years. The other anions showed no significant fluctuations over the year. One total suspended solids result for March was also elevated. All detected radionuclides (including uranium) declined in CY 2011 compared to the CY 2010 results, and all showed downward trends during the year. There were no exceedances of a delisting level during the year.

The composite leachate samples contained detectable concentrations of common metals, anions, and mobile radionuclides. Evaluation of the reported constituents for the expanded analyte list found no impact to the delisting criteria. Based on the CY 2011 leachate sampling results, the constituents that were generally decreasing in activity include gross alpha and gross beta. The following is an update of those constituents, for which there were detectable concentrations, and their activities in evaluation of the CY 2011 sampling results:

- **Chromium**. Chromium concentrations began declining during CY 2007 and have stabilized in recent years. The chromium concentration averaged 29 µg/L in December 2006, but the CY 2011 average was approximately 38 µg/L.

- **Nickel**. Nickel, which is on the long list of analytes and monitored once every 2 years, appears to be decreasing in concentration.

- **Potassium**. Potassium concentrations have declined from a maximum of about 26,000 µg/L to ~17,500 µg/L through CY 2011.

- **Specific Conductance**. Specific conductance remained steady during CY 2011.

- **Bromide**. Bromide concentration had been detected in leachate samples in CY 2011.

- **Nitrate**. Nitrate concentrations remained steady through March 2011, averaging ~369 mg/L. A significant decline to about 204 mg/L was seen in the October 2011 samples.

- **Total Dissolved Solids**. Total dissolved solids had been increasing throughout 2006, but declined during CY 2011, averaging ~1,737,500 µg/L.

- **Gross Alpha**. Gross alpha activity concentrations historically increased through December 2008, reaching a new maximum concentration of 3,380 pCi/L, but have declined in recent sampling. A significant decline to 410 pCi/L was seen in the October 2011 samples.

- **Gross Beta**. Gross beta activity concentrations historically increased through December 2008, reaching a new maximum concentration of 1,500 pCi/L, but have declined in recent sampling. The gross beta concentrations for the October sampling were 310 pCi/L.

- **Uranium**. Uranium concentrations historically increased through December 2008 and reached a new maximum concentration of 3,060 µg/L in March 2010, but have declined in recent sampling. The uranium concentration declined significantly in the October sampling to 812 µg/L.

- **Technetium-99**. Technetium-99 concentrations have decreased since March 2010 to 280 pCi/L in the October 2011 samples.

- **Tritium**. Tritium concentrations remained above approximately 100,000 pCi/L from beginning analysis in December 2008 through CY 2010. A significant decline seen in the CY 2011 samples to less than 60,000 pCi/L in October 2011.

4.0 LYSIMETER MONITORING AND SAMPLING

4.1 PURPOSE AND OBJECTIVES

The purpose of this report is to evaluate the conditions and identify trends to develop Hanford Site-specific data on the performance of the lysimeter systems related to the vadose zone monitoring and potential future use of the lysimeter systems. The objectives of this report are as follows:

- Assess data from routine ERDF lysimeter sampling to determine if COC concentrations over time may be attributed to ERDF operations
- Describe and evaluate the sample data, identify changes or trends in the data, and incorporate a summary of the results
- Evaluate the data to determine if the routine analyte list of indicator parameters is adequate
- Document and describe the changes in the volume of liquid in the lysimeter.

4.2 LYSIMETER MONITORING AND SAMPLING

The lysimeter monitoring program is described in the *Environmental Restoration Disposal Facility Lysimeter Monitoring and Sampling Plan* (WCH 2009b). This section provides an overview of these monitoring requirements and sample results.

The lysimeters visually inspected and dewatered semi-annually. Inspections and dewatering will continue until it can be demonstrated that the lysimeters have been successfully dewatered. The dewatering activities during the CY 2010 resulted in minimal water recharge in the lysimeters to support CY 2011 monitoring and sampling activities. The lysimeters were inspected in September 2011 and December 2011 to determine the water levels. During the late December 2011 inspection it was determined that the lysimeters may contain pumpable volumes for sampling in CY2012. Initial samples were collected from cells 9 and 10 lysimeters during CY 2011.

4.2.1 Camera Inspection and Dewatering

The lysimeters were visually structurally sound without any obstructions within the visual portion of the pipe. The lysimeters had some silt settlement within the water layer that clouded out the camera when disturbed. Prior to the visual disturbance associated with the silt, the liquid associated with the lysimeters appeared transparent with minimal suspended particles. The liquid surfaces had no apparent sheen and only had a very minor amount of unidentifiable floating particles.

Depth-to-water measurements were achieved by using a distance counter associated with the inspection camera. The water depth was determined from the top of the lysimeter opening to the water level.

Cell 5. During the February 2010 inspection, the water level was reached at 95.4 m (313 ft). This was a 2.1 m (7 ft) increase of water in the lysimeter pipe from the May 2009 inspection where the water level was reached at 97.6 m (320 ft). The dewatering activities in 2010 resulted in a total dewatering of 1,520 L (400 gal).

Cell 6. During the February 2010 inspection, the water level was reached at 102.7 m (337 ft). This was a 2.4 m (8 ft) increase of water in the lysimeter pipe from the April 2009 inspection where the water level was reached at 105.2 m (345 ft). The dewatering activities in 2010 resulted in a total dewatering of 1,368 L (360 gal).

Cell 7. A baseline water level of the cell 7 lysimeter was established in April 2009 with an initial water depth of 94.5 m (310 ft). During the inspection in February 2010, the water level was reached at 93 m (305 ft). This is an increase in water level by 1.5 m (5 feet) from April 2009. The dewatering of cell 7 in 2010 resulted in a total dewatering of 1,520 L (400 gal).

Cell 8. A baseline water level of the cell 8 lysimeter was established in April 2009 with an initial water depth of 99.1 m (325 ft). During the inspection in February 2010, the water level was reached at 100 m (328 ft). This is a decrease in water level by 0.9 m (3 ft) from April 2009. There was no dewatering of cell 8 in 2010 due to insufficient water volume in the lysimeter.

Cell 9. A baseline water level of the cell 9 lysimeter was established in February 2011 with an initial water depth of 93.6 m (307 ft). The dewatering activities in CY 2011 resulted in a total dewatering of 6,057 L (1,600 gal).

Cell 10. A baseline water level of the cell 10 lysimeter was established in June 2011 with an initial water depth of 92.7 m (304 ft). The dewatering activities in CY 2011 resulted in a total dewatering of 22,713 L (6,000 gal).

Table 4-1 shows the total gallons of water associated with the lysimeter dewatering activity.

Based on the limited data, response to dewatering activities cannot be analyzed adequately. Further inspections and dewatering of lysimeters is planned as a routine activity during CY 2012.

Table 4-1. Lysimeter Dewatering Activity.

	Cell 5 Lysimeter	Cell 6 Lysimeter	Cell 7 Lysimeter	Cell 8 Lysimeter	Cell 9 Lysimeter	Cell 10 Lysimeter
	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons
CY 2005	NA	2,302				
CY 2006	3,541	273				
CY 2007	NA	NA				
CY 2008	2,770	NA				
CY 2009	1,851	3,000	800	650		
CY 2010	400	360	400	Insufficient Volume to Pump		
CY 2011	Insufficient Volume to Pump	Insufficient Volume to Pump	Insufficient Volume to Pump	Insufficient Volume to Pump	1,600	6,000
Total	**8,562**	**5,935**	**1,200**	**650**	**1,600**	**6,000**

4.3 LYSIMETER SAMPLING

Analytical results will be evaluated to document vadose zone conditions, characterized to ensure proper management of liquids, and monitored for any trends in the data.

The vadose zone monitoring activities are expected to continue until after the final landfill cap is installed and the annual quantity of leachate collected in the secondary leachate collection and removal system is shown to be insignificant (i.e., less than the amount needed to activate the removal pumps).

Lysimeters in cells 5 and 6 were initially sampled in August 2005 in accordance with *Gravity Collection Lysimeter Monitoring Plan ERDF Cells 5 and 6* (BHI 2005). Initial lysimeter samples were analyzed for chloride, gross alpha, technetium-99, and gross beta. The cell 7 and 8 lysimeters were initially sampled in CY 2009. In CY 2009, the *Environmental Restoration Disposal Facility Lysimeter Monitoring and Sampling Plan* (WCH 2009b) was developed. It was determined that the COCs for the sampling of the lysimeters should be consistent with the COCs for the routine leachate sampling at ERDF as described in the *Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan* (WCH 2008a).

The purpose of the initial characterization was to establish a baseline and determine if the routine analyte list of indicator parameters was adequate.

4.3.1 General Approach to Evaluating Results

Lysimeter samples were analyzed in accordance with the requirements of the EPA SW-846 (EPA 1986), industry standard, or laboratory-specific test methods as presented in Table 4-2. Table 4-2 shows the list of baseline lysimeter analytes by analytical method. The following data selection and evaluation criteria were applied:

- Quality assurance/quality control data were evaluated for the purpose of identifying potential collection or analytical problems. However, unless a problem with the data was identified during this review, the results of or a discussion regarding the quality assurance/quality control data were not included in this report.

- All data qualifiers were recorded.
- If the relative percent difference between values reported for main and duplicate samples was greater than 20%, the samples were flagged in the data spreadsheet and the data evaluated to determine their applicability.
- Data acceptance based on a less than 20% relative percent difference criterion was relaxed for analytical results reported at or near the method detection limit (e.g., typically within five times the detection limit). This allows for an expected increased analytical error when values are close to the detection limit.

Table 4-2. List of Baseline Lysimeter Analytes by Analytical Method. (2 Pages)

Analyte	Method[a]	Practical Quantitation Limit	Accuracy[b] (%)	Precision[b] (%)
Arsenic	6010B	15 μg/L	±25	±25
Barium	6010B	10 μg/L	±25	±25
Calcium	6010B	20 μg/L	±25	±25
Chromium	6010B	10 μg/L	±25	±25
Lead	6010B	9 μg/L	±25	±25
Potassium	6010B	3,000 μg/L	±25	±25
Selenium	6010B	15 μg/L	±25	±25
Silicon	6010B	500 μg/L	±25	±25
Sodium	6010B	500 μg/L	±25	±25
Thallium	6010B	15 μg/L	±25	±25
Tin	6010B	100 μg/L	±25	±25
Vanadium	6010B	10 μg/L	±25	±25
Zinc	6010B	10 μg/L	±25	±25
Carbon tetrachloride	8260B	1 μg/L	±25	±25
Trichloroethylene	8260B	1 μg/L	±25	±25
Bromide	300.0A[c]	200 μg/L	±25	±25
Chloride	300.0A[c]	30,000 μg/L	±20	±25
Fluoride	300.0A[c]	500 μg/L	±20	±25
Nitrogen (in nitrite/nitrate)	353.2	1000 μg/L	±20	±25
Sulfate	300.0A[c]	250,000 μg/L	±20	±25
Phosphate	300.0A[c]	500 μg/L	±20	±25
Total dissolved solids	2540C	10,000 μg/L	±20	NA

Table 4-2. List of Baseline Lysimeter Analytes by Analytical Method. (2 Pages)

Analyte	Method[a]	Practical Quantitation Limit	Accuracy[b] (%)	Precision[b] (%)
Total suspended solids	2540D	8000 μg/L	±20	NA
Total organic halides	9020B	30 μg/L	±20	NA
Carbon-14	[d]	200 pCi/L	±20	±25
Iodine-129	[d]	5 pCi/L	±20	±25
Technetium-99	[d]	10 pCi/L	±20	±25
Radium	903.1[e]	1 pCi/L	±20	±25
Total uranium	[d]	0.1 μg/L	±20	±25
Gross alpha	900.0[e]	3 pCi/L	±20	±25
Gross beta	900.0[e]	4 pCi/L	±20	±25
Alkalinity	2320B	5,000 μg/L	±20	±25
pH	[f]	NA	NA	NA
Specific conductance	[f]	25 μS/cm	±20	NA

[a] Method number indicated is from *Test Method for Evaluating Solid Wastes: Physical Chemical Methods* (SW-846) (EPA 1986), unless otherwise specified.
[b] Accuracy is expressed as percent recovery; precision is expressed as a percent relative difference.
[c] Method specified is from *Determination of Inorganic Anions in Aqueous and Solids Samples by Ion Chromatography* (Lindahl 1984), and is a modification of EPA Method 300.0 (*Method 300.0 Determination of Inorganic Anions by Ion Chromatography* [EPA 1993]).
[d] Industry standard method, laboratory-specific, based on acceptance by Washington Closure Hanford.
[e] Method specified is from *Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA 1989).
[f] Parameter will be measured in the field.
NA = not available or not applicable.

4.4 SUMMARY OF LYSIMETER ANALYTICAL RESULTS

Analytical results from CY 2011 sampling events are presented in the following tables. Only analytical results that were reported as significant detects (>1 ppb) or that were reported as nondetected values on the routine COC list are included in this report.

Due to dewatering activities in CY 2010, there was only enough water in cells 5 through 8 lysimeters to sample during the spring CY 2011 sampling event. Initial samples were collected from cells 9 and 10 lysimeters during CY 2011.

Data associated with the cell lysimeters sampling conducted during CY 2011 are presented in Appendix E.

4.5 SUMMARY OF LYSIMETER ANALYSIS

Lysimeter samples contained detectable concentrations of common metals, anions, and radionuclides. The following is a brief description of those constituents for which concentrations/activities contained inconsistencies when compared with the other lysimeters.

- **Sulfate**. Soluble salts, such as sulfate, were the primary constituents present within the lysimeter liquid and can be directly correlated to the levels of the primary constituents found within the admix material used to construct the cells.

- **Total Dissolved Solids**. Total dissolved solids concentrations indicate a significant decrease in all of the cell lysimeters.

- **Total Suspended Solids**. Total suspended solids concentrations appear to be remaining stable in all of the cell lysimeters.

- **Uranium.** Uranium levels within cells 5 through 8 lysimeter had low detectable levels, cells 9 and 10 had very low levels present.

- **Gross Alpha**. Gross alpha activity concentrations in the cell 5 lysimeter appears elevated when compared to the other cell lysimeters.

- **Gross Beta**. Gross beta activity appears to be within a consistent range within the lysimeters.

- **pH**. The cells appear to have stable pH levels.

5.0 ERDF BIENNIAL WASTE STREAM EVALUATION AND CONFIRMATORY LEACHATE SAMPLING RESULTS (NOVEMBER 2008 – OCTOBER 2010)

The ERDF Biennial Waste Stream Evaluation and Confirmatory Leachate Sampling Results will be documents in the appropriate calendar year annual groundwater and leachate report. The results from the 2008-2010 sampling are being reported in this annual report, as described below.

The ERDF delisting 1999 ROD Amendment states that ERDF waste profiles will be evaluated for the presence of compounds on the EPA delisting docket that were not part of the initial COCs list. The ROD also requires that any new compounds be evaluated against the initial COC list to determine if they should be included in future leachate sampling, and if they are identified on existing EPA docket lists. It should be noted that the EPA delisting docket list (as referenced in the ERDF ROD) has been replaced by delisting values derived from the Delisting Risk Assessment Software (DRAS) program, a Microsoft Windows-based software tool developed by the EPA to estimate the potential releases of waste constituents and to predict the risk associated with those releases.

Based upon our evaluation of the ERDF ROD delisting values and the compounds identified within waste profiles for wastes disposed at ERDF between November 2008 and October 2010, of the 1,200 newly disposed chemicals on the nonWaste Acceptance Criteria list:

- 50 constituents already have delist limits shown in Table 1 of the original delist ROD amendment
- 32 constituents are in DRAS 2.0 (the model used to establish delist limits for new constituents)
- 2 constituents are on the "Table 2" list from the original ROD amendment

Of the 32 constituents in DRAS 2.0:

- 18 already have delist limits established in previous biennial waste stream evaluation reports
- 10 appear in DRAS 2.0, but have no toxicity data to calculate delist limits
- 4 are truly "new" constituents for which delisting values may be established

The 4 new constituents and their calculated leachate delist levels, are as follows:

- Dimethoate (CAS 60-51-5); delist limit: 31.5 mg/L (groundwater ingestion pathway)
- Chlorodifluoromethane (CAS 75-45-6); delist limit: 42.4 mg/L (groundwater inhalation pathway)

- Acrylamide (CAS 79-06-1); delist limit: 0.000211 mg/L (groundwater ingestion pathway)
- Heptachlor epoxide (CAS 1024-57-3); delist limit: 4.73 mg/kg (air volatile inhalation pathway)

In the confirmatory leachate sampling for all COCs, an evaluation of analytical data obtained from the ERDF leachate collection system is used to confirm that no constituents were present in the leachate at levels exceeding the established delisting values. Typically, this evaluation occurs after receipt of the results from the biennial "long list" analysis normally performed during the September leachate sampling in even numbered years.

All data has been received and evaluation shows that no detected result exceeded any delisting value over the last 2 years of analysis.

Between November 2008 and October 2010, only one analyte was detected at a value greater than one-tenth of the delisting value. Nitrate continues at about one-third of its delisting value for every sample. The nitrate levels did not change significantly through 2010 and values have remained below previous maximum values.

No upward trends can be noted for any of the analytes for which delisting values have been established. Of the analysis performed for which no delisting value has been established, only uranium concentrations (and associated gross alpha and gross beta activities) show a historic upward trend in the ERDF leachate.

The concentrations of contaminants in the ERDF leachate have not changed significantly in recent years and there are no indications for potential to exceed delisting levels for any constituent.

In addition, to evaluate new contaminants in the waste disposed at ERDF, the ERDF delisting ROD amendment requires a review of constituents identified within the original delisting petition against the current delisting docket to determine if delisting values have been established (i.e., there was no delisting level available for these constituents at the time of the original delisting), and if they should be included in future sampling. No constituents fall into this category. The evaluation performed for this report was based on Version 2.0 of DRAS. Subsequent to this evaluation, EPA issued Version 3.0 of DRAS. As confirmed through conversations with EPA and DOE-RL, use of DRAS 2.0 is appropriate for purposes of the report.

The Leachate Sampling Analysis Plan also requires that advances in commercially available technology will be monitored periodically for revisions to practical quantification limits and implementation of alternate methods with lower practical quantification limits. No improved quantification limit requirements were identified in this review.

The chemicals evaluated during the 2008 to 2010 ERDF Leachate Delisting Evaluation are presented in the tables in Appendix E.

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APPENDIX A

GROUNDWATER SAMPLING RESULTS, 1996-2011

Table A-1. Arsenic

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	3 B		1.1 B		3 B		1.7 B	1.7 B					4.4	
Sep-96	2.6 B	3.8 B	0.98 B		2.1 B		0.67 B						4.4	
Mar-97	2.8 B	2.7 B	2 B		2.5 B		1.4 B						4.4	
Sep-97	3.5 B	2.8 B	1.9 B		3.3 B		1.6 U						4.4	
Mar-98	2.1 B		1.6 B	1.1 B	2.6 B		0.6 U						4.4	
Aug-98	2.8 B		1 U		1.2 B		1.4 B	1 U					4.4	
Mar-99	3.3 U		3.3 U	3.3 U	3.3 U		3.3 U						4.4	
Sep-99	3.3 U	3.3 U	3.3 U		3.3 U		3.3 U						4.4	
Mar-00													4.4	
Sep-00	2.6		2.4 U		3.2	3.8							4.4	
Mar-01	3		2.3 U		5.2		4.5	3.2					4.4	
Sep-01	5.6		22.8	10 U	52.1 U		52.1 U						4.4	
Mar-02	4.4	3 U	4.6		4.3		3 U						4.4	
Sep-02	4.4		4.5 U	3.3	3.8		3.3 U						4.4	
Mar-03	3.5 U		4.4		3.5 U		3.5 U						4.4	
Sep-03	4.2 U	4.2 U	4.2 U		4.2 U		4.2 U						4.4	
Mar-04	3.4 U		3.40 U		3.4 U		3.4 U	3.4 U					4.4	
Sep-04	3.6 U		3.7	3.6 U	3.6 U		3.6 U						4.4	
Mar-05	34 U	34 U	34 U		34 U		34 U						4.4	
Sep-05	4.7 U		23.6 U		23.6 U		27.5	23.6 U					4.4	
Mar-06													4.4	
Sep-06	5.3		3.7 U	3.7 U	4.7		3.7 U						4.4	4.2
Mar-07	4.6		4.1		4.3	5	4.1 U						4.4	4.2
Sep-07	5.6		4.1 U	4.1 U	4.1 U		4.1 U							4.2
Mar-08	5 U				5 U	5			5 U		5 U			4.2
Jun-08									5 U		5 U			4.2
Sep-08	3.8				5.5				3.5		2.9	3.6		4.2
Dec-08									10 U		10 U	10 U		4.2
Mar-09	10 U				10 U				10 U		10 U	10 U		4.2
Sep-09	4.54 B	3.1 B			3.2 B				2.14 B		2.23 B			4.2
Apr-10	2.6 B				2.8 B				10 U	10 U	10 U			4.2
Nov-10	2.71 B				2.97 B				10 U	2.4 B	2 B			4.2
Mar-11	3.15B				2.85B	3.58B			3.54B		3.45B			4.2
Sep-11	10U				4.03B	3.96B			10U		10U			4.2

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results
U = Result is non-detected.

Table A-2. Barium Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	46 B		81.9 B		92.1 B		92 B	90.6 B					123.3	
Sep-96	42.9 B	0.0402 B	66.7 B		80.8 B		77.9 B						123.3	
Mar-97	46.3 B	47 B	87.6 B		93.4 B		102 B						123.3	
Jun-97					83.6								123.3	
Sep-97	42.2 B	40.9 B	64.6 B		80 B	76.6	69.6 B						123.3	
Mar-98	43.7		66.8	66.6	78.4	82.4	79						123.3	
Aug-98	39.8 B		58.2 B		74.1 B		71.1 B	69 B					123.3	
Mar-99	40.5		59	58.4	76.1	72.8	73.2						123.3	
Sep-99	40.3 B	40.2 B	54.1 B		75.6 B		69.8 B						123.3	
Jan-00					77.8 B								123.3	
Mar-00													123.3	
Sep-00	38.9		51.5		73.8	74.3							123.3	
Dec-00					77.3 B								123.3	
Mar-01	38		50		71.4		68.1	69.9					123.3	
Sep-01	40.5		200 U	200 U	71.2		64.9						123.3	
Dec-01					74.6 B								123.3	
Mar-02	38.3	38.5	56.2		66.9		68.7						123.3	
Sep-02	39.8		58.1	0.31	69.4		67.9						123.3	
Mar-03	37.8		49.6		70		64.3						123.3	
Sep-03	39.8	41.4	58.3		71.5		65						123.3	
Mar-04	38.9		56.1		56.5		66.6	66.5					123.3	
Sep-04	39.9 C		56.3 C	57.2 C	60.9 C		68.7 C						123.3	
Mar-05	39.3	39.5	56.4		60.4		61.6						123.3	
Sep-05	37.1 C		48.4		54.5		65.4	63.8					123.3	
Mar-06	35.4	38.1	55.2		58.1		64.5						123.3	
Sep-06	39.2 C		53	52.1	55.9 C		60.5						123.3	122.3
Mar-07	40		57.7		61.3	46.1	67.7						123.3	122.3
Sep-07	39 C		55.4	54.9	53.8 C		66.4							122.3
Mar-08	39 C				49.4 C	50.6 C			80 C		64.8 C			122.3
Jun-08									77.4		59.8			122.3
Sep-08	39.7 C				51 C				77.9 C		59.8 C	59.9 C		122.3
Dec-08									76.8		59.5	59.2		122.3
Mar-09	37				46				75.1		55.8	56.4		122.3
Sep-09	37.6	37.8			43.6				71.6		55.2			122.3

Mar-10	41				45.8				77.8	76.9	57.2			122.3
Nov-10	39.2				44				72.2	75.4	58			122.3
Mar-11	38.4				43.1	44.6			74.6		57			122.3
Sep-11	38.9				43.5	44			72.1		58.6			122.3

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-3. Chromium Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	13.4		4.4 U		5.9 B		7.7 B	5.1 B					16.5	
Sep-96	12.1	0.0205	4.4 U		4.4 U		4.4 U						16.5	
Mar-97	12.2	12	2.7 U		3.9 B		4.5 B						16.5	
Jun-97					7.9 B								16.5	
Sep-97	13.4	13.3	3.3 B		3.5 U	3.6 B	3.5 U						16.5	
Mar-98	16.6		3.3 B	3.6 B	6.8 B	5.4 B	4.1 B						16.5	
Aug-98	13.5		4.2 U		4.2 U		4.2 U	4.2 U					16.5	
Mar-99	13.9		2.3	2.2	6.1 B	2.2	3.1						16.5	
Sep-99	14.8	14.8	2.5 B		4.4 B		3.1 B						16.5	
Jan-00					4.4 B								16.5	
Mar-00													16.5	
Sep-00	16.3		1.6		4.6	4.9							16.5	
Dec-00					5.7 U								16.5	
Mar-01	14.8		2.4		4.1		4.5	3.8					16.5	
Sep-01	21.1		10 U	10 U	7.4		5.4						16.5	
Dec-01					1.5 B								16.5	
Mar-02	16.3	16.2	5.2		6		11.3						16.5	
Sep-02	16.2		5.6	1.2	5.5		8.7						16.5	
Mar-03	16.3		2.5		3.8		9.9						16.5	
Sep-03	16.2 C	17.2C	3.6		4.9		12 C						16.5	
Mar-04	16.6		4.1		4		4.4	3.8					16.5	
Sep-04	15.6		5.5	5.3	3.8		11.6						16.5	
Mar-05	15.9	17.1	9.7 U		9.7 U		9.7 U						16.5	
Sep-05	14.4		3.6 UC		3.6 UC		3.6 UC	5.4 UC					16.5	
Mar-06	14.6	15.8	6.4 U		6.4 U		6.4 U						16.5	
Sep-06	16.3		2.5	2.6	4.8		3.4						16.5	13.4
Mar-07	17.5		3.1		4.9	3.4	4.3						16.5	13.4
Sep-07	17		2.7	3.3	3.4		5							13.4
Mar-08	17.2				4.2	4.7			2.8		4.1			13.4
Jun-08									2.2		3.2			13.4
Sep-08	17.1				4.5				2.5		3.4	3.6		13.4
Dec-08									2.93		3.98	3.93		13.4
Mar-09	16				5.21				1.99 B		3.2	3.27		13.4
Sep-09	16.4	16			3.78				2.74		3.32			13.4

Mar-10	16.9				4.5				2.46	3.12	3.69			13.4
Nov-10	16.5				3.67				2.48	2.51	3.46			13.4
Mar-11	16.1				3.56	3.79			2.47		3.08			13.4
Sep-11	16.2				3.73	3.63			2.32		3.37			13.4

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-4. Lead Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	1 UJ		1 UJ		1 UJ		1 UJ	1 UJ					70.4	
Sep-96	42.1 U	0.002 U	42.1 U		42.1 U		42.1 U						70.4	
Mar-97	26 U	26 U	26 U		34.8 B		26 U						70.4	
Sep-97	1.1 U	1.1 U	1.1 U		1.1 U		47.1 U						70.4	
Mar-98	1.1 U		1.1 U	1.1 U	1.1 U		2.4 B						70.4	
Aug-98	30.2 U		30.2 U		30.2 U		30.2 U	30.2 U					70.4	
Mar-99	1.8 U		1.8 U	1.8 U	1.8 U		2.5						70.4	
Sep-99	2.1 U	4	49.2		6.7		2.4 B						70.4	
Mar-00													70.4	
Sep-00	2.1 U		2.1 U		2.1 U	2.1 U							70.4	
Mar-01	2.6 U		2.6 U		2.6 U		2.6 U	2.6 U					70.4	
Sep-01	3.7		6.8	3 U	22.7 U		22.7 U						70.4	
Mar-02	2.2 U	2.8	2.2 U		2.2 U		4.2						70.4	
Sep-02	2.4 U		2.4 U	2.4 U	2.4 U		2.4 U						70.4	
Mar-03	2.6 U		2.3 U		2.6 U		2.6 U						70.4	
Sep-03	1.9 U	1.9U	1.9 U		1.9 U		1.9 U						70.4	
Mar-04	2 U		2 U		2 U		2 U	2					70.4	
Sep-04	1.9 U		1.9 U	1.9 U	1.9 U		1.9 U						70.4	
Mar-05	24.7 U	24.7 U	24.7 U		24.7 U		24.7 U						70.4	
Sep-05	2.9 U		31.9 U		31.9 U		31.9 U	31.9 U					70.4	
Mar-06													70.4	
Sep-06	3.3 UC		1.2 U	1.2 U	1.2 U		1.2 U						70.4	5
Mar-07	2.8 U		2.8 U		2.8 U	2.8 U	2.8 U						70.4	5
Sep-07	3.3 U		3.3 U	3.3 U	3.3 U		3.3 U							5
Mar-08	3 U				3 U	3 U			3 U		3 U			5
Jun-08									3 U		3 U			5
Sep-08	1.5 U				1.5 U				1.5 U		1.5 U	1.5 U		5
Dec-08									5 U		5 U	5 U		5
Mar-09	5 U				5 U				5 U		5 U	5 U		5
Sep-09	5 U	5 U			5 U				5 U		5 U			5
April-10	5 U				5 U				5 U	5 U	5 U			5

Nov-10	5 U				5 U				5 U	5 U	5 U			5
Mar-11	7.15				7.64	7.5			7.23		7.74			5
Sep-11	5U				5U	5U			5U		5U			5

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-5. Selenium Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	2.1 B		2.6 B		3.5 B		3.4 B	3.6B					5.6	
Sep-96	3.1 B	0.003 U	3.8 B		4.1 B		4.8 B						5.6	
Mar-97	2.6 BN	2.3 BN	3.5 BN		3.1 BN		3.9 BN						5.6	
Sep-97	3.2 B	2.9 B	3.6 B		4.8 B		4.6 B						5.6	
Mar-98	3.2 B		3.6 B	3.6 B	4.4 B		4.2 B						5.6	
Aug-98	3.2 B		4.5 B		5.8		5.8	5.5					5.6	
Mar-99	5.2		3.6 U	4.5	7.6		4.2						5.6	
Sep-99	3.7 U	5.2	3.7 U		7.3		4.6 B						5.6	
Mar-00													5.6	
Sep-00	3.4		3.5		4	5.5							5.6	
Mar-01	2.6 U		3.1		3.4		2.6	2.6 U					5.6	
Sep-01	5.9		5 U	19.8	62.1 U		62.1 U						5.6	
Mar-02	7.7	7.9	3.6 U		7.8		7.7						5.6	
Sep-02	4.1 U		4.1 U	4.1 U	7.4		4.1 U						5.6	
Mar-03	3.6 U		5.7		4.4 U		3.8 U						5.6	
Sep-03	3.8	4.4	3.6		6.9		5.7						5.6	
Mar-04	4.2		5.6		7.4		3.4 U	3.4 U					5.6	
Sep-04	3.9 U		3.9 U	3.9 U	3.9 U		3.9 U						5.6	
Mar-05	48.5 U	48.5 U	48.5 U		48.5 U		48.5 U						5.6	
Sep-05	6.2 C		44 U		44 U		44 U	44.0 U					5.6	
Mar-06													5.6	
Sep-06	4.4		3.3	5.2	3.7		3						5.6	5.6
Mar-07	5.9		5.1		9.7		5.9						5.6	5.6
Sep-07	4.8		4.3 U	4.3 U	4.3 U		4.3 U							5.6
Mar-08	6 U				7.8	9.3			6.5		6 U			5.6
Jun-08									6 U		6 U			5.6
Sep-08	4.3				3.4 C				4.7		6	5.1		5.6
Dec-08									10 U		10 U	10 U		5.6
Mar-09	6.98 B				6.65 B				5.56 B		6.07 B	6.78 B		5.6
Sep-09	3.23 B	5.53 B			4.61 B				4.64 B		3.66 B			5.6
April-10	5.24 B				4.28 B				5.7 B	6.6 B	4.8 B			5.6

Nov-10	10 U				10 U				10 U	10 U	10 U			5.6
Mar-11	10 U				10 U	10 U			10 U		10 U			5.6
Sep-11	10 U				3.48B	10 U			4.05B		10 U			5.6

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-6. Tin Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	35.3 U		35.3 U		35.3 U		40.1 B	35.3 U					55.6	
Sep-96	33.5 U	0.033 U	33.5 U		33.5 U		33.5 U						55.6	
Mar-97	24.7 U	24.7 U	24.7 U		29 B		24.7 U						55.6	
Sep-97	5.6 U	5.6 U	5.6 U		5.6 U		33.2 U						55.6	
Mar-98	4.9 U		4.9 U	4.9 U	4.9 U		4.9 U						55.6	
Aug-98	28 U		28 U		28 U		28 U	28 U					55.6	
Mar-99	2.7 U		2.7 U	2.7 U	2.7 U		2.7 U						55.6	
Sep-99	2.1 U	2.1 U	2.1 U		2.1 U		2.1 U						55.6	
Mar-00													55.6	
Sep-00													55.6	
Mar-01	3.5 U		3.5 U		3.5 U		3.5 U	3.5 U					55.6	
Sep-01	2.4 U		100 U	100 U	13.9 U		13.9 U						55.6	
Mar-02	3.3 U	3.3 U	3.3 U		3.3 U		3.3 U						55.6	
Sep-02	4.7 U		4.7 U	4.7 U	4.7 U		4.7 U						55.6	
Mar-03	3.6 U		5.8 U		3.6 U		3.6 U						55.6	
Sep-03	5.6 U	5.6 U	5.6 U		5.6 U		5.6 U						55.6	
Mar-04	3.6 U		3.6 U		3.6 U		3.6 U	3.6 U					55.6	
Sep-04	4 U		4 U	4 U	4 U		4 U						55.6	
Mar-05													55.6	
Sep-05	5.1 U												55.6	
Mar-06													55.6	
Sep-06	3.5 U		3.5 U	4.6	3.5 U		3.5 U						55.6	10
Mar-07	4.4		3.4 U		3.4 U	4.1	3.8						55.6	10
Sep-07	6.3 U		6.3 U	6.3 U	6.3 U		6.3 U							10
Mar-08	6 U				6 U	6.5			8.1		6 U			10
Jun-08									6 U		6 U			10
Sep-08	3 U				3 U				3 U		3 U	3 U		10
Dec-08									100 U		100 U	100 U		10
Mar-09	100 U				100 U				100 U		100 U	100 U		10
Sep-09	100 U	100 U			100 U				100 U		100 U			10
April-10	100 U				100 U				100 U	100 U	100 U			10

Nov-10	1 U				1 U				1 U	1 U	1 U			10
Mar-11	1 U				1 U	1 U			1 U		1 U			10
Sep-11	1 U				1 U	1 U			1 U		1 U			10

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-7. Uranium Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Sep-95					2.98 U								3.4	
Mar-96	2.64		2.24		2.94		2.74	2.77					3.4	
Sep-96	2.4		2.26		2.42		2.21						3.4	
Mar-97	2.7		2.69		3.16		2.87						3.4	
Sep-97	2.76	2.55	2.43		3.01		2.38						3.4	
Mar-98	2.33		2.49	2.44	2.99		2.32						3.4	
Aug-98	2.59		2.48		3.34		2.34	2.36					3.4	
Mar-99	2.6		2.8	3	3.4		2.7						3.4	
Sep-99	2.65	2.53	2.63		3.41		2.58						3.4	
Mar-00													3.4	
Sep-00	3.27		3.19		3.17	3.62							3.4	
Mar-01	2.31		2.36		3.12		2.83	2.79					3.4	
Sep-01	2.42		2.25	2.28	3.06		2.65						3.4	
Mar-02	2.44	2.52	2.46		3.22		2.84						3.4	
Sep-02	2.25		2.27	2.14	2.99		2.58						3.4	
Mar-03	2.33		4.22		3.27		2.79						3.4	
Sep-03	2.19	2.22	2.49		2.97		2.58						3.4	
Mar-04	2.24		2.12		2.94		2.8	3.07					3.4	
Sep-04	2.35 B		2.15 B	2.38 B	2.95 B		2.59 B						3.4	
Mar-05	2.26	2.3	2.14		2.86		2.85						3.4	
Sep-05	2		1.63		2.34		2.09	2.2					3.4	
Mar-06	2.35	2.3	2.14		2.94		2.68						3.4	
Sep-06	2.12		1.94	1.95	2.53		2.72						3.4	3.4
Mar-07	1.91		2.57		2.6	2.16	2.53						3.4	3.4
Sep-07	2.55		1.84	1.93	2.59		2.47							3.4
Mar-08	2.12				2.32	2.53			1.64		2.5			3.4
Jun-08									1.63		2.51			3.4
Sep-08	2.45				2.49				1.96		2.48	2.53		3.4
Dec-08									1.65		2.48	2.61		3.4
Mar-09	2.13				2.4				1.61		2.46	2.38		3.4
Sep-09	2.29	2.35			2.43				1.67		2.56			3.4

April-10	2.07				2.34				1.56	1.6	2.48			3.4
Nov-10	2.02				2.34				1.59	1.61	2.34			3.4
Mar-11	2.17				1.96	1.94			1.81		2.5			3.4
Sep-11	2.19				2.27	3.82			1.65		2.25			3.4

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-8. Vanadium Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	26.8 J		12.6 J		23.6 J		14.4 J	15.1 J					41	
Sep-96	33.4 B	0.0258 B	25.1 B		32.9 B		24.3 B						41	
Mar-97	33.2 B	30.3 B	26 B		28.9 B		25.3 B						41	
Jun-97					36.2								41	
Sep-97	27.8 B	27.2 B	18.8 B		25.7 B	28.8	24.9 B						41	
Mar-98	29		18.6	18.3	26.8	28.4	23						41	
Aug-98	39.5 B		30.1 B		39.5 B		36 B	33.9 B					41	
Mar-99	28.3		13.9	15	25.2	30	23.6						41	
Sep-99	28.7 B	28.6 B	17.5 B		26.4 B		23.5 B						41	
Jan-00					25.7 B								41	
Mar-00													41	
Sep-00	27.5		15.5		27.2	27.3							41	
Dec-00					27.1 B								41	
Mar-01	27.1		16.5		25.8		25	25.3					41	
Sep-01	28.5		50 U	50 U	26.2		22.8						41	
Dec-01					26.2 B								41	
Mar-02	26.6	27.4	23.4		25.6		23.4						41	
Sep-02	28.6		26.7	1.1	28.8		24.3						41	
Mar-03	28.5		22.1		26.8		23.8						41	
Sep-03	25.9	26.9	24.4		26.2		16.2						41	
Mar-04	26.8		24.9		24.6		24.2	24.7					41	
Sep-04	27 C		25.4 C	25.2	26.1		24.8 C						41	
Mar-05	25.8	27.4	25.1		25.9		23.3						41	
Sep-05	25.4		21.5		24.9		27.4	23.4					41	
Mar-06	25.3	27.1	24.9		26.4		22.9						41	
Sep-06	28.8 C		23.7 C	23.2 C	28.6 C		22.7 C						41	40
Mar-07	27.6		25.1		27.6	21.1	25						41	40
Sep-07	28.5		23.8	23.6	29.1		25.9							40
Mar-08	27.7				28.8	29			23.2		22.1			40
Jun-08									24.3		24.4			40
Sep-08	28.9				30.2				22.6		24.5	23.9		40
Dec-08									27.3		25.9	28.6		40
Mar-09	31.2				32.8				30		29.4	28.4		40
Sep-09	31.2	30.6			30				24.5		29			40
April-10	41.8				41.7				40.5	41	39.1			40

Nov-10	36.9				38.6				35.7	37.7	36.9			40
Mar-11	36				37.6	37.3			36.3		36.4			40
Sep-11	34.8				37.6	37.4			33.2		35.2			40

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-9. Zinc Data

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	13.7 U		146		8.5 U		368	155					757	
Sep-96	15.4 B	0.003 U	260		23.1		665						757	
Mar-97	26.5	26.7	382		55.4		507						757	
Jun-97					12								757	
Sep-97	8.1 B	5.7	339		10.3	5.1 U	394						757	
Mar-98	5.8 B		318	321	6.1 B	2.2 U	386						757	
Aug-98	10.3 B		241		4.7 B		663	629					757	
Mar-99	2.6		164	144	10.6	0.8 U	347						757	
Sep-99	2.9 B	3.5 B	215		0.8 U		350						757	
Jan-00					10.4 B								757	
Mar-00													757	
Sep-00	7.4		357		2.8	4.2							757	
Dec-00					7.1 U								757	
Mar-01	4.4		262		0.94		17.4	17.5					757	
Sep-01	5.8		310	325	17.1		24.6						757	
Dec-01					1.3 U								757	
Mar-02	3.1	2.6	280		0.4 U		33.4						757	
Sep-02	7.1		329	0.54	2.3		33.6						757	
Mar-03	13.4 C		180		15 C		34.4 C						757	
Sep-03	23.7 C	2.6 C	296		3.1		8.9 C						757	
Mar-04	7.8 C		317 C		5.1 C		12.9 C	9.9 C					757	
Sep-04	6.9		288	286 C	7.3 C		12.8						757	
Mar-05	29.6 UC	5.6 UC	316 C		3.8 UC		15.4 UC						757	
Sep-05	14.5 UC		266 C		8.5 UC		9.1 UC	8.6 UC					757	
Mar-06	9 UC	15.9 UC	286 C		17 UC		12.4 UC						757	
Sep-06	8.7 UC		259 C	260 C	10.3 UC		6.6 UC						757	26.5
Mar-07	5.8 UCJ		341		7 UCJ	6.1 UCJ	11.7 UCJ						757	25.5
Sep-07	11.8 UC		378	375	3.8 UC		10.3 UC							26.5
Mar-08	6 U				6 U	6 U			6 U		19			26.5
Jun-08									6 U		6 U			26.5
Sep-08	4.7				3 U				3 U		6.9	5.9		26.5
Dec-08									10 U		10 U	10 U		26.5
Mar-09	10 U				10 U				10 U		8.16 B	4.83 B		26.5
Sep-09	10 U	10 U			10 U				10 U		10 U			26.5
April-10	10 U				10 U				10 U		10 U			26.5

Nov-10	10 U				10 U				12.6	10 U	10 U			26.5
Mar-11	10 U				10 U	10 U			10 U		10 U			26.5
Sep-11	10 U				10 U	10 U			10 U		10 U			26.5

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-10. Alkalinity Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	138		121		113		124	125					151.8	
Sep-96	143		125		117		129						151.8	
Mar-97	147		129		113		121						151.8	
Jun-97					114								151.8	
Sep-97	138	142	125		119		125						151.8	
Dec-97					121								151.8	
Mar-98	140		122	123	120		127						151.8	
Jun-98					122								151.8	
Aug-98	143		124		124		131	131					151.8	
Dec-98					127								151.8	
Mar-99	143		124	124	123		129						151.8	
Jun-99					118								151.8	
Sep-99	140	139	123		122		130						151.8	
Jan-00					135								151.8	
Mar-00													151.8	
Jun-00					137								151.8	
Sep-00	160		137		119	123							151.8	
Mar-01	137		145		120		152	144					151.8	
Jun-01					130								151.8	
Sep-01	132		126	128	124		130						151.8	
Mar-02	138	135	124		126		132						151.8	
Sep-02	135		130	128	131		146						151.8	
Mar-03	128		120		111		113						151.8	
Sep-03	130	129	128		114		123						151.8	
Mar-04	147		132		140		136	141					151.8	
Sep-04	137		121	130	126		121						151.8	
Mar-05	142	138	128		128		130						151.8	
Sep-05	138		132		126		126	130					151.8	
Mar-06	139	139	128		124		128						151.8	
Sep-06	137		125	117	120		123						151.8	152.9
Mar-07	138 J		126 J		126 J	126 J	124 J						151.8	152.9
Sep-07	129 J		117 J	120 J	118 J		120 J							152.9
Mar-08	123				111	100			117		129			152.9
Jun-08									121		131			152.9
Sep-08	133				121				125		137	135		152.9
Mar-09	143				121				127		141	137		152.9

Sep-09	137	139			126				135		141			152.9
April-10	138				119				125	140	136			152.9
Nov-10	139				127				134	132	143			152.9
Mar-11	138				122	124			136		146			152.9
Sep-11	139				125	124			135		146			152.9

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-11. Chloride Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	21.1		24.2		24.2		20.2	20.6					25.9	
Sep-96	19		22.9		21.7		20.1						25.9	
Mar-97	19.2		23.7				20.08						25.9	
Jun-97					22 D								25.9	
Sep-97	20.5	19.9	22.9		22.4		21						25.9	
Dec-97					20.6 D								25.9	
Mar-98	16.1 CD		21.4 D	21.4 D	20.9 CD		19.6 CD						25.9	
Jun-98					21								25.9	
Aug-98	18.3		23.7		21.4		20.7	21					25.9	
Dec-98					20.5 D								25.9	
Mar-99	19.5		24.9	24.4	20.2 CD	23.3	21.7						25.9	
Jun-99					21.2 CD								25.9	
Sep-99	18.9	19.9	26.3		23.2		28.1						25.9	
Jan-00					20.4 D								25.9	
Mar-00													25.9	
Jun-00					20.5 CD								25.9	
Sep-00	18.4		25.7		21.4	22.4							25.9	
Dec-00					21.9 D								25.9	
Mar-01	18.6		25.7		17.2		22.3	27.6					25.9	
Jun-01					16.8 D								25.9	
Sep-01	19		23.4	24.4	20.5		23.3						25.9	
Dec-01					18.6 D								25.9	
Mar-02	16.6	16.8	22.6		19.3		25.2						25.9	
Sep-02	18		25.6	24.5	20.7		26.6						25.9	
Mar-03	18.3		22.5		22.8		28.2						25.9	
Sep-03	15.7 D	15.6 D	22.6 D		23 D		23.8 D						25.9	
Mar-04	15 D		21.9 D		16.5 D		23.8 D	24.3 D					25.9	
Sep-04	15.7		22.3	23.1	17.4		24.1						25.9	
Mar-05	20.7	20.1	27.7		22.5		19						25.9	
Sep-05	13.4 D		23 D		17.1 D		24.8 D	24.5 D					25.9	
Mar-06	13.2 D	13.9 D	23.5 D		16.7 D		20.6 D						25.9	
Sep-06	15.2		21.2 D	21 D	17.5		24.5 D						25.9	26
Mar-07	16.4 D		24.3 D		19.1 D	18.9 D	27.2 D						25.9	26
Sep-07	15.8 D		21.3 D	21.9 D	16.2 D		23.9 D							26
Mar-08	17 D				18.3 D	18 D			18.1 D		22.2 D			26
Jun-08									15.4 D		18.8 D			26
Sep-08	14.4 D				15.2 D						19.6 D	19.8 D		26
Mar-09	12 D				13 D				16 D		18.6 D	18.7		26
Sep-09	14.3 D	13.8 D			15.4				16.8 D		20.8			26
April-10	11.9 D				12.3 D				15.7 D	15.9 D	18.9 D			26

Nov-10	16.1 D				17.7 D				17.1 D	17.1 D	20.6 D		26
Mar-11	14.5D				15.2D	16.4D			15D		19.2D		26
Sep-11	13.5D				13.4D	13.4D			16.2D		19.4D		26

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-12. Fluoride Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	0.34		0.4		0.42		0.36	0.36					0.5	
Sep-96	0.34		0.37		0.41		0.33						0.5	
Mar-97	0.34		0.36				0.3						0.5	
Jun-97					0.406								0.5	
Sep-97	0.39	0.334	0.348		0.415		0.331						0.5	
Dec-97					0.378								0.5	
Mar-98	0.304		0.363	0.364	0.371		0.33						0.5	
Jun-98					0.383								0.5	
Aug-98	0.342		0.355		0.362		0.343	0.34					0.5	
Dec-98					0.399								0.5	
Mar-99	0.5 U		0.5 U	0.5 U	0.335	0.5 U	0.5 U						0.5	
Jun-99					0.373								0.5	
Sep-99	0.5 U	0.5 U	0.5 U		0.5 U		0.5 U						0.5	
Jan-00					0.41								0.5	
Mar-00													0.5	
Jun-00					0.39								0.5	
Sep-00	0.5 U		0.5 U		0.5 U	0.5 U							0.5	
Dec-00					0.36 C								0.5	
Mar-01	0.5 U		2.5 U		0.5 U		2.5 U	2.5U					0.5	
Jun-01					0.35								0.5	
Sep-01	1 U		1 U	1 U	0.5 U		0.5 U						0.5	
Dec-01					0.36								0.5	
Mar-02	0.25 U	0.25 U	0.26		0.28		0.25 U						0.5	
Sep-02	0.25 U		0.25 U	0.25 U	0.25 U		0.357						0.5	
Mar-03	0.25 U		0.34		0.3		0.34						0.5	
Sep-03	0.3	0.31	0.28		0.3		0.25 U						0.5	
Mar-04	0.3		0.32		0.37		0.286	0.327					0.5	
Sep-04	0.28		0.34	0.29	0.3		0.26						0.5	
Mar-05	0.25	.25 U	0.27		0.28		0.29						0.5	
Sep-05	0.268		0.316		0.343		0.289	0.284					0.5	
Mar-06	0.27	0.3	0.29		0.31		0.26						0.5	
Sep-06	0.3		0.35	0.37	0.28		0.26						0.5	0.45
Mar-07	0.29		0.25		0.27	0.27	0.25 U						0.5	0.45
Sep-07	0.28		0.3	0.35	0.42		0.33							0.45
Mar-08	0.25 U				0.3	0.3			0.25 U		0.25 U			0.45
Jun-08									0.26		0.29			0.45
Sep-08	0.27				0.35				1.2 UD		0.5 UD	.5 UD		0.45
Mar-09	0.25				0.3				0.28		0.29	.25 D		0.45
Sep-09	0.4	0.43			0.31				0.34		0.37			0.45
April-10	0.23				0.3				.019 B	0.23 B	0.24 B			0.45

Nov-10	0.27				0.32				0.24 B	0.21 B	0.22 B			0.45
Mar-11	0.32B				0.28B	0.29B			0.29B		0.31B			0.45
Sep-11	0.33B				0.54	0.38B			0.26B		0.32B			0.45

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-13. Sulfate Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	24.2		29.9		30.7		28.9	28.7					37.8	
Sep-96	25.2		32.2		33.2		30.3						37.8	
Mar-97	27		31.5				30.5						37.8	
Jun-97					33.8 D								37.8	
Sep-97	26.6	26.1	32.6		34.9		31.4						37.8	
Dec-97					34.5 D								37.8	
Mar-98	22.7 D		31.6 D	31.4 D	34.8 D		31.2 D						37.8	
Jun-98					35								37.8	
Aug-98	26		30.7		35.4		31.8	31.5					37.8	
Dec-98					36.8 D								37.8	
Mar-99	26.8		32.4	32	37.3	35.2 D	30.8						37.8	
Jun-99					33.2 D								37.8	
Sep-99	25.9	25.8	32.5		34.6		31.3						37.8	
Jan-00					34.5 D								37.8	
Mar-00													37.8	
Jun-00					34.2 D								37.8	
Sep-00	30.5		31.7		37.6	35.9							37.8	
Dec-00					36.8 D								37.8	
Mar-01	26.9		36		31.6		37.8	39.5					37.8	
Jun-01					36.9 D								37.8	
Sep-01	27.8		30.3	30.8	34.5		31						37.8	
Dec-01					33.1 D								37.8	
Mar-02	25.6	25.6	29.2		33.8		30.5						37.8	
Sep-02	26.2		30.2	29.2	32.7		31.1						37.8	
Mar-03	26		30		34.7		31						37.8	
Sep-03	26.6 D	26.7 D	31.3 D		34.3 D		31.5 D						37.8	
Mar-04	26.7 D		31 D		32.2 D		31.5 D	32.4 D					37.8	
Sep-04	29.2		33.7	36	37.4		34.5						37.8	
Mar-05	27.7	27.3	32.7		33		24						37.8	
Sep-05	24 D		32.8 D		32.3 D		31.5 D	31.1 D					37.8	
Mar-06	27.3 D	27.4 D	30.9 D		30.5 D		30.9 D						37.8	
Sep-06	26.6		30.2 D	29.4 D	29.9		29.8 D						37.8	37.8
Mar-07	27.1 D		30.7 D		32.1 D	31.8 D	31.7 D						37.8	37.8
Sep-07	26.6 D		31.2 D	30.1 D	29 D		30.5 D							37.8
Mar-08	28 D				30.7 D	31.1			27.1 D		29.9 D			37.8
Jun-08									27.4 D		30.9 D			37.8
Sep-08	26.7 D				28.4 D				26		28.3 D	29.3 D		37.8
Mar-09	23.9 D				26.3 D				25 D		27.3 D	28.3 D		37.8
Sep-09	29.2 D	28 D			30.4 D				28.2 D		31.1 D			37.8
April-10	23.4 D				24.6 D				25.7 D	22.5 D	27.2 D			37.8

Nov-10	26.7				27.7				26.5	26.6	29.8			37.8
Mar-11	26.9D				29.2D	30.1D			26.5D		28.6D			37.8
Sep-11	36.8D				29.7D	26.2D			26.3D		28.7D			37.8

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-14. Gross Alpha Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	1.45 J		2.12 J		2.28 J		2.43 J	1.73 J					3.3	
Sep-96	1.69 J		0.109 U		1.57 J		1.15 U						3.3	
Mar-97	1.69 J	0.199 U	1.31 U		1.26 J		0.837 U						3.3	
Jun-97					1.68 J								3.3	
Sep-97	0.39 U	1.66 J	0.791 U		1.2 J		2.5 J						3.3	
Dec-97					2.36 J								3.3	
Mar-98	1.32 J		0.659 U	1.4J	2.17 J		0.683 U						3.3	
Jun-98					2.17 U								3.3	
Aug-98	0.431 U		2.3 J		2.89 J		2.45 J	3.37					3.3	
Dec-98					1.87 J								3.3	
Mar-99	2.7 J		3	1.3U	1.68 U	1.3 U	1.5 U						3.3	
Jun-99					2.75 J								3.3	
Sep-99	2.64 J	0.565 U	0.535 U		1.31 U	0.928 U	1.55 U						3.3	
Jan-00					3.75								3.3	
Mar-00													3.3	
Jun-00					3.29								3.3	
Sep-00	0.34 U		0.5 U		0.266 U	1.28 U							3.3	
Dec-00					2.06 U								3.3	
Mar-01	0.303 U		1.01 U		2.33 J		0.812 U	1.43 U					3.3	
Sep-01	-0.386 U		0.976 U	0.751 U	1.12 U		0.374 U						3.3	
Mar-02	0.884 U	0.227 U	0.522 U		0.363 U		0.016 U						3.3	
Sep-02	0.348 U		0.38 U	0.91 U	0.289 U		-0.377 U						3.3	
Mar-03	0.748 U		6.01		0.865 U		1.68						3.3	
Sep-03	1.44	0.882 U	1.11 U		1.16 U		1.64						3.3	
Mar-04	2.26		1.73 U		1.83 U		1.52	2.13					3.3	
Sep-04	1.21		-0.435 U	-0.173 U	0.487 U		0.531 U						3.3	
Mar-05	1.53	0.817 U	1.33		0.913 U		1.68						3.3	
Sep-05	0.862 U		1.06 U		0.646 U		1.16 U	1.78					3.3	
Mar-06	-0.264 U	1.16 U	-0.146 U		1.12 U		0.117 U						3.3	
Sep-06	-0.059 U		1.34 U	3.05	1.86		-0.156 U						3.3	2.98
Mar-07	0.083 U		-0.0265 U		-0.442 U	-.857 U	-0.864 U						3.3	2.98
Sep-07	-0.352 U		4.71	1.05 U	3.62		-0.194 U							2.98
Mar-08	0.897 U				1.06 U	0.656 U			0.119 U		-0.095 U			2.98
Jun-08									2.1		0.673 U			2.98
Sep-08	-0.474 U				2.76				1.41 U		0.125 U	-.134 U		2.98
Dec-08									0.066 U		-0.187 U	.841 U		2.98
Mar-09	1.56 U				0.767 U				-0.179 U		3.92	.583 U		2.98

Dec-09	1.38 U	1.26 U			1.9 U				0.576 U		1.54 U			2.98
April-10	2.41 U				1.99				1.38 U	2.67	1.8 U			2.98
Nov-10	0.97 U				1.22U				0.946 U	.926 U	0.767 U			2.98
Mar-11	1.42U				1.49U	2.06			1.56U		0.74U			2.98
Sep-11	2.05U				2.05U	1.98U			2.04U		-0.311U			2.98

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-15. Gross Beta Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	10.9		22.4		20.4		16	15.5					31.7	
Sep-96	13.2		26.9		25.7		17.6						31.7	
Mar-97	11.2	10.5	21.6		23.2		13.5						31.7	
Jun-97					16.3								31.7	
Sep-97	10.2	12.7	20.7		21		15.9						31.7	
Dec-97					21.4								31.7	
Mar-98	10.5		26.4	25.4	20.2		14.5						31.7	
Jun-98					44.7								31.7	
Aug-98	17.1		27.4		25.1		19.1	13.4					31.7	
Dec-98					21.3								31.7	
Mar-99	25		17	67	25.1	56	27						31.7	
Jun-99					25.8								31.7	
Sep-99	25.1	25.8	57.2		38	50.2	27.1						31.7	
Jan-00					21.7								31.7	
Mar-00													31.7	
Jun-00					21.6								31.7	
Sep-00	27.6		49.2		49.9	47.4							31.7	
Dec-00					23.4								31.7	
Mar-01	26.2		59.4		47.8		31.9	35.5					31.7	
Sep-01	29.8		41.2	39.6	41.2		29.8						31.7	
Mar-02	28	28.5	39.1		42.7		30.8						31.7	
Sep-02	23.3		28.3	26.3	28.7		21.4						31.7	
Mar-03	38.8		47		44.3		36.8						31.7	
Sep-03	38.1	38.1	35.6		44		41.5						31.7	
Mar-04	25.8		28.1		29.8		36.2	41.3					31.7	
Sep-04	39.1		34.1	34.3	33.8		38.3						31.7	
Mar-05	41.4	38.4	32.9		33.2		36.9						31.7	
Sep-05	44.6		35.8		27.8		41.6	41.2					31.7	
Mar-06	45.4	44.6	30		30		45.4						31.7	
Sep-06	45.5		27.6	33.2	29		40.5						31.7	31.5
Mar-07	52.1		35.3		27.8	24	39.6						31.7	31.5
Sep-07	52.5		34.6	38.2	26.4		46.2						31.7	31.5
Mar-08	45.7				20	23.6			38.7		33.4			31.5
Jun-08									31.9		39.2			31.5
Sep-08	42.1				22.8				44.8		38.1	60.3		31.5
Dec-08									39.9		33.7 J	41.8 J		31.5
Mar-09	46.8				24.9				37.8		42.4	39.6		31.5

Sep-09	46.4	50.7			19.9				37		38.9			31.5
April-10	54.4				21.3				34.9	41.8	38.6			31.5
Nov-10	53.7				21.4				36.5	34.7	34.6			31.5
Mar-11	54.2				22.5	19.4			34.2		31.8			31.5
Sep-11	54.8				18.1	19.2			32.6		36.8			31.5

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-16. Carbon-14 Data

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	22.3 J		6.76 J		4.26 J		4.72 J	2.48 U					26.8	
Sep-96													26.8	
Mar-97	21.6 J	22.2 J	11.1 J		3.94 U		3.81 U						26.8	
Sep-97	16.7 J	10.7 J	3.27 U		1.6 U		5.43 U						26.8	
Mar-98	19.4 J		4.5 U	7.16 U	3.69 U		-1.49 U						26.8	
Aug-98	18.5 J		8.63 J		2.07 U		6.46 U	6.4 U					26.8	
Mar-99	25 U		9.9 U	12 U	-6.1 U		-6.5 U						26.8	
Sep-99	14.1 U	7.43 U	-2.74 U		-9.54 U		-5.94 U						26.8	
Mar-00													26.8	
Sep-00	35.2 U		13.7 U		3.75 U	4.81 U							26.8	
Mar-01	9.56 U		43.4 U		-28.1 U		47.2 U	57 J					26.8	
Sep-01	32.5 U		6.73 U	22.5 U	-15.1 U		-1.16 U						26.8	
Mar-02	14 U	21.4 U	11.6 U		21.7 U		13.2 U						26.8	
Sep-02	5.02 U		17 U	32.6 U	-1.55 U		8.45 U						26.8	
Mar-03	-6.69 U		-0.225 U		25.2 U		1.78 U						26.8	
Sep-03	0.446 U	3.32 U	5.74 U		-10.3 U		-4.5 U						26.8	
Mar-04	33.9 U		16.4 U		10.2 U		9.75 U	-12.4 U					26.8	
Sep-04	8.8 U		0 U	6.99 U	1.22 U		2.45 U						26.8	
Mar-05	11.8 U	42.2 U	38.6 U		17.8 U		28.9 U						26.8	
Sep-05	19.9 U		8.17 U		-2.4 U		-2.37 U	-10.7 U					26.8	
Mar-06	34.2 U	16.1 U	1.44 U		-22.6 U		6.04 U						26.8	
Sep-06	15.8 U		1.42 U	-5.16 U	13.6 U		-4.74 U						26.8	58.1
Mar-07	20.8 U		29.4 U		21.2 U	7.41 U	16.1 U						26.8	58.1
Sep-07	22.4 U		26.8 U	26.4 U	-0.045 U		44.9 U							58.1
Mar-08	30.6 U				23.5 U	-3.8 U			0.956 U		18.1 U			58.1
Jun-08									-20.6 U		-4.28 U			58.1
Sep-08	27.6 U				-20.8 U				-8.35 U		-12.9 U	-4.33 U		58.1
Dec-08									19.6 U		34.6 UJ	49.2 UJ		58.1
Mar-09	-18.3 U				-0.458 U				-13.9 U		-13.9 U	17.5 U		58.1
Sep-09	35 U	14.3 U			7.52 U				-8.42 U		11.5 U			58.1
April-10	41.9 U				33.5 U				8.23 U	6.81 U	18.3 U			58.1

Nov-10	10.3 U				0.452 U				-31.7 U	-7.42 U	30.6 U			58.1
Mar-11	35.8U				-2.96U	1.26U			3.96U		4.31U			58.1
Sep-11	25.7U				12.4U	16.7U			-0.939U		29.8U			58.1

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.

J = Estimated Results.
U = Result is non-detected.

Table A-17. Iodine-129 Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Jan-95					38.8 J								21.5	
Jun-95					19.9								21.5	
Jan-96			3.06 U				1.04 U						21.5	
Mar-96	9.4		9.42		18.7		6.01	3.69 U					21.5	
Sep-96	7.54		11.9		13.7		2.22 U						21.5	
Mar-97	10.1	11	7.81		11.8		2.82 J						21.5	
Jun-97					12.3								21.5	
Sep-97	9.52	11.3	9.73		16.2		3.03 J						21.5	
Mar-98	8.07	4.54 U	13.2	9.83 U	15.2	15.2	1.62 U	1.62 U					21.5	
Aug-98	9.6		12.2		15.2		2.57	2.78					21.5	
Mar-99	6.1		7.9	1.2 U	14.4	3.8 U	2.9 U						21.5	
Sep-99	5.68	6.96	9.24		6.54 U		1.87 U						21.5	
Jan-00					12.9								21.5	
Mar-00													21.5	
Sep-00	0.307 U		11		13.9	13.1							21.5	
Dec-00					13.3								21.5	
Mar-01	4.63 U		13.8		16.7		6.72	2.74 U					21.5	
Jun-01					7.37								21.5	
Sep-01	3.1 U		12.3	-5.52 U	13.8		4.59 J						21.5	
Dec-01					9.14								21.5	
Mar-02	4.09	3.79	9.71	10.7	13.9		2.2	2.16 U					21.5	
Sep-02	4.66 J		8.34	12	14.3		2.3 U						21.5	
Mar-03	4.97		12.1		14.2		3.43						21.5	
Sep-03	2.91 U	-9.28 U	7.88 U		13.4		-1.82 U						21.5	
Mar-04	4.86		11.8		11		2.44 U	1.64 U					21.5	
Sep-04	4.99		13.6	13.3	6.53		2.52 U						21.5	
Mar-05	5.25 U	3.66 U	15.5		10.6		-1.61 U						21.5	
Sep-05	5.30		14.6		12.5		2.42 U	2.45 U					21.5	
Mar-06	2.87 U	1.91 U	13.5		7.66		0.379 U						21.5	
Sep-06	3.02 U		12.7	15.4	10.1		3.58 U						21.5	21.1
Mar-07	5.18		14.3		14.3	11.5	3.51						21.5	21.1
Sep-07	5.59		17	16	11.3		2.63 U						21.5	21.1
Mar-08	6.32				12.6	11.6			1.58 U		7.66			21.1
Jun-08									0.236 U		7.94			21.1
Sep-08	3.29				11.2				0.953 U		7.44	7.8		21.1
Dec-08									0.784 U		5.59	7.69		21.1
Mar-09	4.6				11.2				1.1 U		7.28	4.82		21.1
Sep-09	6.15	4.7 U			11.6				2.83		8.26			21.1

April-10	2.99 U				10				1.05 U	-0.853 U	5.52			21.1
Nov-10	4.82				10.6				.0651 U	0.767 U	5.3			21.1
Mar-11	3.21U				4.23	1.92U			1.44U		5.52			21.1
Sep-11	2.31U				8.68	7.81			1.12U		4.79			21.1

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-18. Technetium-99 Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Sep-95					60.2								94.9	
Mar-96	25.5		65		64.2		31	32					94.9	
Sep-96	20.3		53.5		52.3		32.1						94.9	
Mar-97	20	21.6	77.5		59.9		30						94.9	
Jun-97					64								94.9	
Sep-97	18.9	17.3	66.8		57		34.8						94.9	
Dec-97					64.2								94.9	
Mar-98	23.2		68.6	75.4	78.2		23.5						94.9	
Jun-98					73.6								94.9	
Aug-98	29.4		74.9		77.4		36.5	16.5					94.9	
Dec-98					72								94.9	
Mar-99	0 U		86	83	70.5	0 U	36						94.9	
Jun-99					0.0737 J								94.9	
Sep-99	40.4	34.3	85.2		90.1		44.6						94.9	
Jan-00					126								94.9	
Mar-01													94.9	
Jun-00					85.7								94.9	
Sep-00	35.6		80.1		85.6	76.5							94.9	
Dec-00					60.9								94.9	
Mar-01	45.5		75.9		92		40.2	42.3					94.9	
Jun-01					61.3								94.9	
Sep-01	47.6		56.5	63.7	72.3		46.9						94.9	
Dec-01					66.3								94.9	
Mar-02	51.4	61.3	71.8		76.1		46.3						94.9	
Sep-02	52.8		59.7	51.6	67.1		58.8						94.9	
Mar-03	61.3		62.1		66.3		56.5						94.9	
Sep-03	57.7	59.5	54.5		58.3		58.7						94.9	
Mar-04	59.4		54.7		56.4		66.7	68.1					94.9	
Sep-04	67.2		60.6	63.5	56.5		66.3						94.9	
Mar-05	68.6	78.4	66.2		57.2		65.5						94.9	
Sep-05	73.1		57		50.9		71.8	73					94.9	
Mar-06	74.3	80	59.2		46		60.4						94.9	
Sep-06	75.2		47.1	48.3	40.7		64.5						94.9	93.8
Mar-07	73.3		51.5		40.6	39	67.7						94.9	93.8
Sep-07	84.3		46.7	51.5	37		72.8							93.8
Mar-08	76.9				39	33.2			63.4		67.7			93.8
Jun-08									63.8		65.4			93.8
Sep-08	74.8				33.7				61.3		64.5	66.6		93.8
Dec-08									64.8		64.1	62.3		93.8

Mar-09	94.7				38.6				77.8		74	71.8		93.8
Sep-09	95.4	99.5			38				69.1		70.6			93.8
April-10	102				38				73.7	78.6	70.6			93.8
Nov-10	100				35.8				73.5	68.5	70.8			93.8
Mar-11	113				35.1	6.84			73.3		74.4			93.8
Sep-11	124				32.1	33.7			76.6		68.6			93.8

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J= Estimated Results.
U = Result is non-detected.

Table A-19. Radium Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	0.141 U		0.207 U		0.521 U		0.276 U	0.235 J					0.5	
Sep-96	0.0497 U		0.135 J		0.0482 U		0.0248 U						0.5	
Mar-97	0.0235 U		0.065 J		0.0577 U		0.07 U						0.5	
Sep-97	0.0723 U	0.0358U	0.0353 U		0.123 U		0.0748 U						0.5	
Mar-98	0.078 U		0.21 J	0.103 U	0.148 U		0.114 U						0.5	
Aug-98	0.0391 U		0.0864 U		0.14 U		0.135 U	0.0544 U					0.5	
Mar-99	0.001 U		0.088 U	0 U	0.087 U		0.017 U						0.5	
Sep-99	0.025 U	.088 U	0.083 U		0.195 U		-0.068 U						0.5	
Mar-00													0.5	
Sep-00	0.827 U		1.99 J		-0.261 U	0.182 U							0.5	
Mar-01	0.144 U		0.431 U		-0.037 U		0.033 U	0.931 U					0.5	
Sep-01	-0.387 U		-0.537 U	0.506 U	0.675 U		0.18 U						0.5	
Mar-02	0.94 J	0.599 U	0.063 U		0.383 U		0.258 U						0.5	
Sep-02	-0.147 U		0.332 U	-0.143 U	0.147 U		-0.271 U						0.5	
Mar-03	0.345 U		0.474 U		-0.392 U		0.637 U						0.5	
Sep-03	-0.063 U	-.009 U	0.092 U		0.039 U		0.039 U						0.5	
Mar-04	0.232 U		0.611 U		0.57 U		0.265 U	0.411 U					0.5	
Sep-04	-0.022 U		-0.05 U	-0.128 U	-0.083 U		-0.051 U						0.5	
Mar-05	0.144 U	-.045 U	0.089 U		0.037 U		-0.058 U						0.5	
Sep-05	0.168 U		0.085 U		0.059 U		0.036 U	0.04 U					0.5	
Mar-06	-0.294 U	-0.042 U	0.045 U		-0.199 U		-0.194 U						0.5	
Sep-06	-0.215 U		-0.117 U	0.073 U	-0.327 U		0.06 U						0.5	0.695
Mar-07	-0.136 UJ		-0.395 UJ		-0.301 U	-.21 UJ	-0.327 UJ						0.5	0.695
Sep-07	-0.229 U		-0.008 U	.067 U	-0.121 U		-0.399 U							0.695
Mar-08	-0.019 U				-0.052 U	0.096 U			0.102 U		0.046 U			0.695
Jun-08									0.077 U		0.174 U			0.695
Sep-08	0.023 U				0.027 U				0.1 U		-0.033 U	.424 U		0.695
Dec-08									0.088 U		-0.069 U	.024 U		0.695
Mar-09	-0.14 U				-0.104 U				-0.281 U		-0.1 U	.021 U		0.695
Sep-09	0.078 U				0.053 U				0.036 U		0.271 U			0.695
April-10	0.148 U				-0.005 U				0.089 U	0.048 U	0.015 U			0.695
Nov-10	0.056 U				0.006 U				0.013 U	0.004 U	0.144 U			0.695
Mar-11	-0.032U				0.163U	.045U			0.104U		0.098U			0.695
Sep-11	0.028U				0.057U	.021U			0.072U		0.1U			0.695

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U= Result is non-detected.

Table A-20. Carbon Tetrachloride Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	5 U		2 J		4 J		5 U	5 U					10.6	
Sep-96	4 J	5 U	7		7		5 J						10.6	
Mar-97	4 J	3 J	6		7		4 J						10.6	
Jun-97					7								10.6	
Sep-97	5 U	5 U	4 J		11		5 U						10.6	
Mar-98													10.6	
Jun-98					10 U								10.6	
Aug-98	2 J		6		5		3 J	3 J					10.6	
Mar-99	1 J		4 J	4 J	7		3 J						10.6	
Sep-99	5 U	1 J	4 J		5		3 J						10.6	
Mar-00													10.6	
Jun-00					7.1								10.6	
Sep-00	1 J		5		9	9							10.6	
Mar-01	1 J		6		7		5.26	5					10.6	
Sep-01	5 U		4 J	4 J	7		5 J						10.6	
Mar-02	1 J	1 J	5		9		5						10.6	
Sep-02	1.011 J		5.018	5.243	8		5.854						10.6	
Mar-03	5 U		4 J		6		5 J						10.6	
Sep-03	5 U	5 U	4 J		6		5						10.6	
Mar-04	1 J		6		8		7.416						10.6	
Sep-04	1 J		5	6	8		7	7.223					10.6	
Mar-05	1 J	1 J	6	6	7		8						10.6	
Sep-05	5 U		6		7		8	8					10.6	
Mar-06	1 J	1 J	4 J		5 J		10						10.6	
Sep-06	5 U		5 J	5 J	6		6						10.6	11
Mar-07	1 J		5 J		4 J	5 J	7 J						10.6	11
Sep-07	5 U		6	6	5		8							11
Mar-08	5 U				5 J	4 J			5 U		2 J			11
Jun-08									5 U		2 J			11
Sep-08	5 U				4 J				5 U		2 J	2 J		11
Dec-08									1.14 J		2.33 J	2.32 J		11
Mar-09	5 U				4.05 J				5 U		1.52 J	1.6 J		11
Sep-09	5 U	5 U			4.35 J				5 U		1.85 J			11

April-10	5 U				3.02 J				5 U	5 U	1.63 J			11
Nov-10	5 U				4.61 J				1 J	5 U	2.01 J			11
Mar-11	5 U				3.22J	3.33J			5U		1.96J			11
Sep-11	5 U				3.08J	2.94J			1.07J		3.22J			11

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Result.
U= Result is non-detected.

Table A-21. Nitrogen Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Sep-95					36.6								51.5	
Mar-96	4.58		20.2		31.9		35.6	36.5					51.5	
Sep-96	4.19		20.6		26.1		33.7						51.5	
Mar-97	0.419	40	22.6		21.3		34.1						51.5	
Sep-97	4.13	4.19	18.9		24.6		35.4						51.5	
Mar-98	4.62 D		20.4 D	20.1 D	25.3 D		34.3 D						51.5	
Aug-98	4.14		24		26.3		35.2	34.5					51.5	
Mar-99	4.53		20.8	20.6	24.6		31.8						51.5	
Sep-99	4.6	4.5	20		23.7		33						51.5	
Mar-00													51.5	
Sep-00	4.7		19.1		24.6	23.2							51.5	
Mar-01	5.5		19.9		24.7		31.3	32.2					51.5	
Sep-01	4.6		17.3	17.6	23		29.3						51.5	
Mar-02	4.6	4.5	16.3		18.9		27.9						51.5	
Sep-02	4.48		15.8	15.8	19		26.6						51.5	
Mar-03	4.8		17		21.4		29.7						51.5	
Sep-03	5.1 D	5.1 D	15.9 D		19.3 D		29.2 D						51.5	
Mar-04	4.8 D		14.4 D		16.8 D		32.4 D	26 D					51.5	
Sep-04	4.9		15.3	15.8	16.8		26.8						51.5	
Mar-05	5.1	5.1	14.3		15.6		25.8						51.5	
Sep-05	7.72 D		12.5 D		14.4 D		24.6 D	24 D					51.5	
Mar-06	4.6 D	4.6 D	12.9 D		13.8 D		23.7 D						51.5	
Sep-06	5.3		13.4 D	13.2 D	13.3		22.8 D						51.5	51.1
Mar-07	4.8 D		13 D		13.8 D	14 D	28.9 D						51.5	51.1
Sep-07	4.4 D		12.7 D	12.7 D	10.7 D		22.7 D							51.1
Mar-08	3.1 D				6.2 D	6.1 D			39.8 D		9.4 D			51.1
Jun-08									36.2 D		13.4 D			51.1
Sep-08	3.4				6.6 D				38.3 D		9.4 D	9.7 D		51.1
Mar-09	4.6 D				8.3 D				35.1 D		13.3 D	12.6 D		51.1
Sep-09	4.44 D	4.36 D			7.52 D				33.8 D		12.4 D			51.1
April-10	5.28 D				7.72 D				35.1 D	91.2	12.4 D			51.1
Nov-10	4.73 D				6.6 D				32.1 D	33.8 D	6.8 D			51.1
Mar-11	5.27D				7.3D	7.28D			37.8D		13.8D			51.1
Sep-11	5.68D				7.31D	7.31D			35.8D		7.3D			51.1

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U= Result is non-detected.

Table A-22. Total Organic Halides Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	6.6 J		10.5 J		5.6 J		6.6 J	5					9.5	
Sep-96	5 U		5 U		5 U		5 U						9.5	
Mar-97	5 U		5 U		2.9		5 U						9.5	
Jun-97					11.7								9.5	
Sep-97	6.05	4.62 U	7.05		4.62 U		5 U						9.5	
Mar-98	4.62 U		4.62 U	4.62 U	4.62 U		4.62 U						9.5	
Aug-98	5.9		5.85		6.7		5 U	5 U					9.5	
Mar-99	24 U		12 U	24 U	34.5		14.3						9.5	
Sep-99	128	12 U	206		12 U		12 U						9.5	
Jan-00					14								9.5	
Mar-00													9.5	
Jun-00					4.4 B								9.5	
Sep-00	206		271		180	181							9.5	
Dec-00					10.6								9.5	
Mar-01	17.1 U		20 U		20 U		20 U	20 U					9.5	
Sep-01	6.5 U		8.7 U	7.4 U	6.5 U		6.6 U						9.5	
Dec-01					13.2								9.5	
Mar-02	5.2 U	6.1	9.3		9.5		5.2 U						9.5	
Sep-02	10.5		5.6	5.2 U	8.5		60.6						9.5	
Mar-03	5.2 U		6.3		5.3		5.2 U						9.5	
Sep-03	5.2 U	5.2 U	6.2		6.8		6.3						9.5	
Mar-04	6.7		5.7		9.8		5.2 U	6.4					9.5	
Sep-04	5.2 U		5.2 U	5.2 U	6.7		5.2 U						9.5	
Mar-05	5 U	6.3	8.1		12.8		11.4						9.5	
Sep-05	5 U		8.83		12.2		7.46	5.51					9.5	
Mar-06	5.2 UC	15.9 C	5.2 UC		9.2 C		10.6 D						9.5	
Sep-06	16.9		5 U	5 U	6.1		38.9						9.5	5
Mar-07	5.2 U		5.2 U		5.2 U	5.2 UJ	7.2						9.5	5
Sep-07	5.2 U		5.2 U	5.2 U	5.2 U		5.2 U							5
Mar-08	5.2 U				5.2 U	5.2			9.8		7.1			5
Jun-08	5.5								5.2 U		5.2 U			5
Sep-08					5 U	5.2 U					5.2 U	5.9		5
Mar-09	5 U				5 U				5 U		5 U	5 U		5
Sep-09	2.77 B	5.38			4.96 B				5.23		14.5			5

April-10	5 U				5 U				1.89 B	3.8 B	0.72 B			5
Nov-10	40 U				40 U				40 U	26.4 B	40 U			5
Mar-11	40U				40U	40U			40U		40U			5
Sep-11	20U				10U	10U			10U		20U			5

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U= Result is non-detected

Table A-23. Total Dissolved Solids Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	254		340		384		401	420					573.6	
Sep-96	236		367		411		457						573.6	
Mar-97	283	279	404		390		514						573.6	
Jun-97					398								573.6	
Sep-97	277	278	377		401		463						573.6	
Dec-97					379								573.6	
Mar-98	322		320	309	327		456						573.6	
Jun-98					472								573.6	
Aug-98	296		406		422		491	507					573.6	
Dec-98					344								573.6	
Mar-99	280		380	400	390	406	440						573.6	
Jun-99					407								573.6	
Sep-99	270	280	370		410		470						573.6	
Jan-00					355								573.6	
Mar-00													573.6	
Jun-00					434								573.6	
Sep-00	270		340		550	520							573.6	
Mar-01	278		407		400		349	436					573.6	
Sep-01	305		384	391	420		535						573.6	
Mar-02	265	258	333		358		430						573.6	
Sep-02	276		326	328	344		446						573.6	
Mar-03	260		337		349		407						573.6	
Sep-03	269	271	361		381		5U						573.6	
Mar-04	262		323		326		438	442					573.6	
Sep-04	262		331	330	355		392						573.6	
Mar-05	205	253	278		339		386						573.6	
Sep-05	292		387		403		460	500					573.6	
Mar-06	274	269	314		302		391						573.6	
Sep-06	270		464	409	311		521						573.6	570
Mar-07	271 J		312 J		310 J	314 J	388 J						573.6	570
Sep-07	259 J		309 J	363 J	304 J		498 J							570
Mar-08	274				295	341			438		344			570
Jun-08									508		222			570
Sep-08	268				285				477		337	345		570
Mar-09	263				291				439		326	301		570
Sep-09	262	286			290				520		344			570
April-10	270				285				485	481	336			570

Nov-10	257				258				442	430	323			570
Mar-11	260				305	295			414		301			570
Sept-11	240				267	272			396		289			570

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-24. Turbidity Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Mar-96	0.34 J		0.3 J		0.26 J		3.21 J	1.48 J					50	
Sep-96													50	
Mar-97	0.71		8.91		0.84		60.6						50	
Jun-97					1.78								50	
Sep-97	1.9		14.4		1.33		4.56						50	
Dec-97					1.38								50	
Mar-98	1.65		23.4		3.52		4.85						50	
Jun-98					3.99								50	
Aug-98	1.29		90.5				2.95						50	
Dec-98					2.62								50	
Mar-99			52.6		4.54								50	
Jun-99					3.25								50	
Sep-99	2.29		87.2		2.68								50	
Jan-00					4.12								50	
Mar-00													50	
Jun-00					1.63								50	
Sep-00	2.3		142		2.6								50	
Dec-00					2.41								50	
Mar-01	1.71		38.2		1.06		16.7						50	
Jun-01					1.71								50	
Sep-01	1.54		3.35		1.17		6.62						50	
Dec-01					4.12								50	
Mar-02	1.85		11.1		5		7.4						50	
Sep-02	2.2		5.6		4.7		6.7						50	
Mar-03	1.86		962		1.29		15						50	
Sep-03	2.41		41.6		2.68		49.7						50	
Mar-04	2.01		16.3		2.49		15						50	
Sep-04	2.93		16.9		4.65		4.19						50	
Mar-05	2.78		7.53		2.13		4.16						50	
Sep-05	0.73		4.61		3.88		3.94						50	
Mar-06	1.93		7.21		1.39		4.07						50	
Sep-06	1.12		4.02		4.41		4.6						50	49.8
Mar-07	1.65		4.99		1.94		7.02						50	49.8
Sep-07	1.17		4.57		3.94		13.5							49.8
Mar-08	2.77				4.74				0.87		3.56			49.8
Jun-08									3.95		2.61			49.8
Sep-08	2.83				1.31				1.93		1.24			49.8

Dec-08									1.65		2.23			49.8
Mar-09	3.49				2.52				0.8		0.57			49.8
Sep-09	1.85				0.97				3.01		1.12			49.8
April-10	3.27				2.43				0.77		2.1			49.8
Nov-10	2.69				1.32				4.03		0.73			49.8
Mar-11	4.12				1.71				2.3		1.26			49.8
Sept-11	3.11				1.38				0.62		0.32			49.8

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

Table A-25. pH Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Jan-96			7.71				7.68						8	
Mar-96	7.66				7.8								8	
Sep-96					7.7								8	
Mar-97	7.82		7.68		7.67		7.64						8	
Jun-97					7.75								8	
Sep-97	7.86		7.86		7.76		7.74						8	
Dec-97					7.81								8	
Mar-98	7.86		7.8		7.64		7.71						8	
Jun-98					7.72								8	
Aug-98	7.95		8.31		7.95		7.77						8	
Dec-98					7.8								8	
Mar-99			7.72		7.71								8	
Jun-99					7.61								8	
Sep-99	7.95		7.69		7.82								8	
Jan-00					7.77								8	
Jun-00					7.71								8	
Sep-00	7.9		7.7		7.8								8	
Dec-00					7.75								8	
Mar-01	8.56		7.7		7.84		7.74						8	
Jun-01					7.68								8	
Sep-01	7.77		7.7		7.7		7.78						8	
Dec-01					7.74								8	
Mar-02	7.89		7.83		7.73		7.8						8	
Sep-02	7.9		7.8		7.7		7.8						8	
Mar-03	7.9		7.79		7.71		7.76						8	
Sep-03	7.85		7.76		7.63		7.67						8	
Mar-04	7.89		7.77		7.63		7.78						8	
Sep-04	7.76		7.78		7.68		7.76						8	
Mar-05	7.86		7.74		7.64		7.83						8	
Sep-05	7.84		7.74		7.59		7.81						8	
Mar-06	7.9		7.74		7.69		7.86						8	
Sep-06	7.81		7.78		7.72		7.8						8	8.01
Mar-07	7.86		7.78		7.77		8.08						8	8.01
Sep-07	8.07		7.79		7.8		7.9							8.01
Mar-08	7.77				7.62				7.51		7.55			8.01
Jun-08									7.5		7.56			8.01
Sep-08	7.35				7.56				7.47		7.52			8.01
Dec-08									7.67		7.75			8.01

Mar-09	7.91				7.77				7.67		7.75			8.01
Sep-09	7.95				7.8				7.6		7.73			8.01
April-10	7.99				7.84				7.7		7.82			8.01
Nov-10	7.97				7.8				7.5		7.71			8.01
Mar-11	8.09				7.77				7.72		7.89			8.01
Sept-11	7.95				7.79				7.76		7.9			8.01

B = Estimated Results.

C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.

D = Reported from dilution.

J = Estimated Results.

U = Result is non-detected.

Table A-26. Specific Conductance Data.

Sample Date	699-35-66A (Down Gradient)	DUP	699-36-67 (Retired 2007)	DUP	699-36-70A (Up Gradient)	DUP	699-37-68 (Retired 2007)	DUP	699-37-66 (Down Gradient)	DUP	699-36-66B (Down Gradient)	DUP	Old Limit (Through 2006)	New Limit (2007 Onward)
Jan-96			461				547						743	
Mar-96	402				618								743	
Sep-96					595								743	
Mar-97	428		545		562		630						743	
Jun-97					591								743	
Sep-97	423		540		575		614						743	
Dec-97					483								743	
Mar-98	441		534		565		671						743	
Jun-98					505								743	
Aug-98	405		510		546		270						743	
Dec-98					558	571 C							743	
Mar-99			577		585	552 C							743	
Jun-99					556 C	571 C							743	
Sep-99	413		541		578								743	
Jan-00					533 C	584							743	
Mar-00													743	
Jun-00					576								743	
Sep-00	412		537		565								743	
Dec-00					537 C	563							743	
Mar-01	416		533		555		618						743	
Jun-01					547								743	
Sep-01	423		522		540		601						743	
Dec-01					460	530							743	
Mar-02	473		518		522		605						743	
Sep-02	412		517		537		605						743	
Mar-03	409		505		535		594						743	
Sep-03	395		502		500		425						743	
Mar-04	409		500		487		604						743	
Sep-04	406		486		483		588						743	
Mar-05	405		487		470		596						743	
Sep-05	402		471		469		562						743	
Mar-06	402		482		465		573						743	
Sep-06	407		475		454		553						743	774
Mar-07	408		482		455		567						743	774
Sep-07	400		491		441		574							774
Mar-08	408				429				667		515			774
Jun-08									676		507			774
Sep-08	397				400				648		500			774
Dec-08									666		504			774
Mar-09	402				421				636		504			774

Sep-09	378				411				617		472			774
April-10	394				396				634		490			774
Nov-10	401				402				656		498			774
Mar-11	404				414				648		500			774
Sept-11	409				400				627		479			774

B = Estimated Results.
C = Detected in both the sample and QC blank, and sample concentration was </= 5x the blank concentration.
D = Reported from dilution.
J = Estimated Results.
U = Result is non-detected.

APPENDIX B

GROUNDWATER SAMPLING TRENDS, 1996-2011

Figure B-1. Arsenic (Filtered).

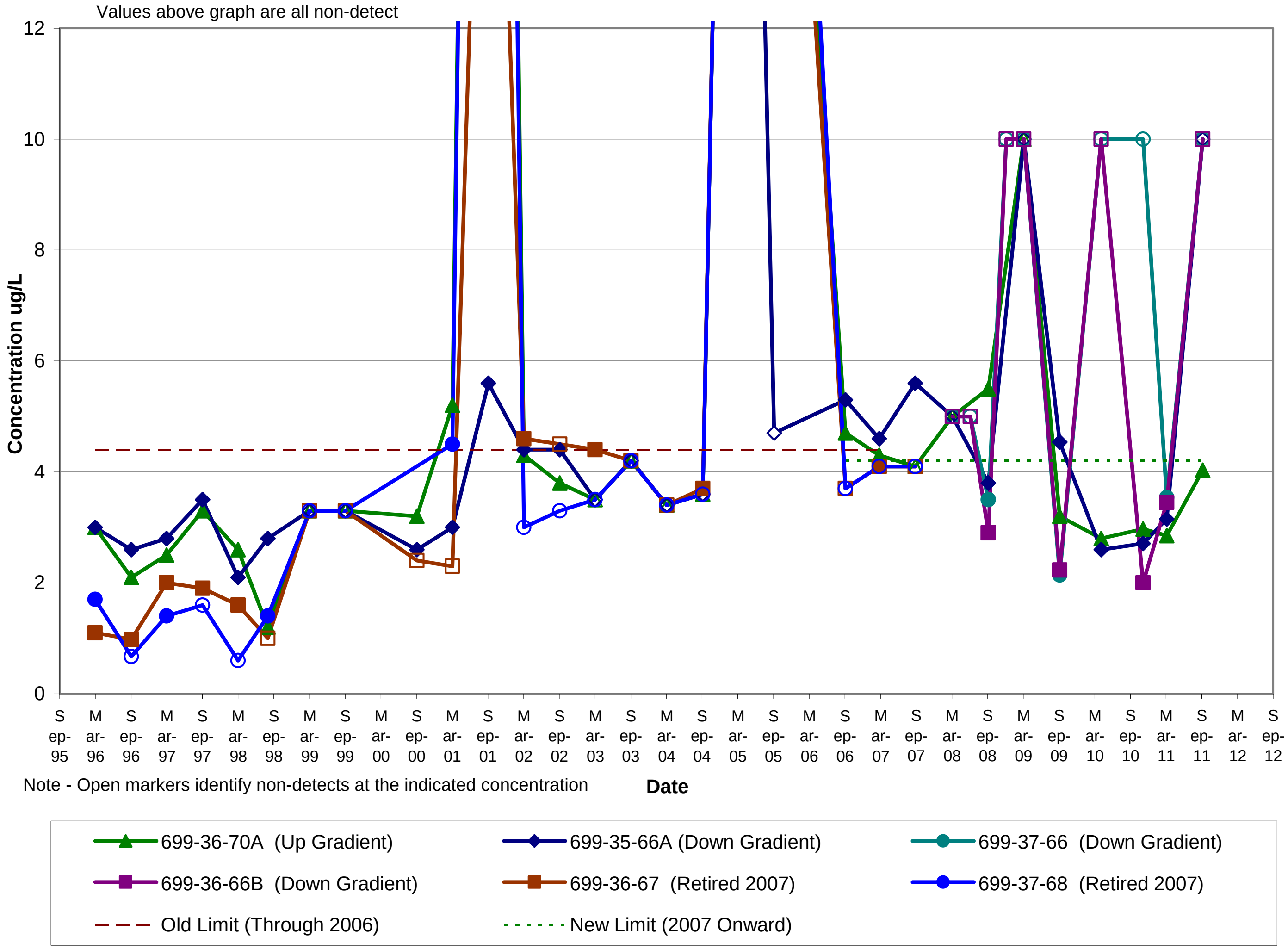


Figure B-2. Barium (Filtered).

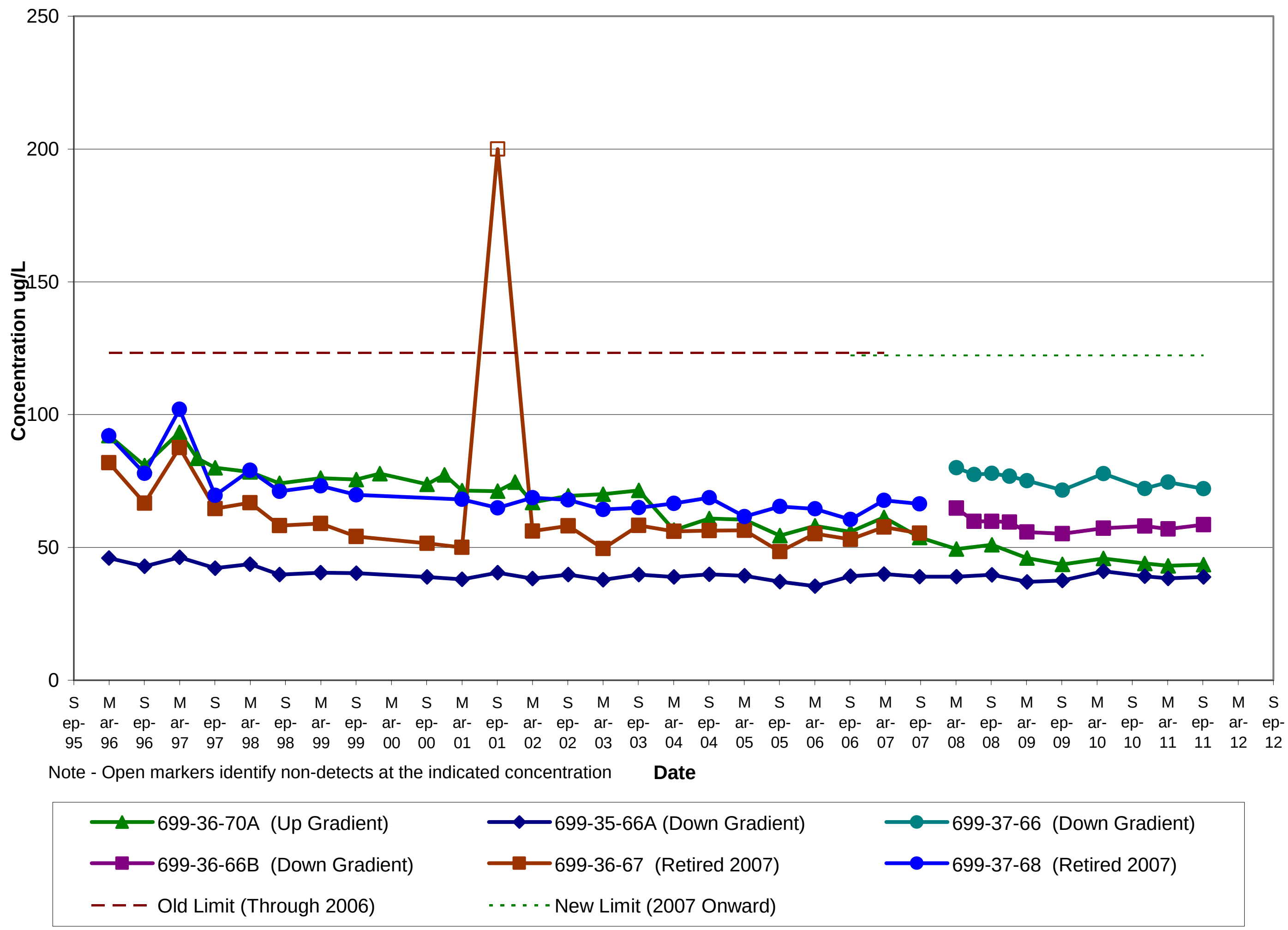


Figure B-3. Chromium (Filtered).

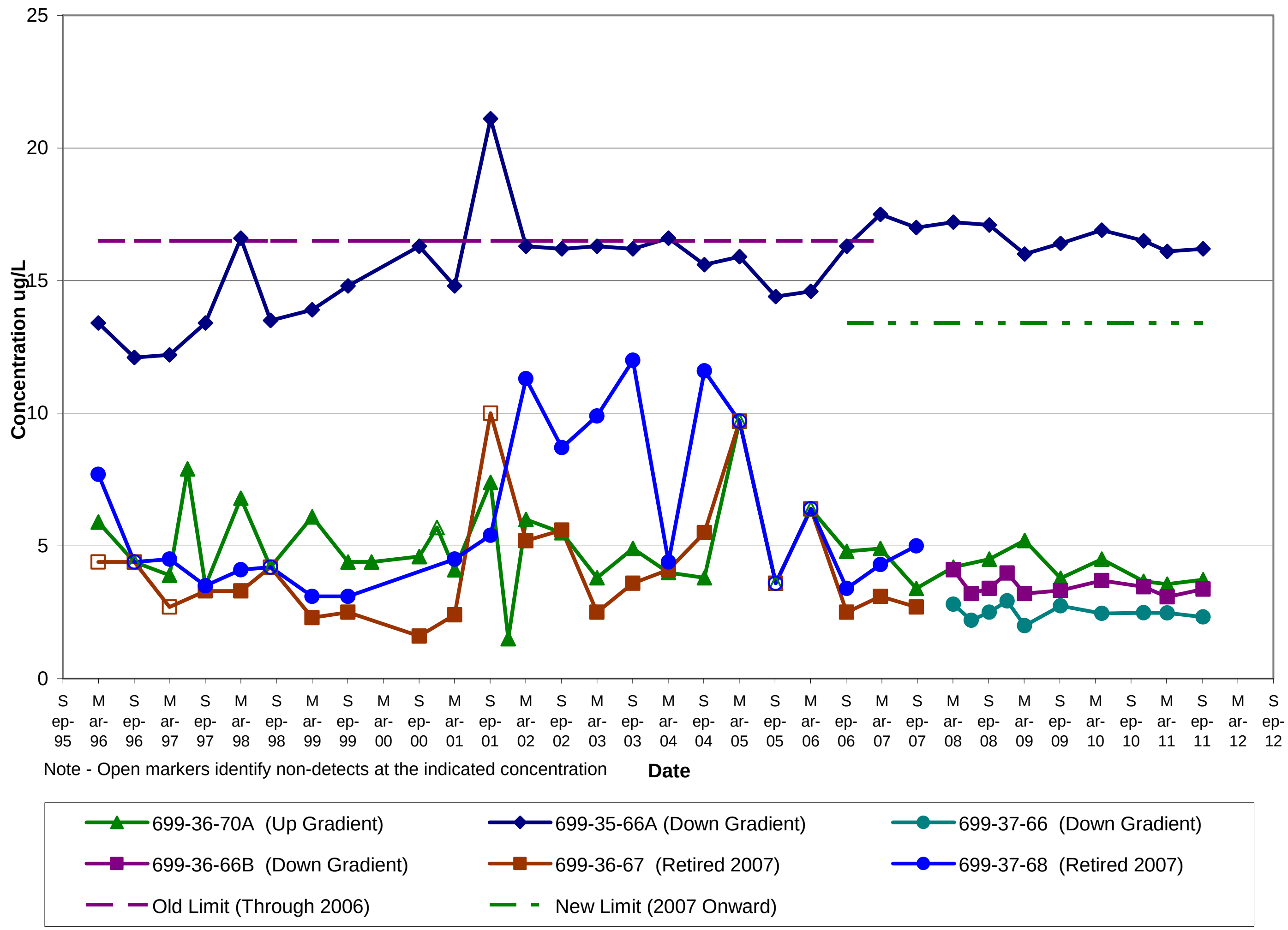


Figure B-4. Lead (Filtered).

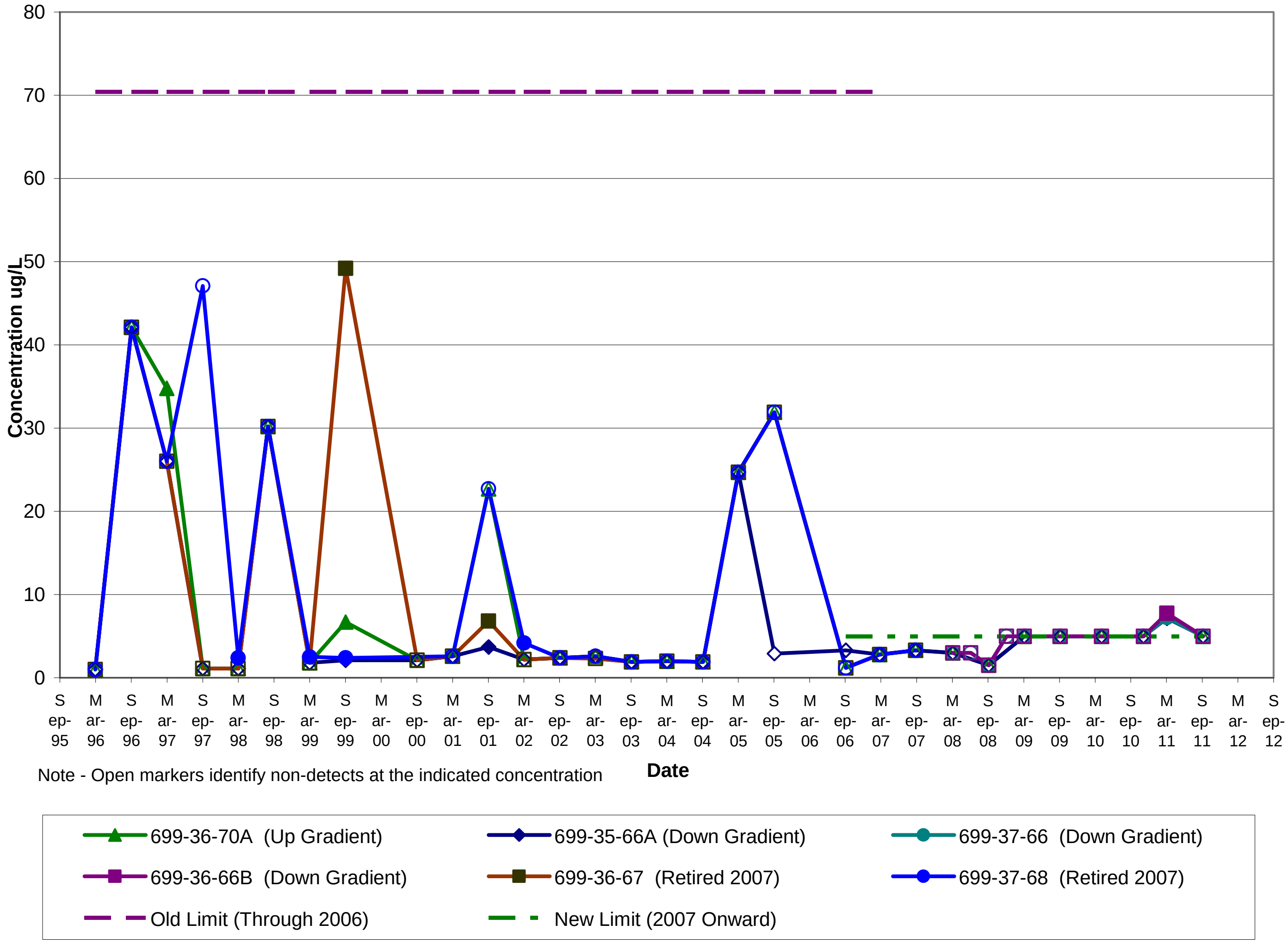


Figure B-5. Selenium (Filtered).

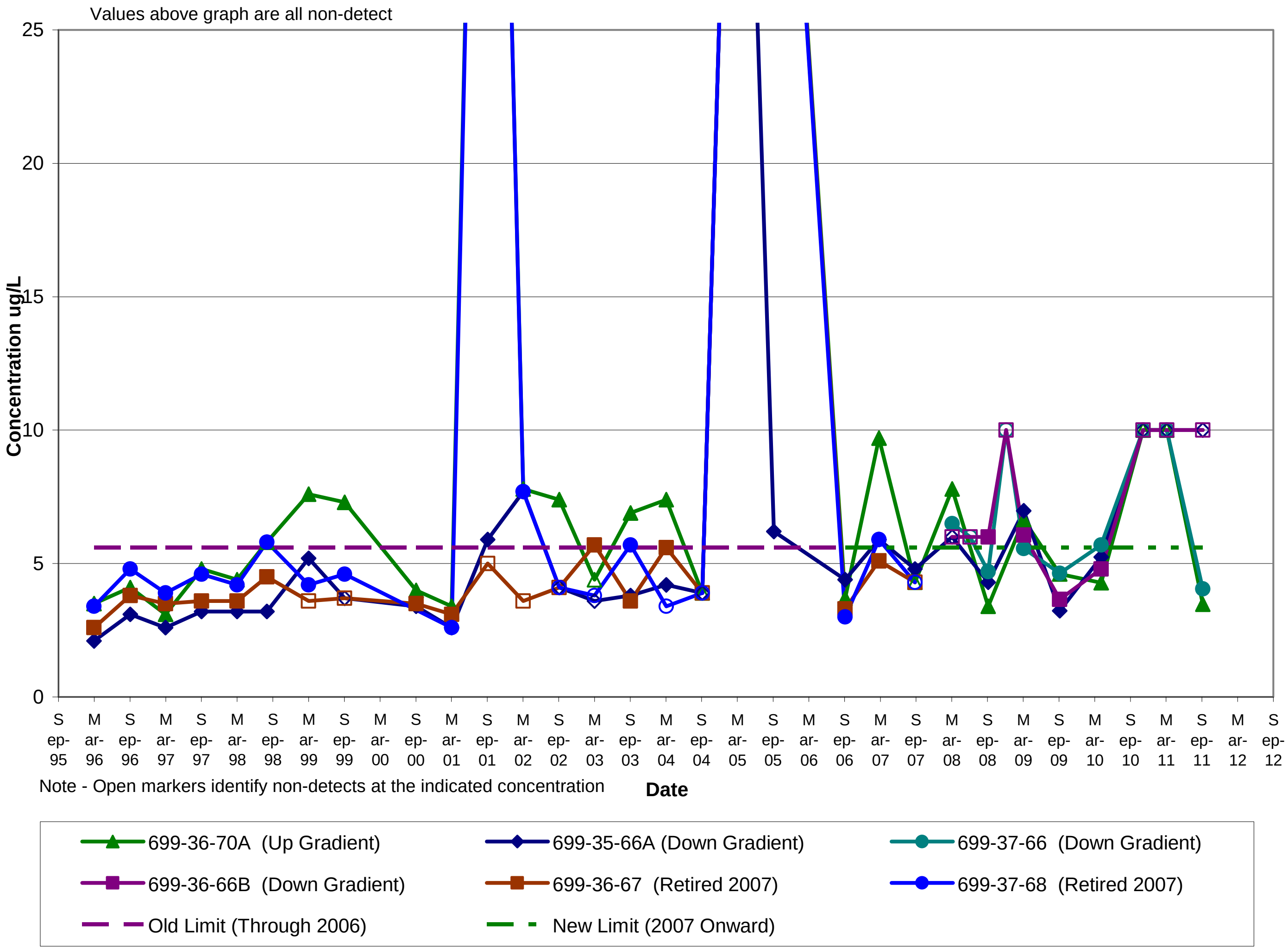


Figure B-6. Uranium.

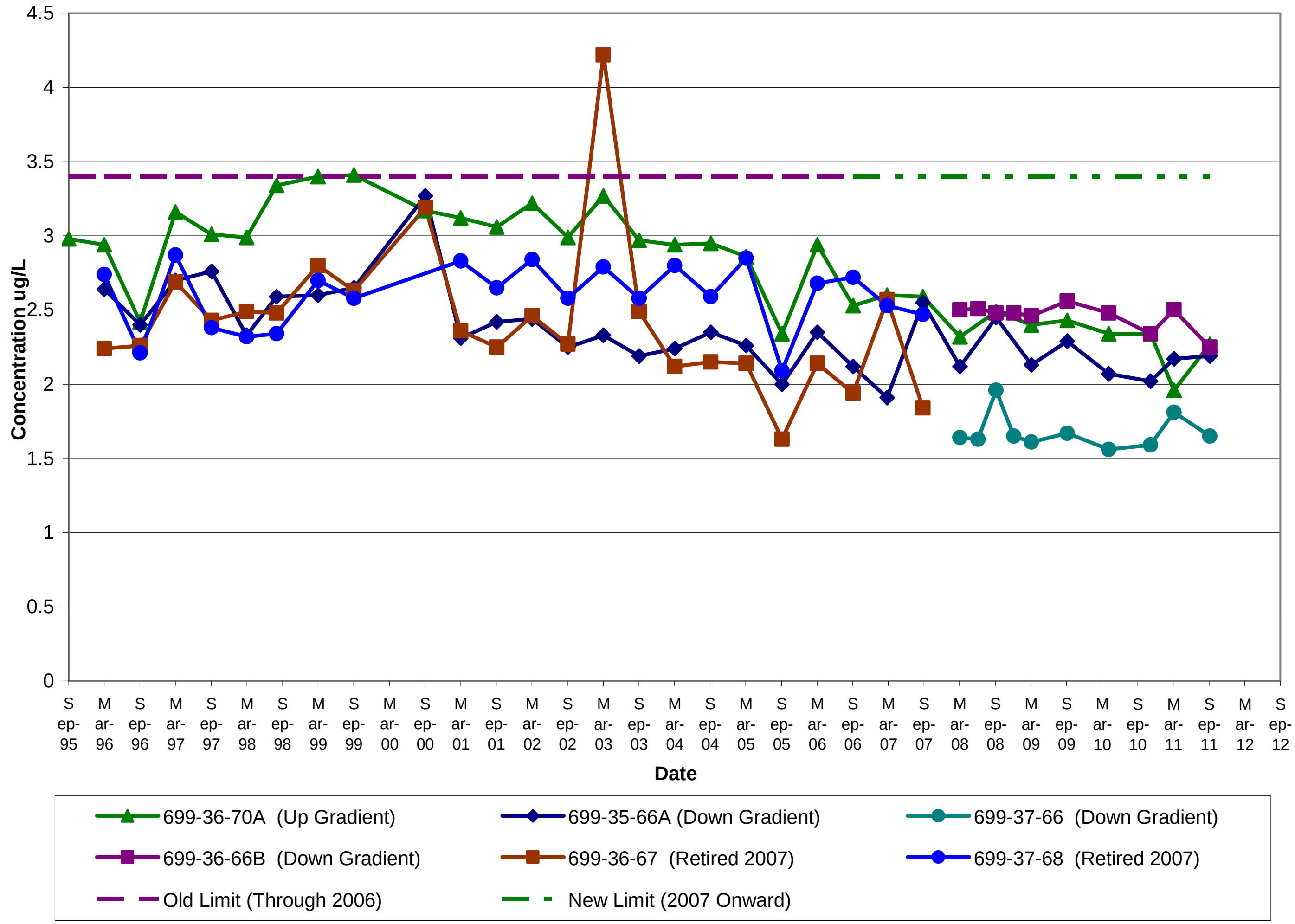


Figure B-7. Tin (Filtered).

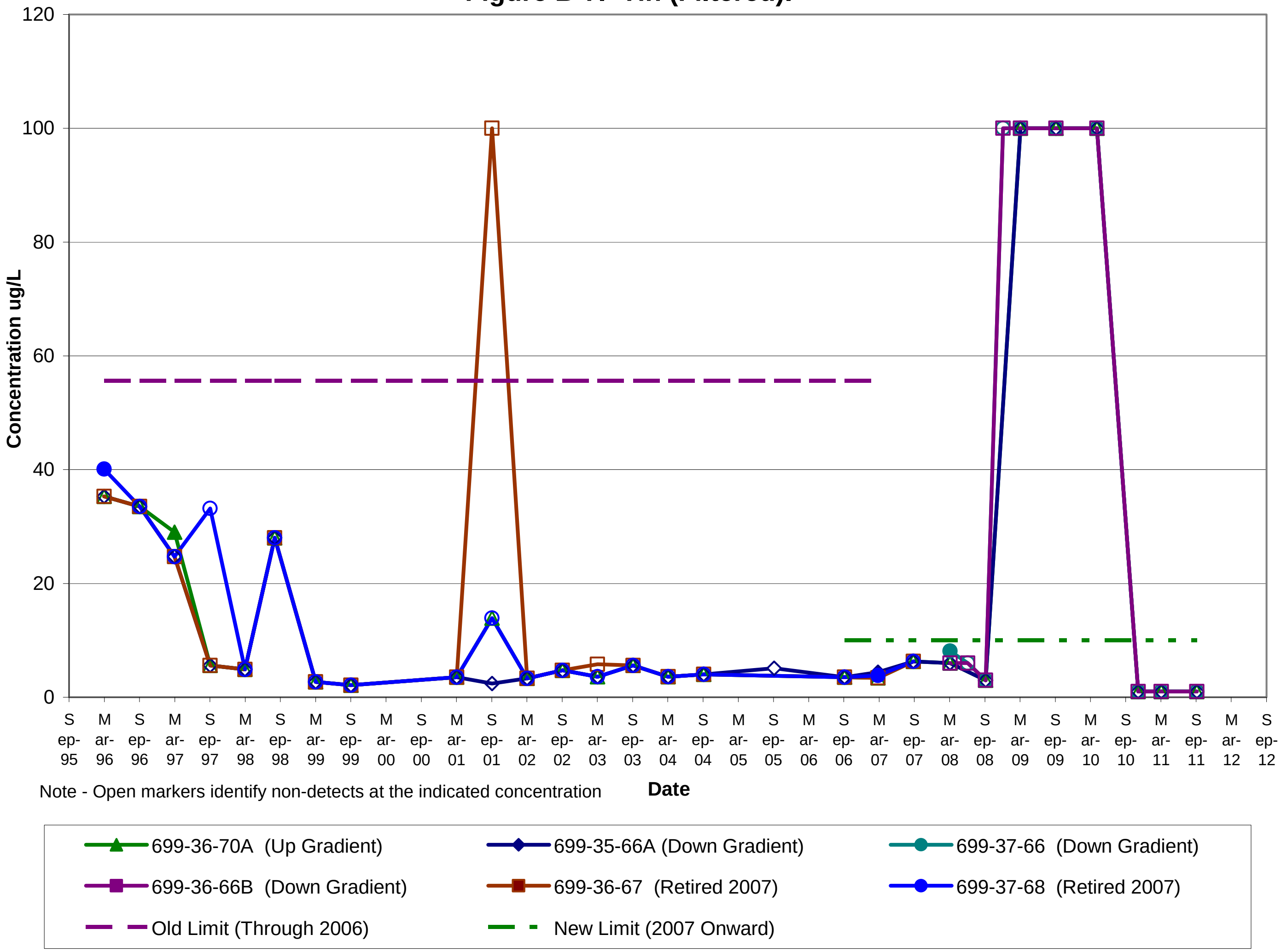


Figure B-8. Vanadium (Filtered).

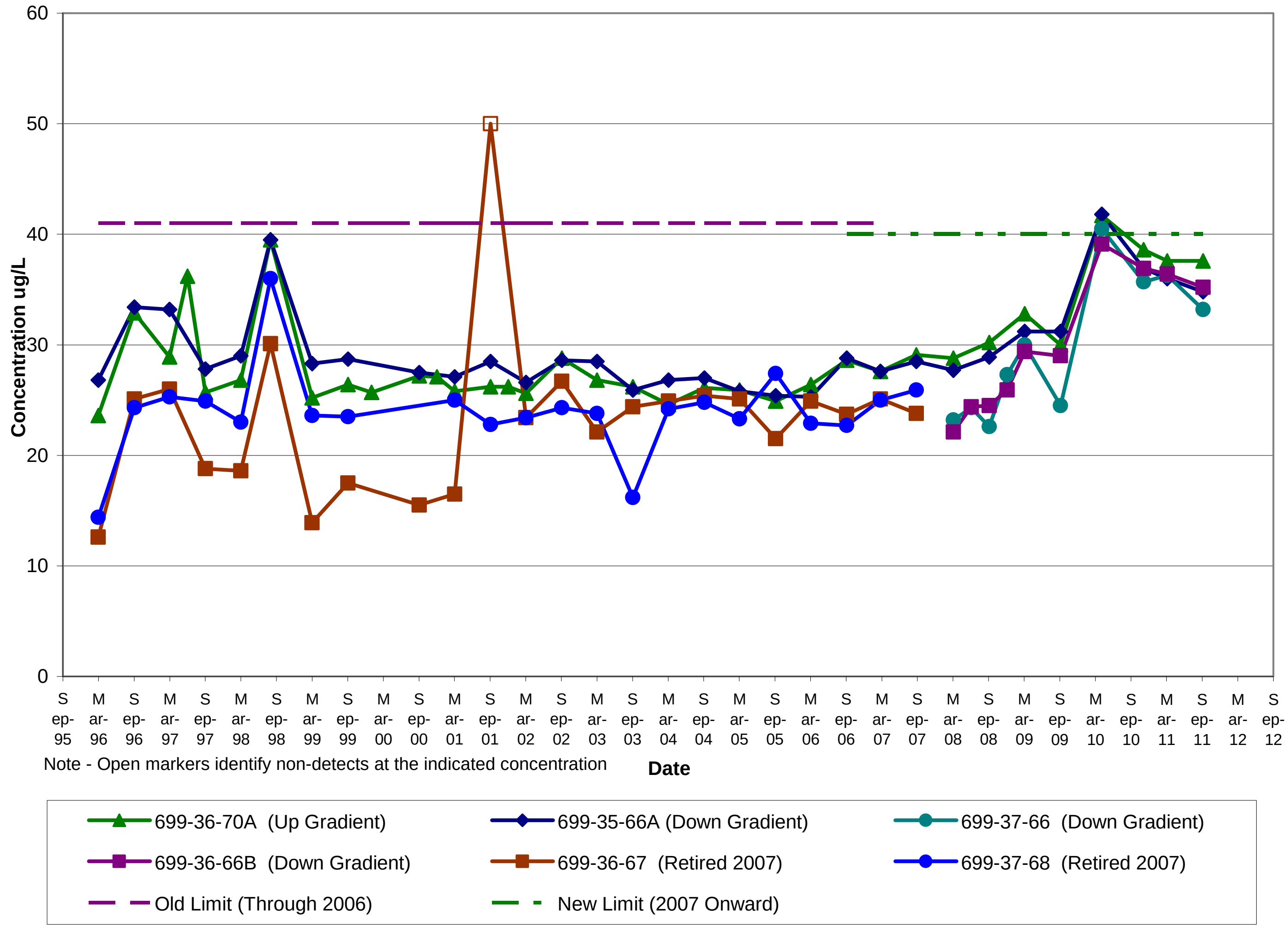


Figure B-9. Zinc (Filtered).

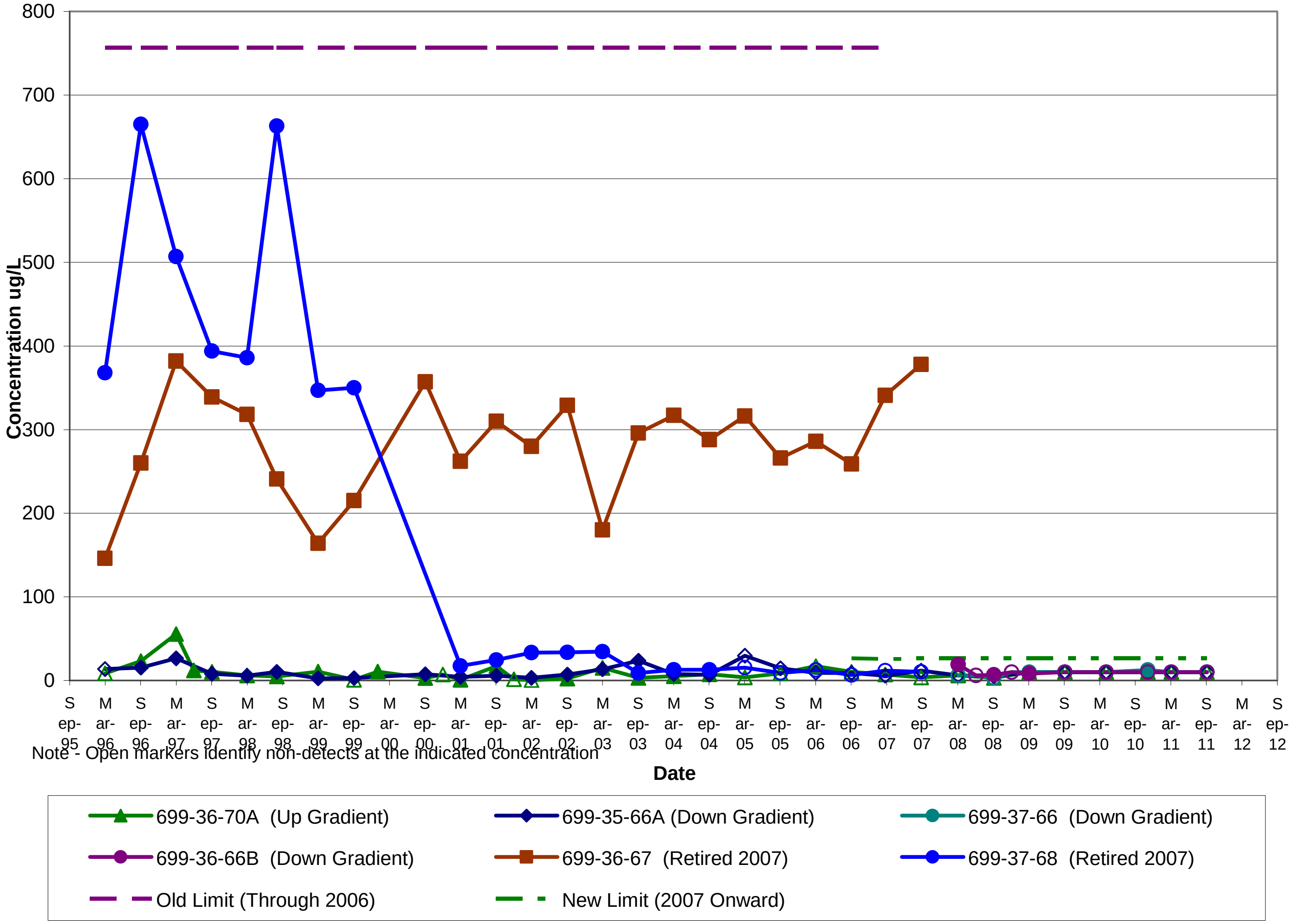


Figure B-10. Alkalinity.

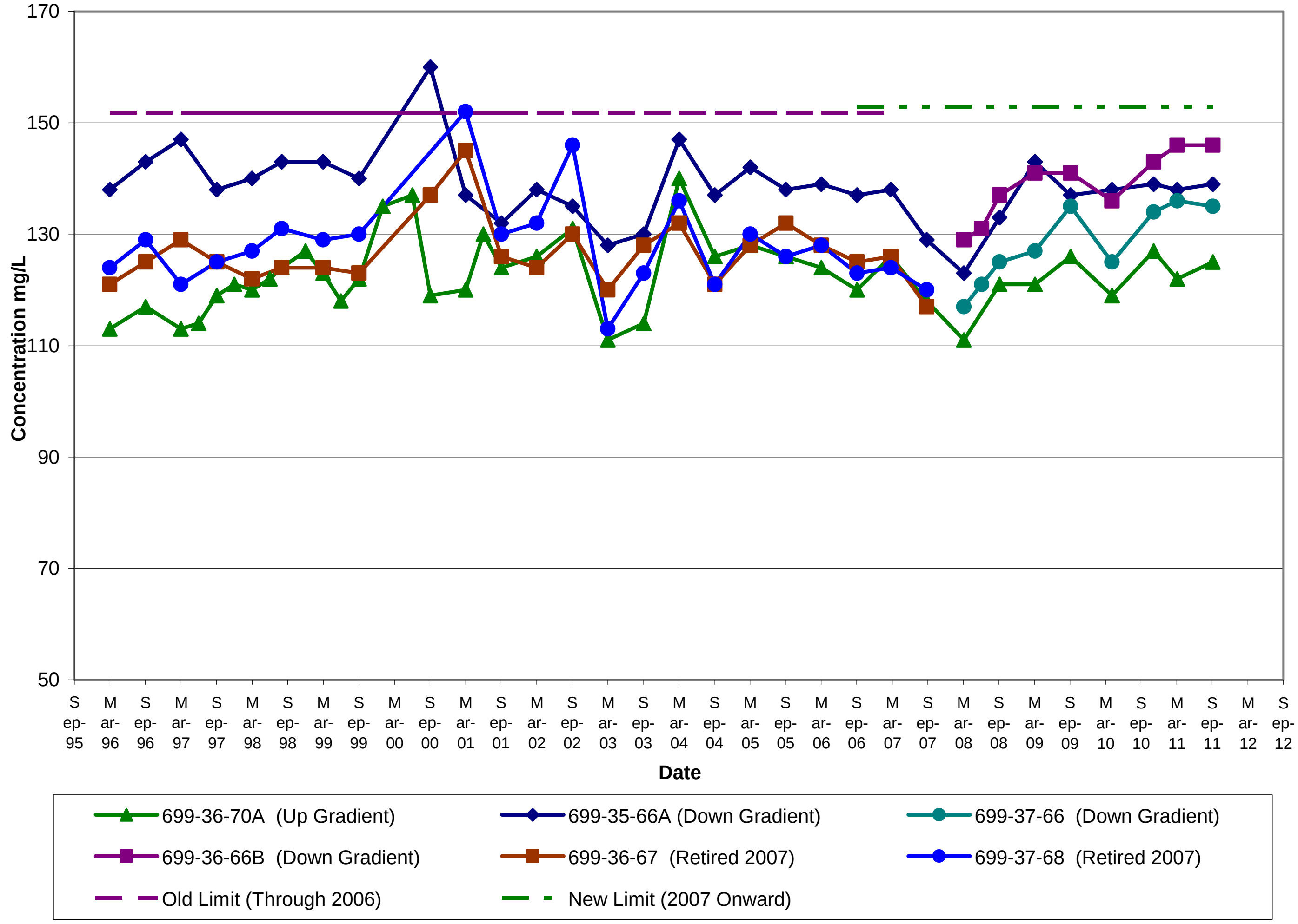


Figure B-11. Fluoride.

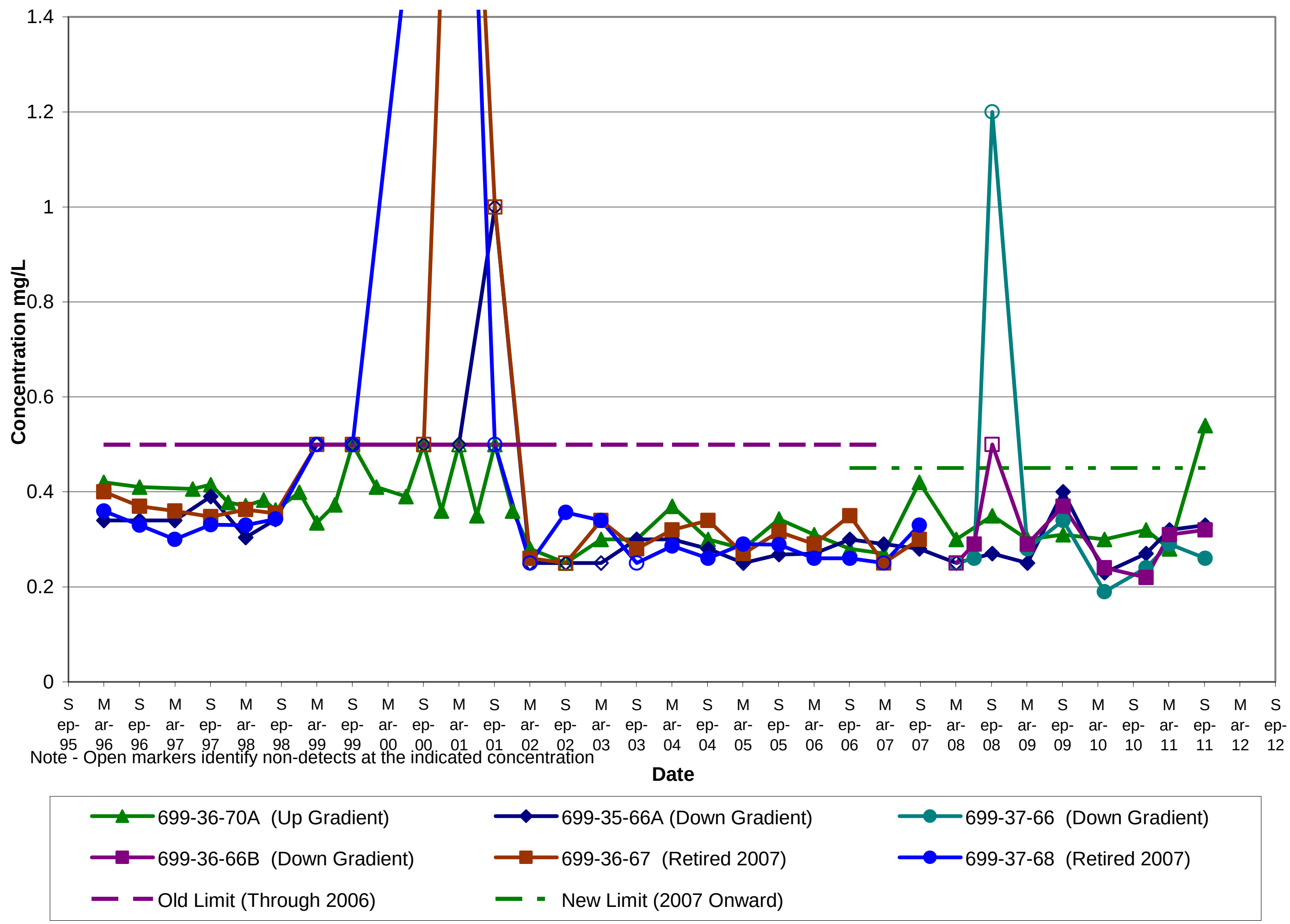


Figure B-12. Chloride.

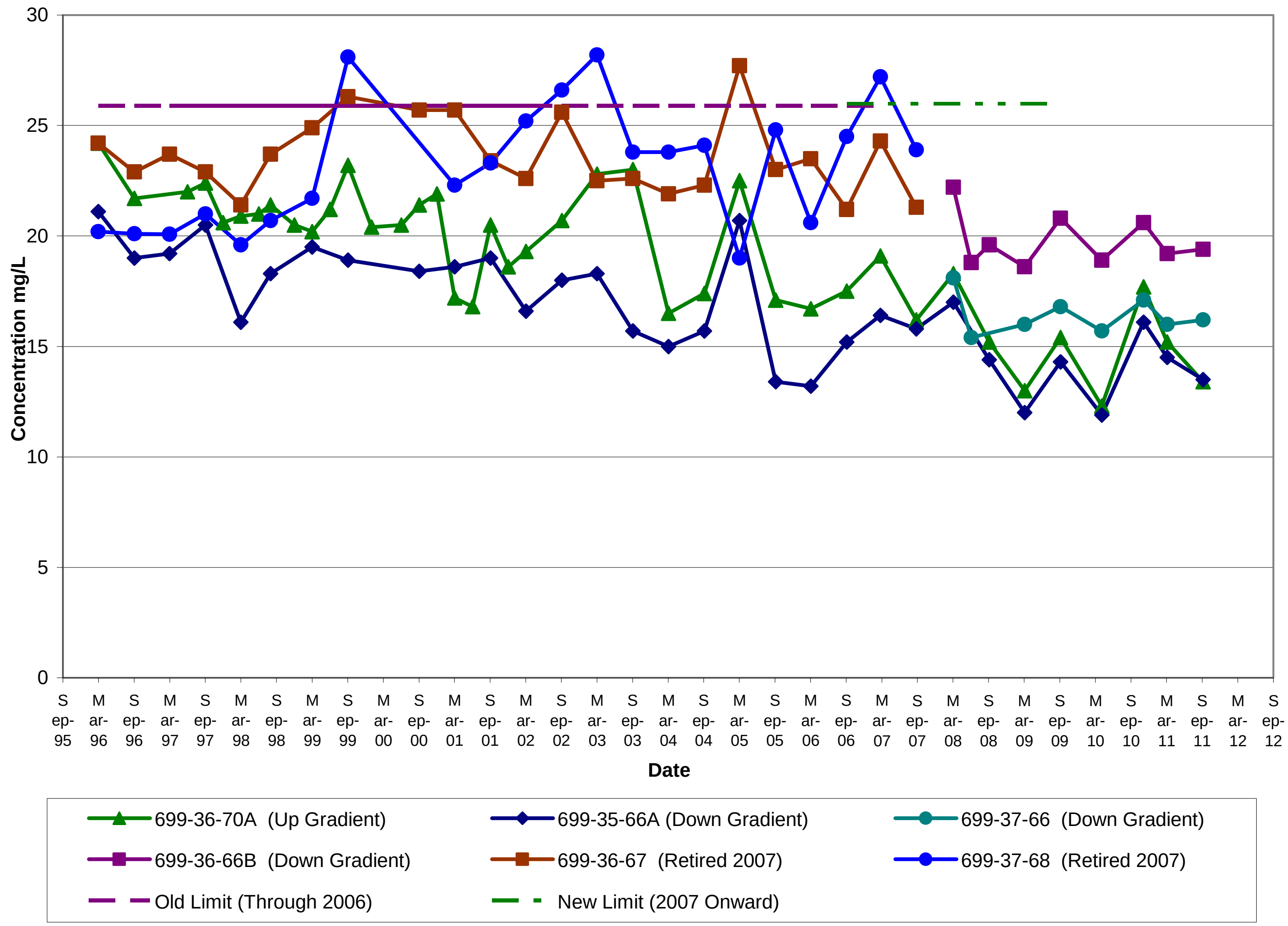


Figure B-13. Sulfate.

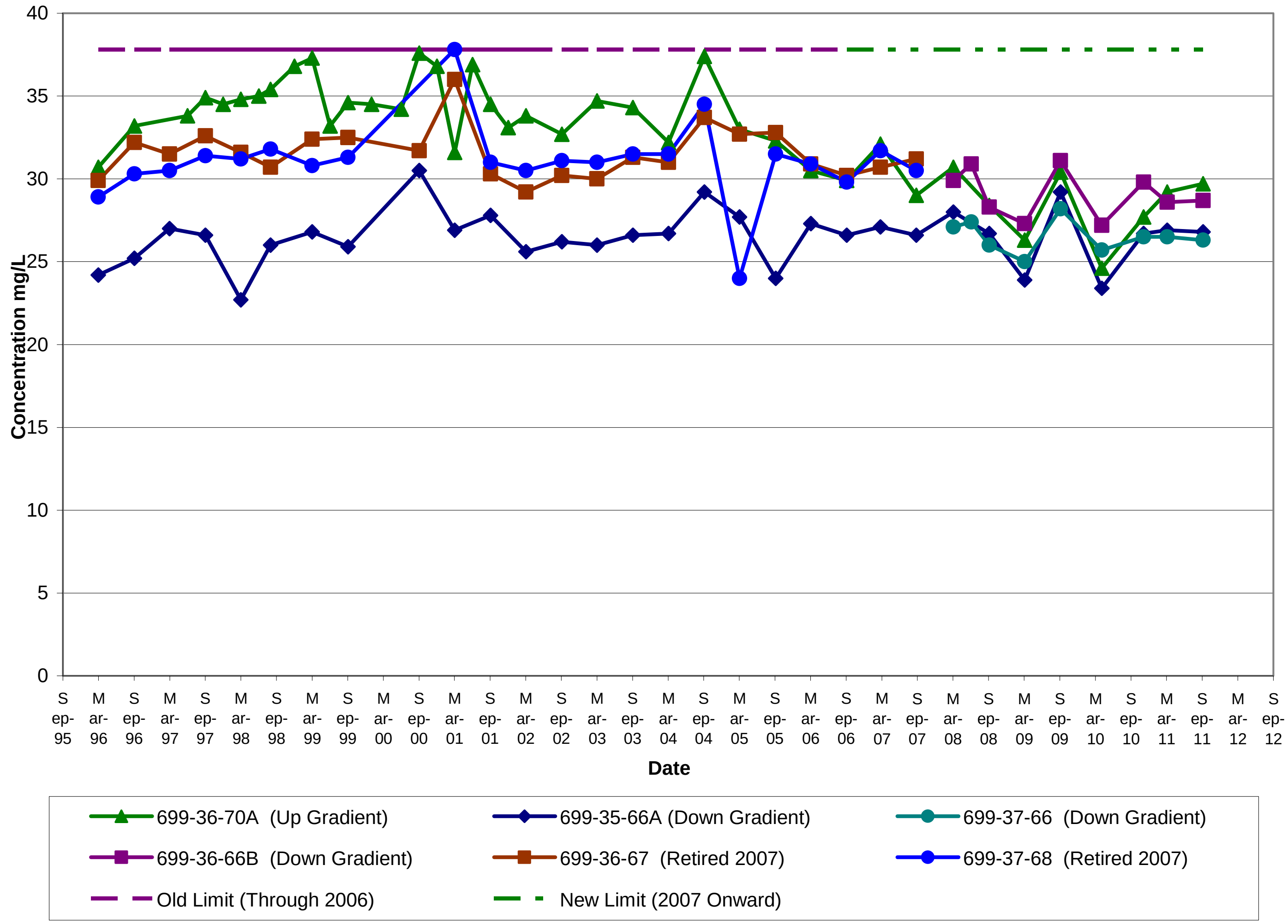


Figure B-14. Gross Alpha.

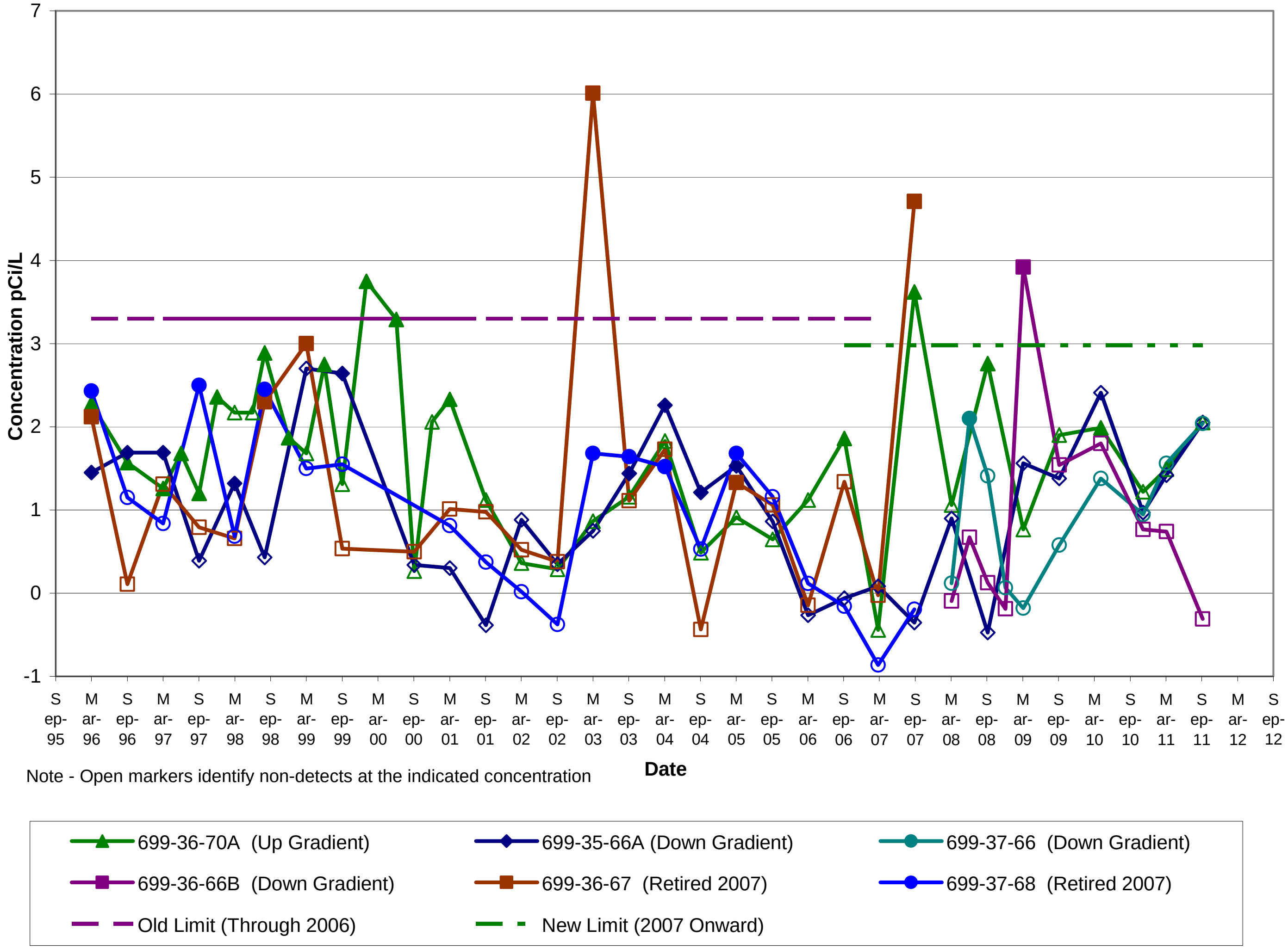


Figure B-15. Gross Beta.

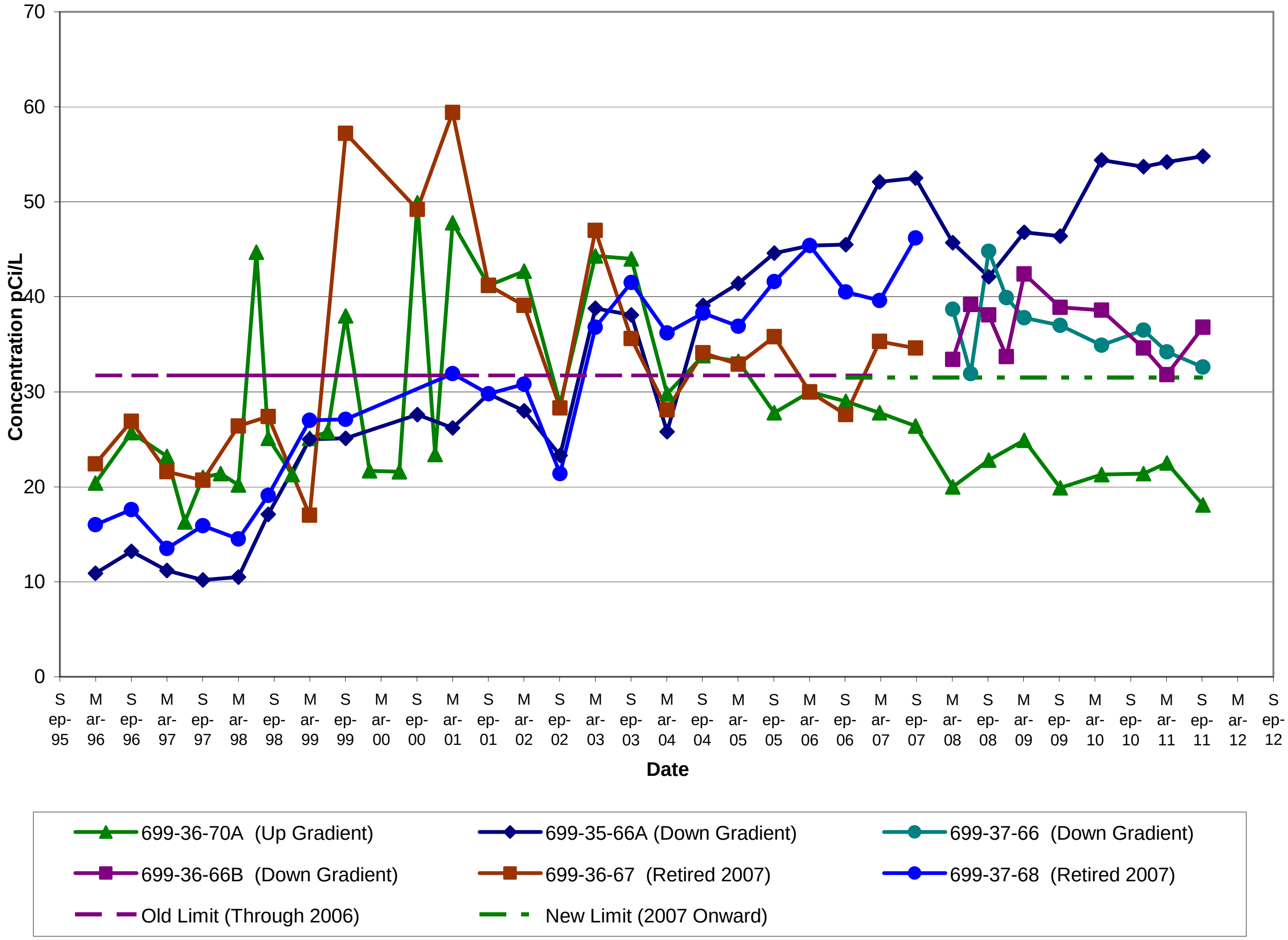


Figure B-16. Carbon-14.

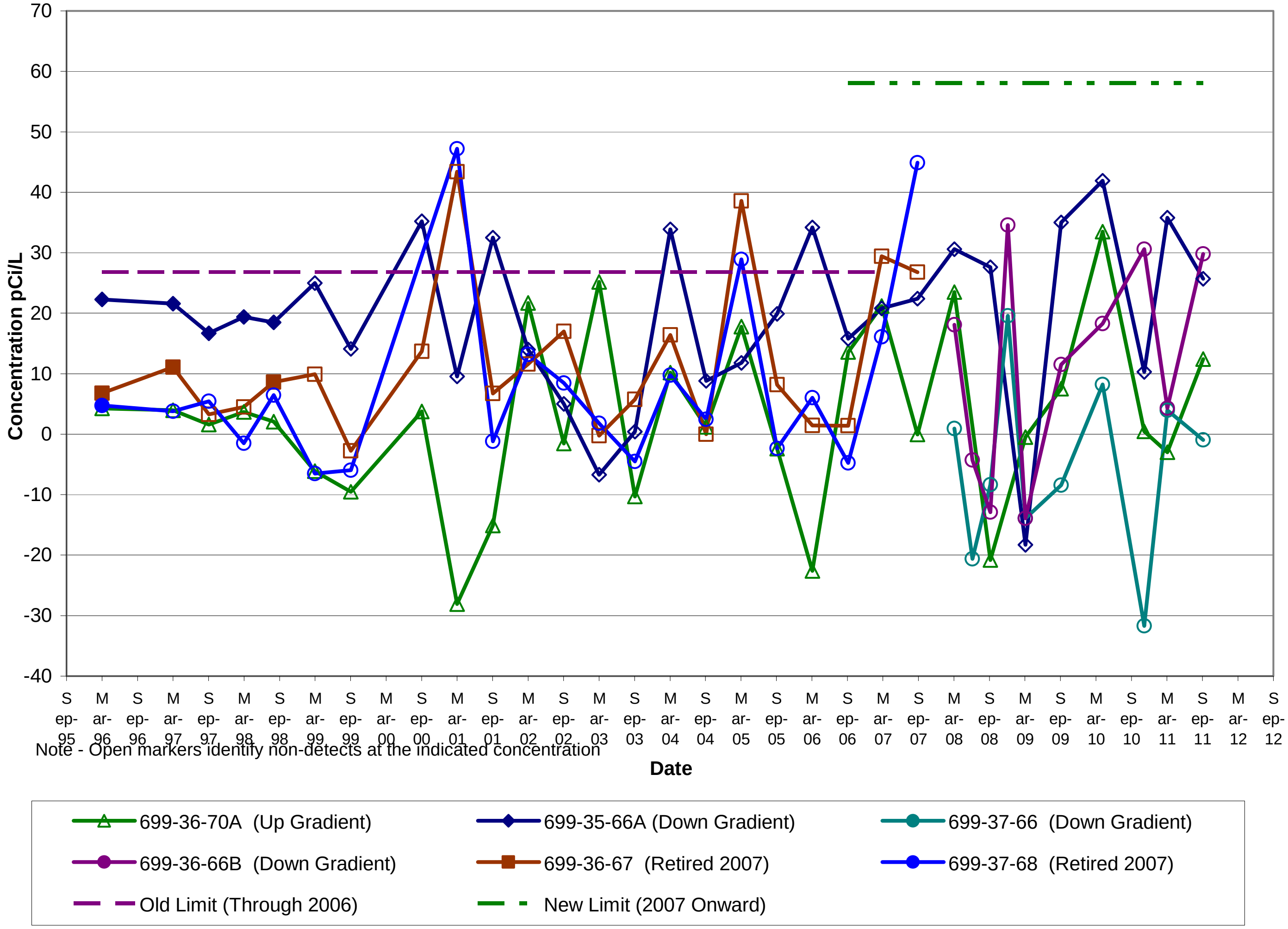


Figure B-17. Iodine-129.

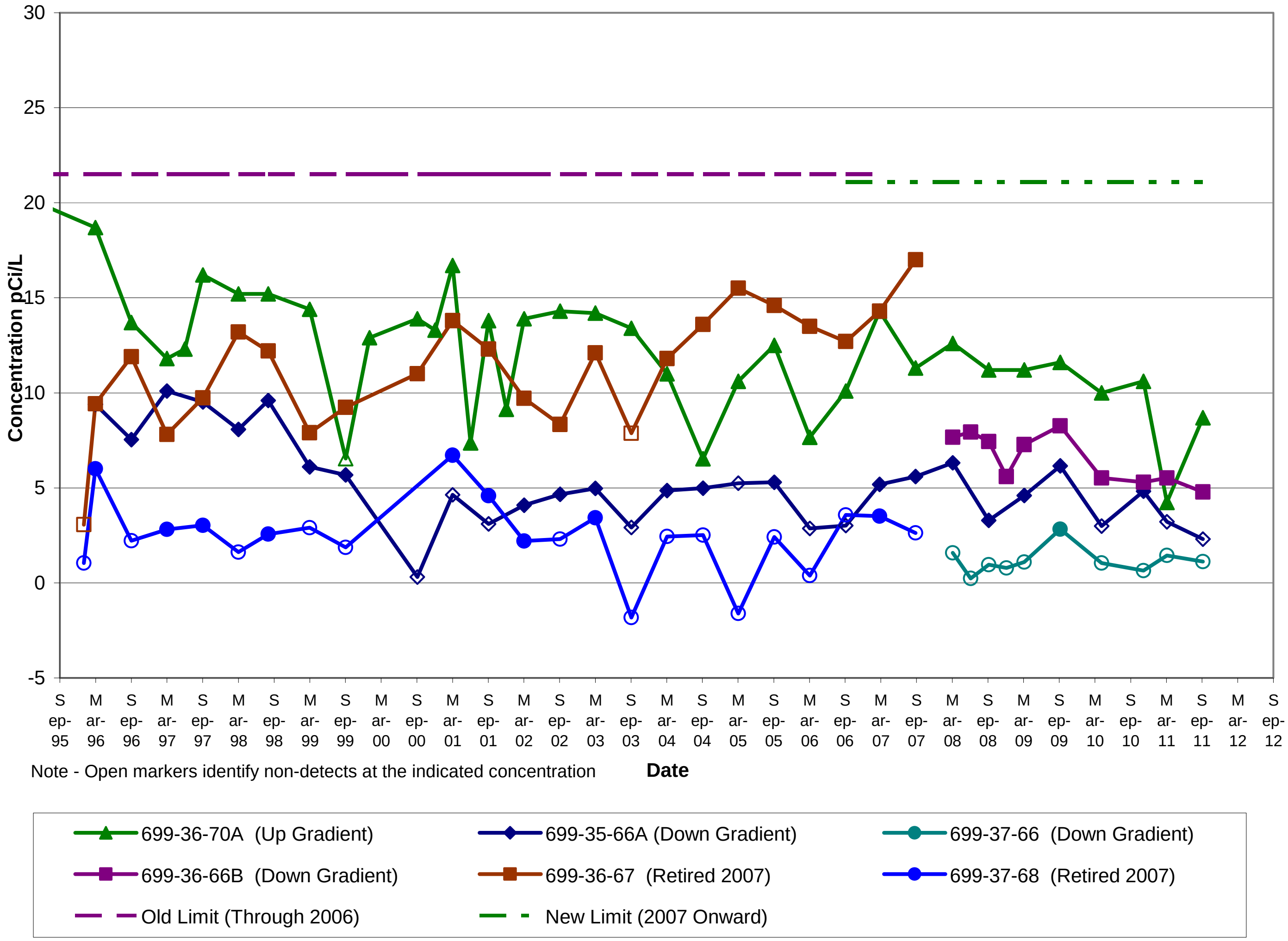


Figure B-18. Technetium-99.

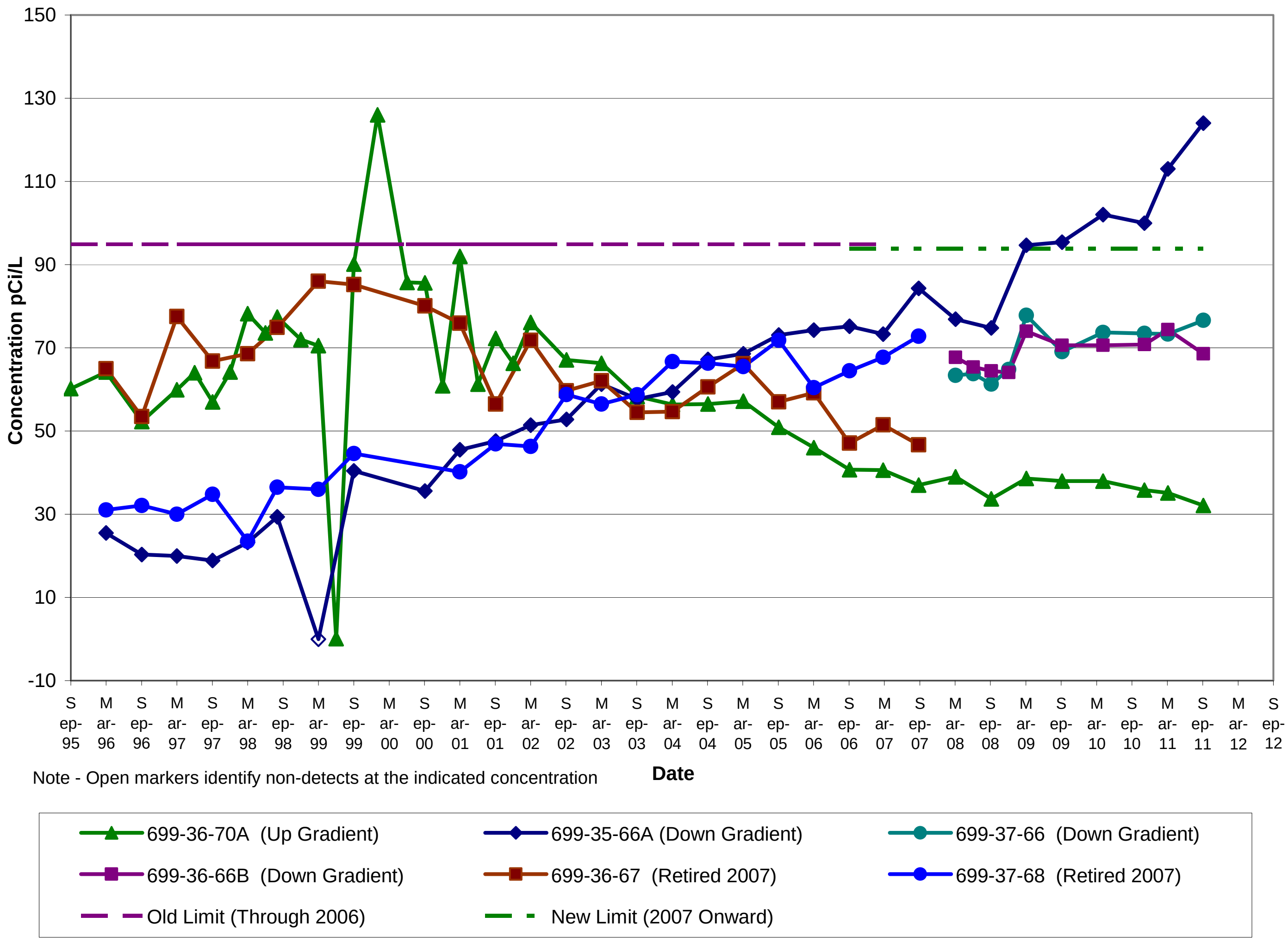


Figure B-19. Radium.

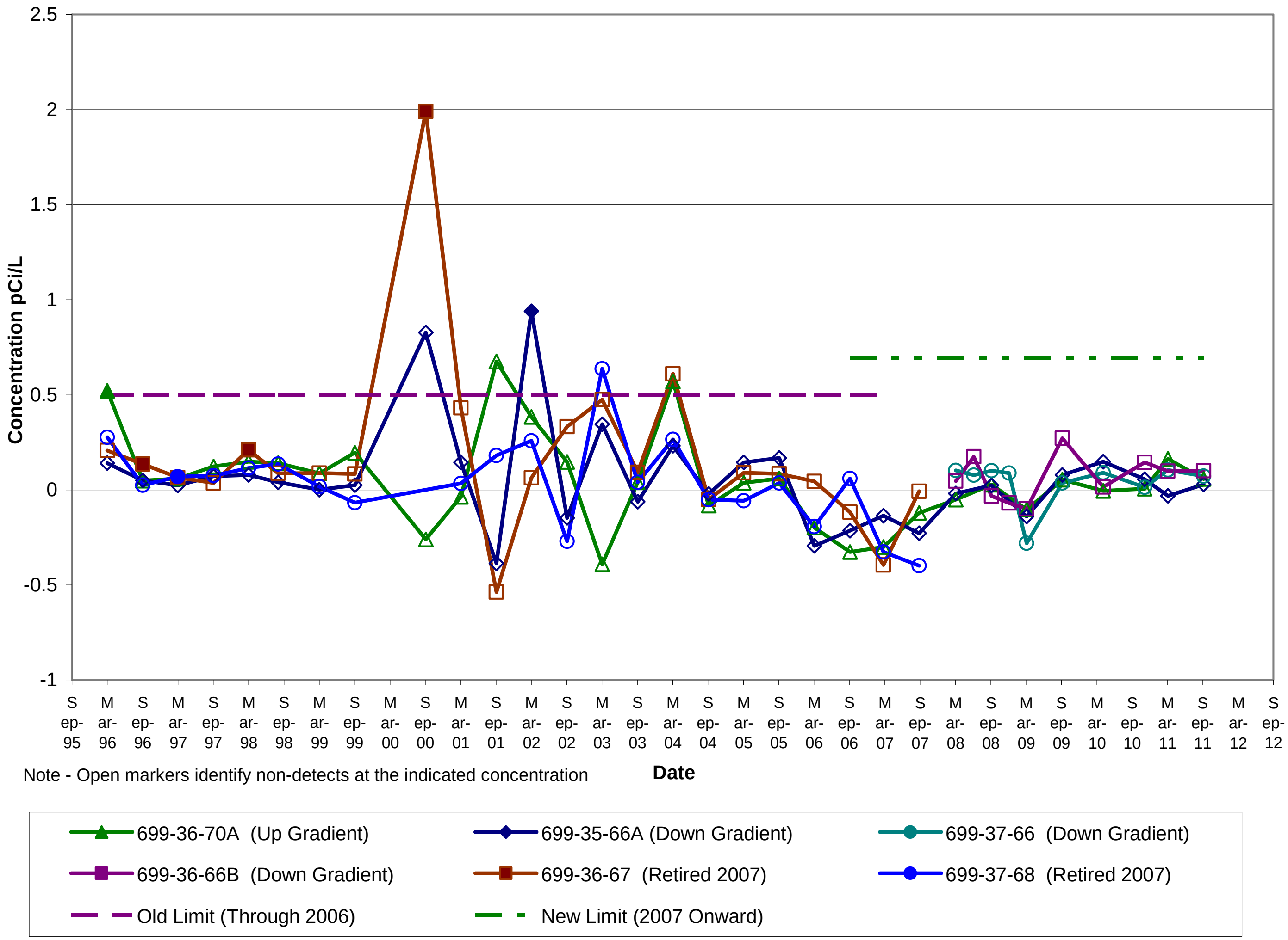


Figure B-20. Carbon Tetrachloride.

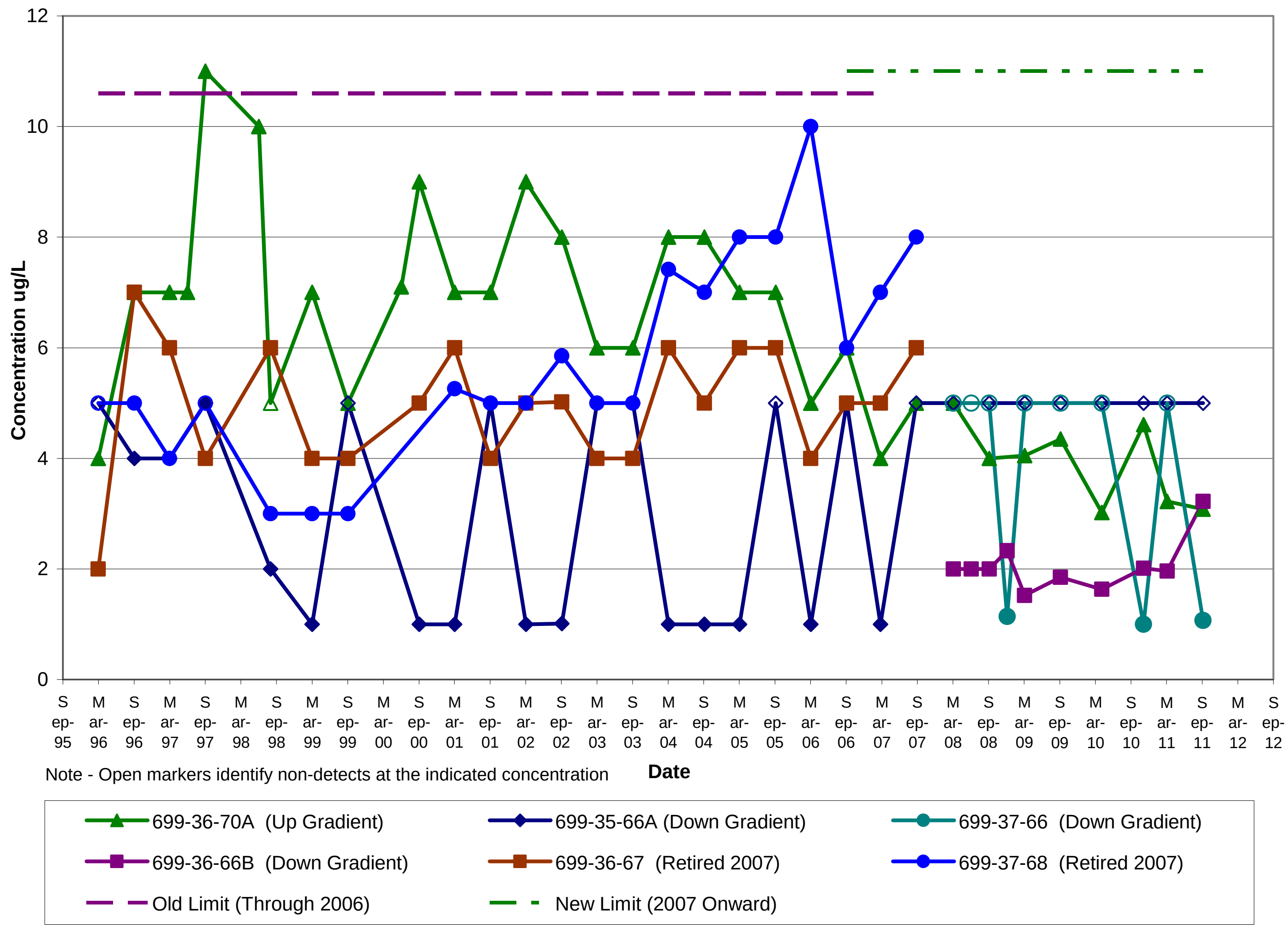


Figure B-21. Nitrogen in Nitrite and Nitrate.

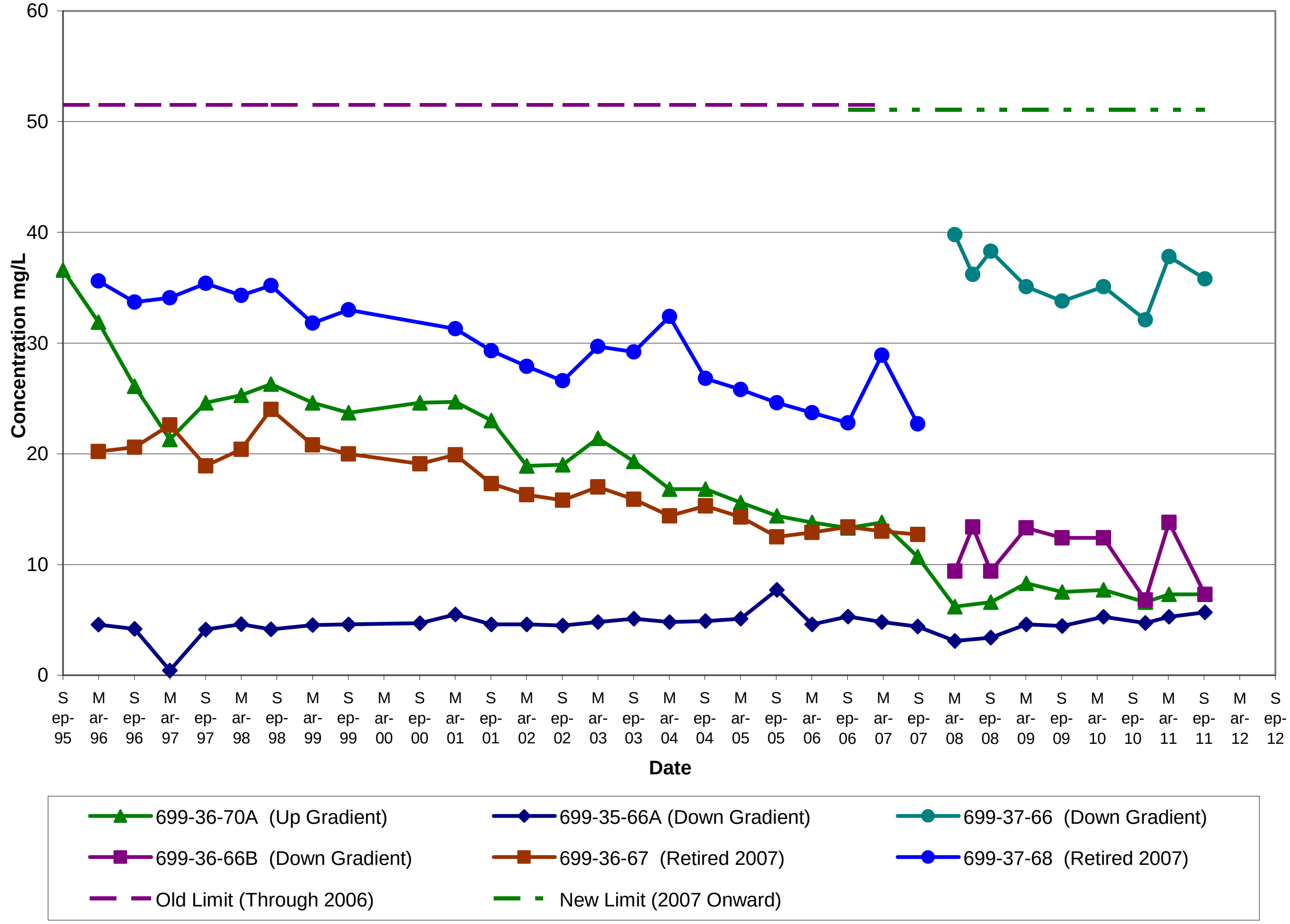


Figure B-22. Total Organic Halides.

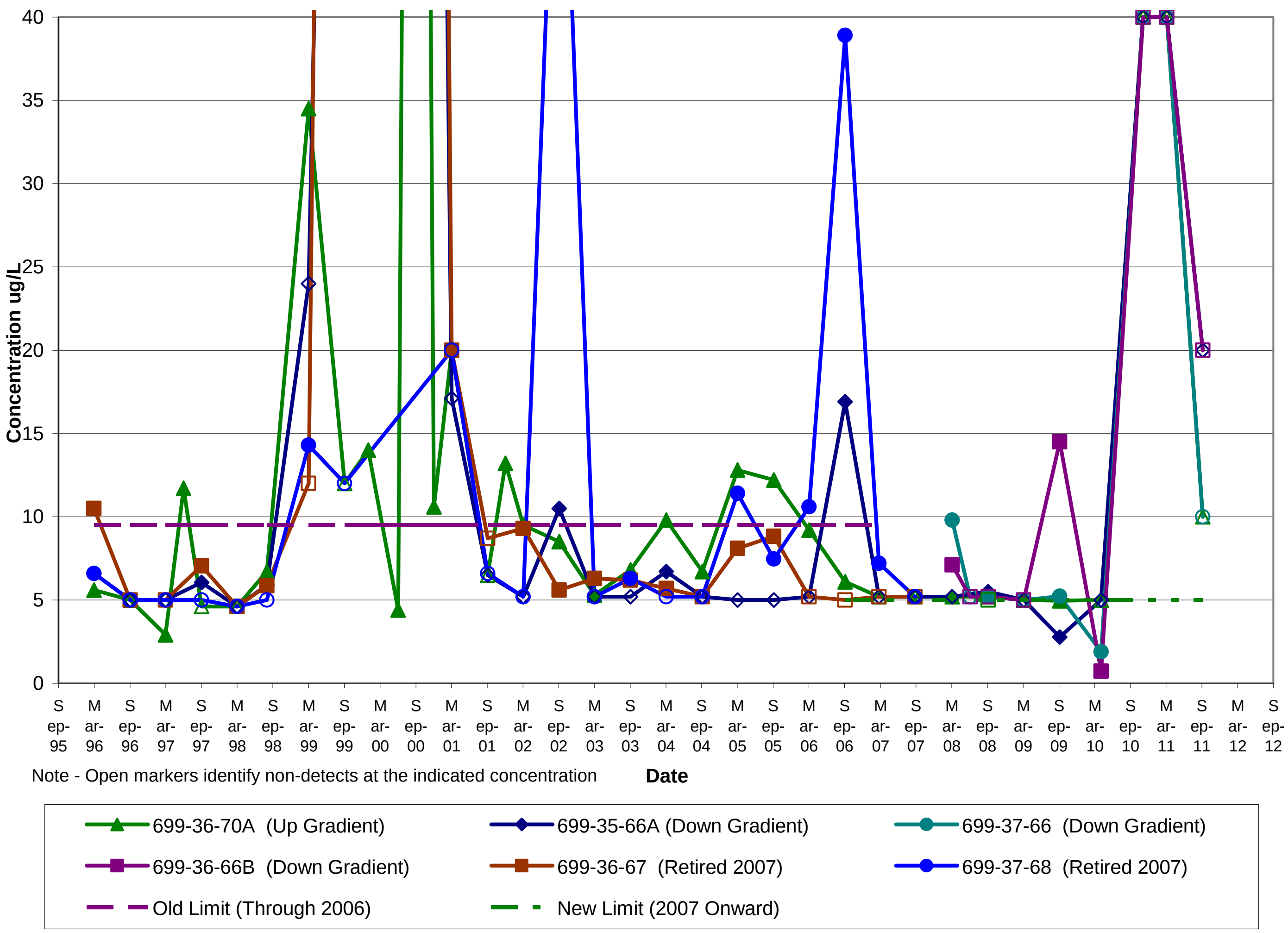


Figure B-23. Total Dissolved Solids.

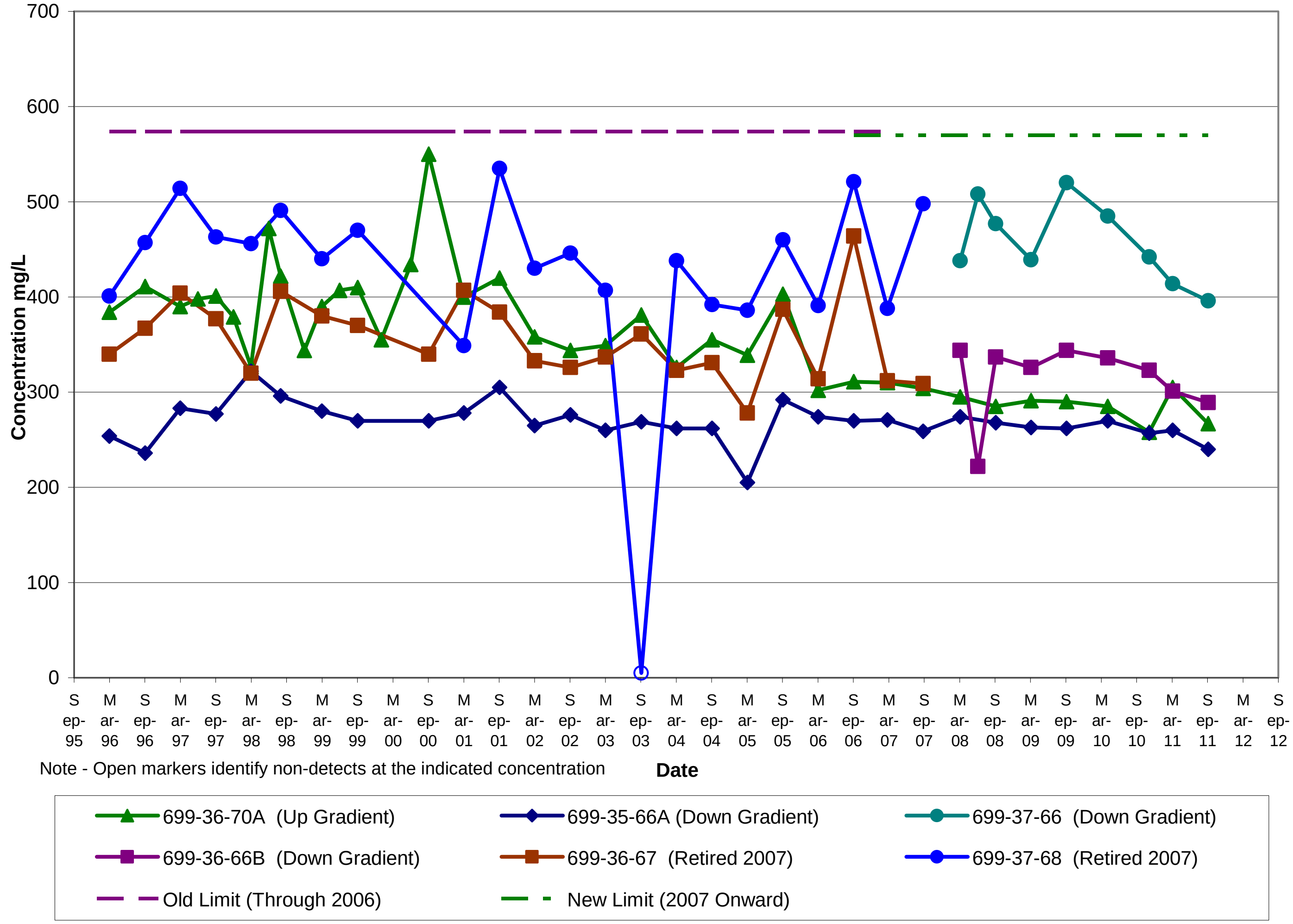


Figure B-24. Turbidity.

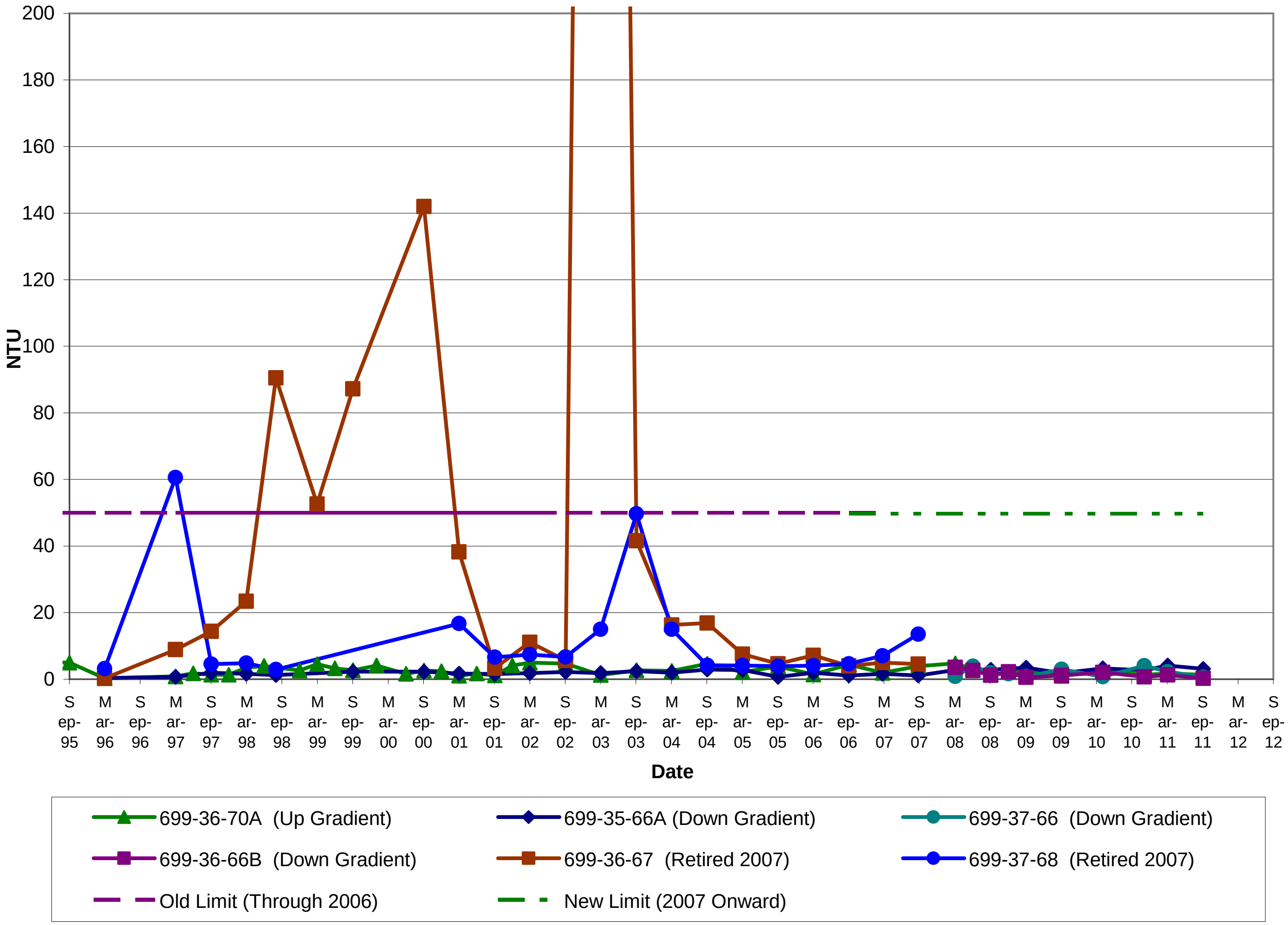


Figure B-25. pH.

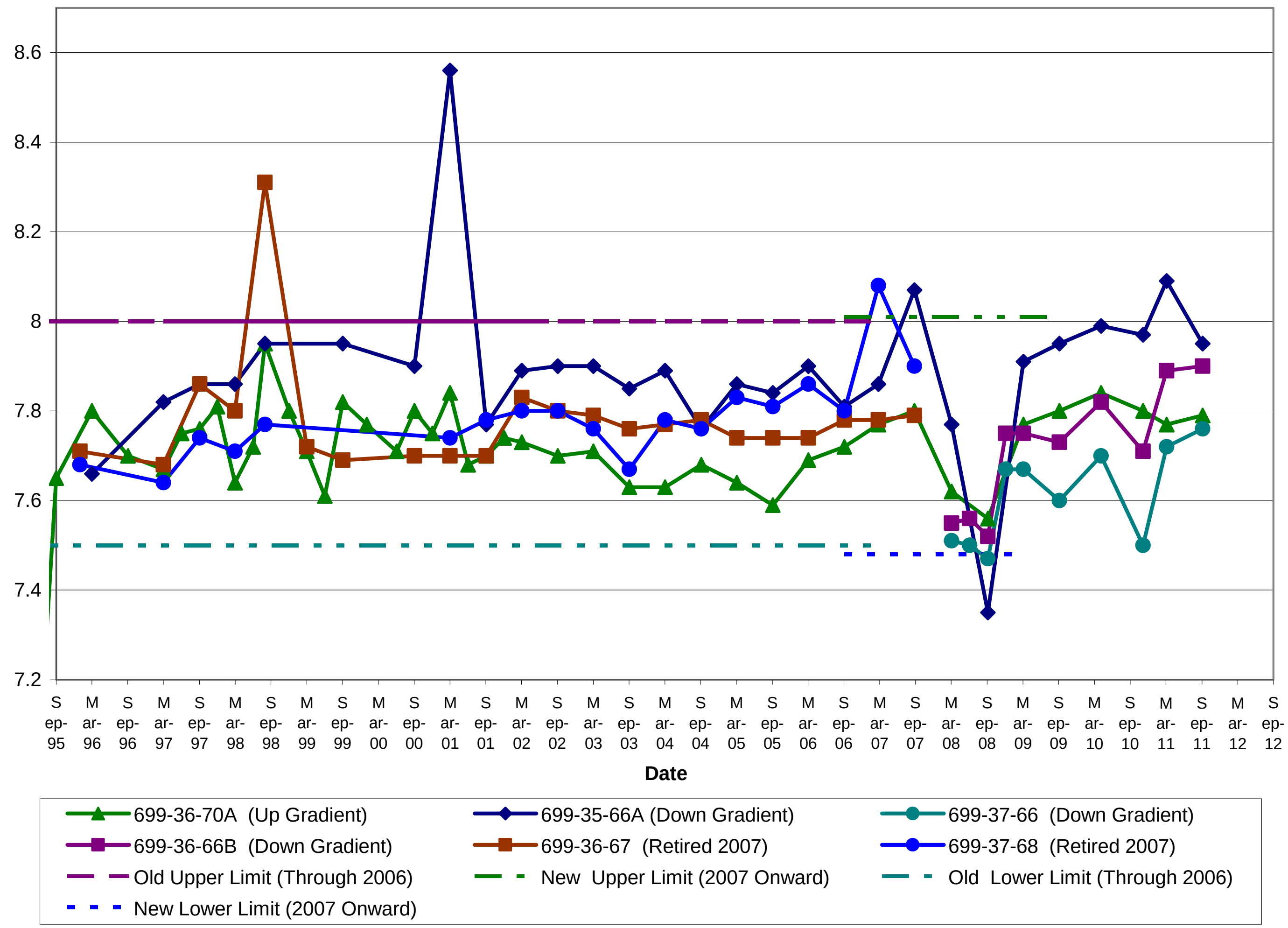
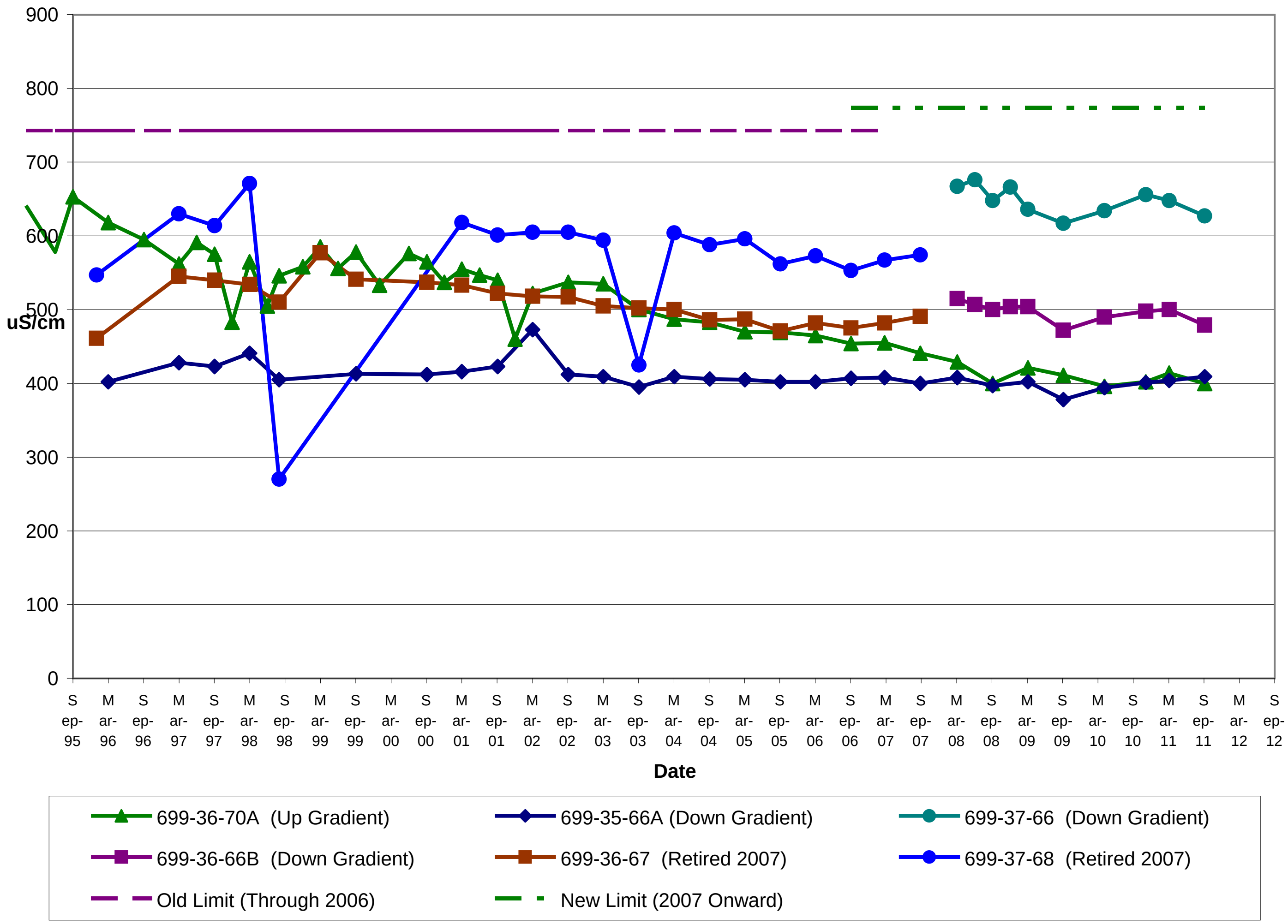


Figure B-26. Specific Conductance.



APPENDIX C

LEACHATE SAMPLING RESULTS SUMMARY, 2009-2011

Leachate Sample Data

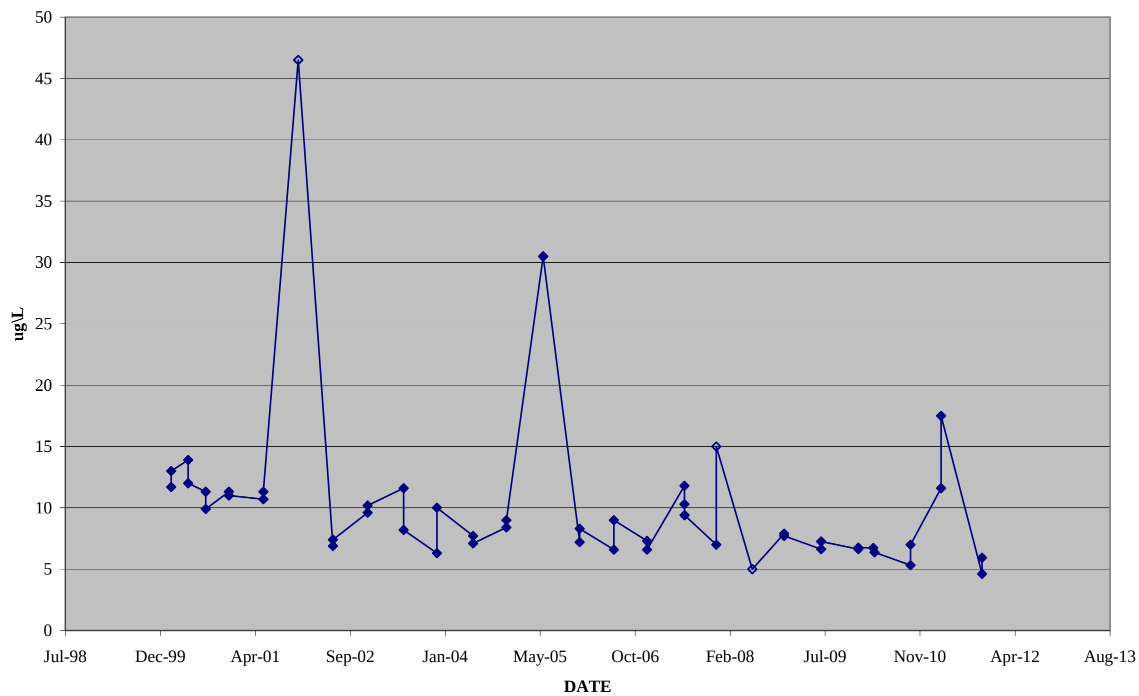
Constituent	Jun-09	Jun-09	Dec-09	Dec-09	Mar-10	Mar-10	Sep-10	Sep-10	Mar-11	Mar-11	Oct-11	Oct-11	Units
Aluminum	60.6	67.1	NR	NR	NR	NR	36.6B	36.4B	NR	NR	NR	NR	ug/L
Antimony	6U	6U	NR	NR	NR	NR	6U	6U	NR	NR	NR	NR	ug/L
Arsenic	6.63B	7.25B	6.62B	6.76B	6.73B	6.37B	5.33B	7B	11.6	17.5	4.62B	5.93B	ug/L
Barium	75.6	76.1	77.4	75.2	73.1	64.4	94.9	95.8	183	317	94.3	90.4	ug/L
Beryllium					1U	1U	2U	2U	1U	1U	1U	1U	ug/L
Calcium	184000	183000	198000	193000	189000	164000	224000	223000	278000	405000	204000	194000	ug/L
Chromium	11.7	11.2	25.2	24.9	19.8	17.7	20.7	20.7	43.6	79.5	13.8	13.4	ug/L
Copper	10U	10U	NR	NR	NR	NR	4.45B	3.85B	NR	NR	NR	NR	ug/L
Iron	50U	50U	NR	NR	NR	NR	25.2B	15.5B	NR	NR	NR	NR	ug/L
Lead	5U	5U	4.53B	5.03B	10U	2.27B	5U	5U	15.6	21.6	10	9.86B	ug/L
Magnesium	80600	79400	NR	NR	NR	NR	87200	88400	NR	NR	NR	NR	ug/L
Nickel	12.7B	12.3B	NR	NR	NR	NR	11.7B	11.8B	NR	NR	NR	NR	ug/L
Potassium	23500	23700	20600	20100	19400	16800	22000	22100	18400	19800	16300	15800	ug/L
Selenium	10U	10U	10U	10U	4.97B	4.91B	4.69B	3.94B	9.84B	12.2	6.84B	8.02B	ug/L
Silcon	19500	21400	19200	19500	18500	17400	22400	22600	26300	36500	18500	17700	ug/L
Sodium	287000	285000	232000	228000	226000	196000	270000	270000	213000	213000	191000	184000	ug/L
Tin	100U	100U	5B	5U	5U	1.16B	100U	100U	5U	5U	5U	5U	ug/L
Thallium	5U	5U	5B	5U	5U	5U	5U	5U	5U	5U	5U	5U	ug/L
Vanadium	36.6	35.8	23.9	22.1	41.8	38.7	40.5	40.2	67.4	102	35.5	34.1	ug/L
Zinc	10U	10U	20U	20U	20U	20U	10U	12.2	33	81.5	20U	20U	ug/L
Carbon tetrachloride	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	ug/L
Trichloroethene	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	5U	ug/L
Methyl alcohol	NR	NR	NR	NR	NR	NR	5U	5U	NR	NR	NR	NR	ug/L
Trichlorofluoromethane	NR	NR	NR	NR	NR	NR	1.36J	1.15J	NR	NR	NR	NR	ug/L
pH	7.51	7.42	7.38	7.42	7.3	7.37	7.41	7.52	7.54	7.55	7.99	7.84	Ph
Specific Conductance	3480	2790	2730	2700	2531	2610	2820	2820	2300	2280	2500	2350	umS/cm
Bromide	2500UD	1090DB	2500U	2500U	2500U	2500U	500U	500U	25000UD	25000UD	1500	1520	ug/L
Chloride	268000D	252000D	222000D	203000D	228000D	226000D	323000	322000	240000D	210000D	221000D	223000D	ug/L
Fluoride	2500UD	2500UD	2500U	2500U	2500U	2500U	500U	500U	25000UD	25000UD	240B	240B	ug/L
Nitrate	358000D	346000D	364000D	338000D	395000D	389000D	276000	278000	311000D	426000D	202000D	206000D	ug/L
Nitrite	2500UD	2500UD	25000U	5000U	2500U	2500U	500U	500U	25000U	25000U	25000U	25000U	ug/L

Leachate Sample Data													
Constituent	**Jun-09**	**Jun-09**	**Dec-09**	**Dec-09**	**Mar-10**	**Mar-10**	**Sep-10**	**Sep-10**	**Mar-11**	**Mar-11**	**Oct-11**	**Oct-11**	**Units**
									D	D	D	D	
Sulfate	575000D	558000D	490000D	475000D	488000D	483000D	563000	563000	597000D	556000D	488000D	489000D	ug/L
Total Organic Carbon	NR	NR	NR	NR	NR	NR	10200	9560	NR	NR	NR	NR	ug/L
Oil & Grease	NR	NR	NR	NR	NR	NR	10500U	10400U	NR	NR	NR	NR	ug/L
Total Dissolved Solids	2220000	2140000	1820000	1880000	1780000	1820000	2030000	2070000	1670000	1700000	1780000	1800000	ug/L
Total Suspended Solids	9000	8000	5000U	5000U	5000U	5000U	10000U	5000	10000U	112000	7000B	15000	ug/L
Alkalinity	216000	216000	234000	232000	214000	216000	274000	267000	238000	245000	298000	361000	ug/L
Gross alpha	1740	1800	1700	1830	1690	1590	1290	1230	845	864	410	520	pCi/L
Gross beta	925	905	862	828	650	657	648	652	426	432	323	310	pCi/L
Carbon-14	48.9U	41U	39.4U	62.8	81.8	48	32.8U	47.9	26.7U	43.7	22.6U	11.4U	pCi/L
Technetium-99	798	751	773	976	739	892	579	580	363	376	280	295	pCi/L
Uranium (Total)	2200	2190	2210	2500	2420	3060	1480	1800	1480	1520	812	865	ug/L
Iodine-129	-0.293U	0.445U	0.751U	-0.204U	1.85U	-2.1U	.751U	.608U	3U	0.436U	-0.46U	-1.34U	pCi/L
Total Radium Alpha Emissions	0.1U	0.132U	0.095U	0.174U	.06U	.132U	.008U	.017U	0.051U	0.028U	0.137U	0.248U	pCi/L
Tritium	98000	100000	120000	123000	122000	125000	97300	97000	66600	65300	53000	54700	pCi/L

APPENDIX D

LEACHATE SAMPLING TRENDS, 1998-2011

ARSENIC



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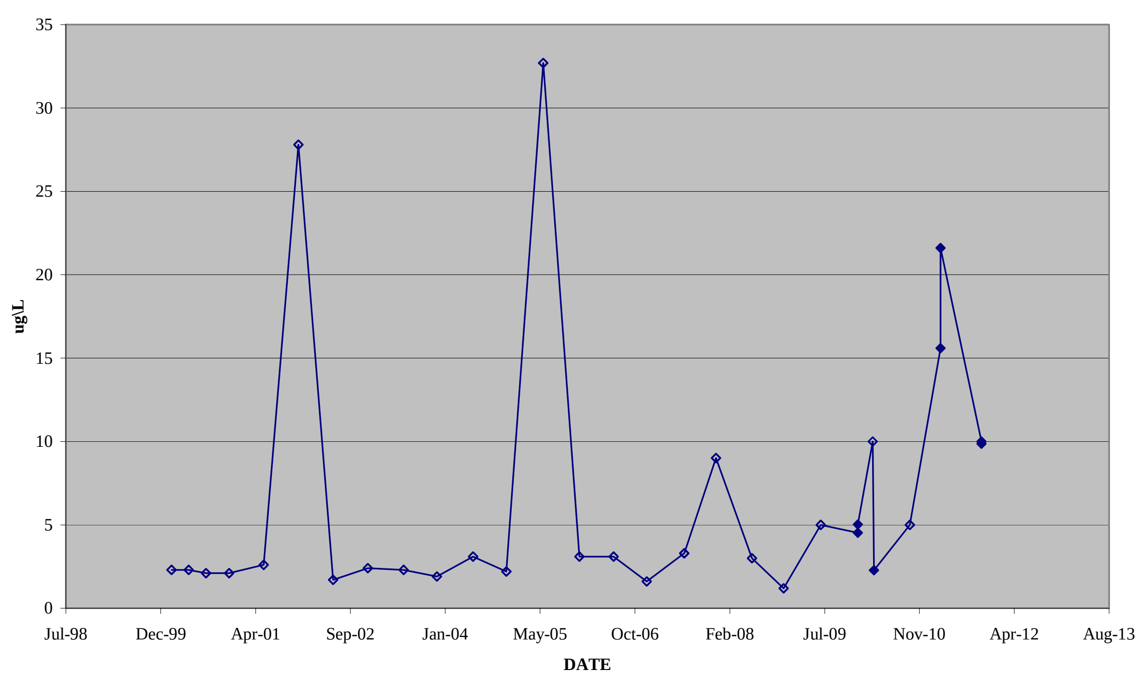

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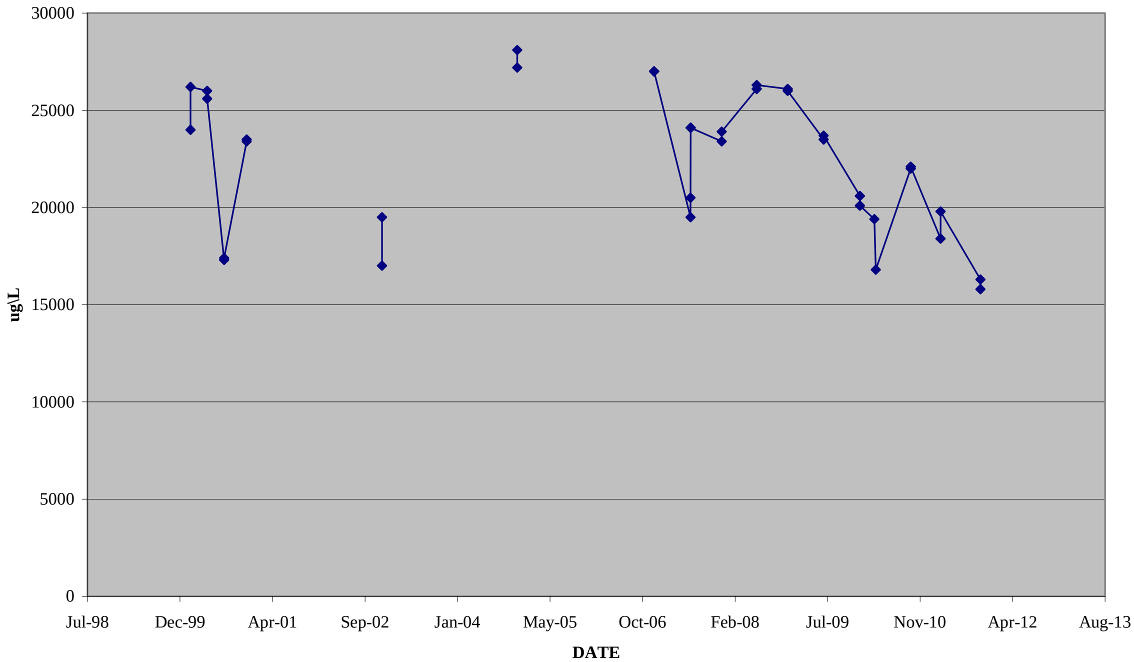

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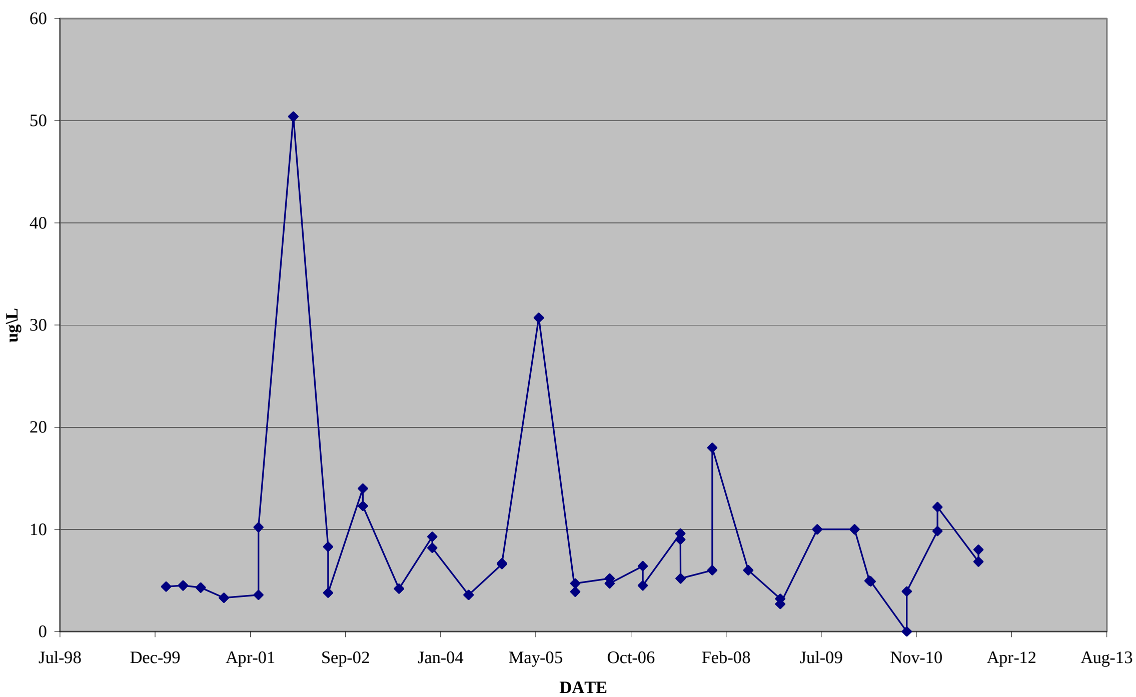

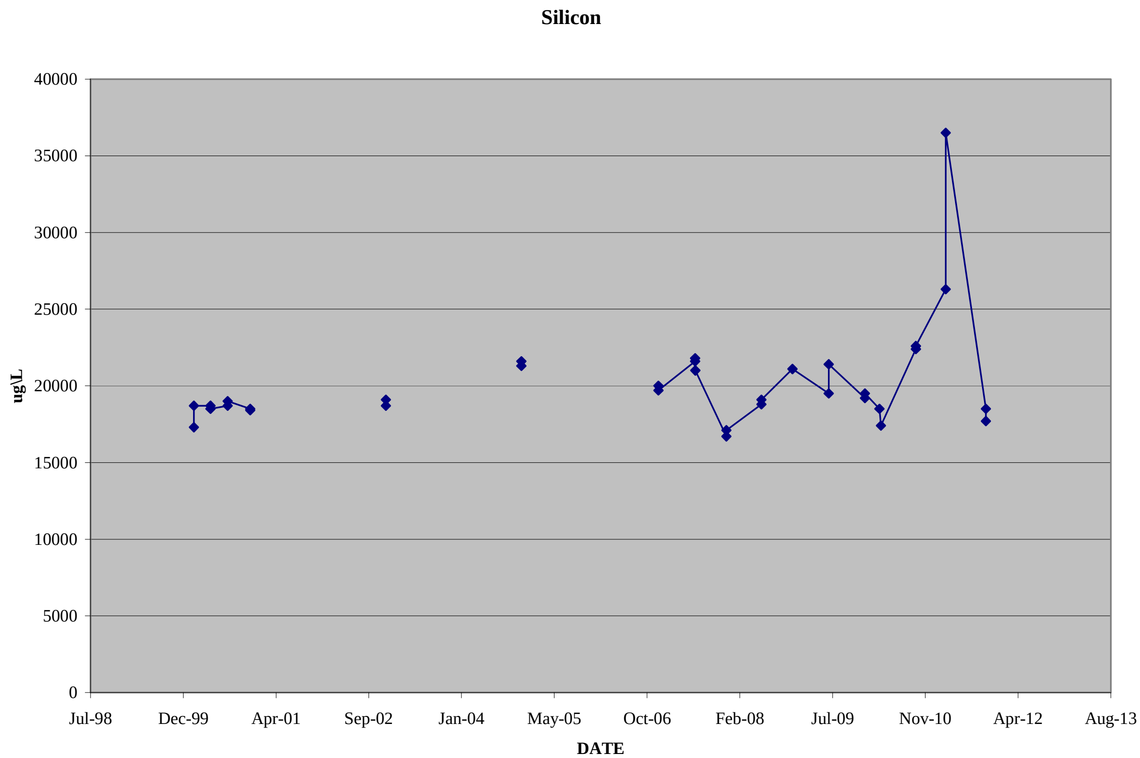
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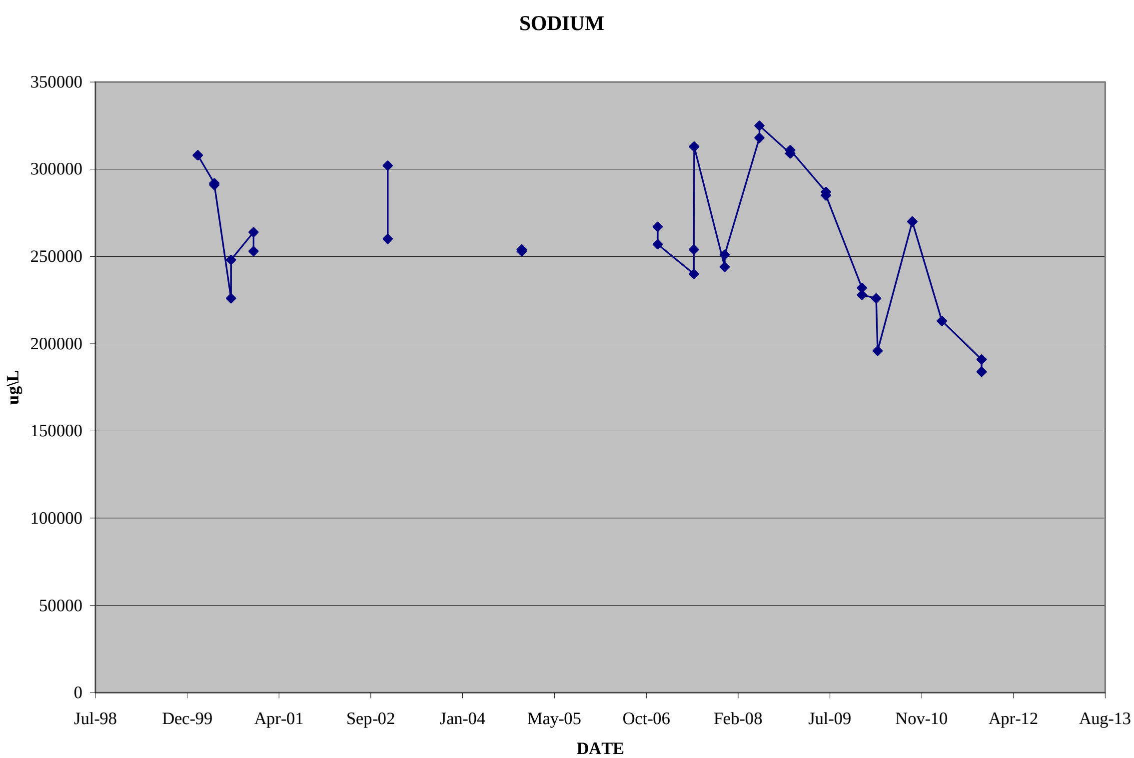
Feb-08
Jul-09
Nov-10
Apr-12
Aug-13
DATE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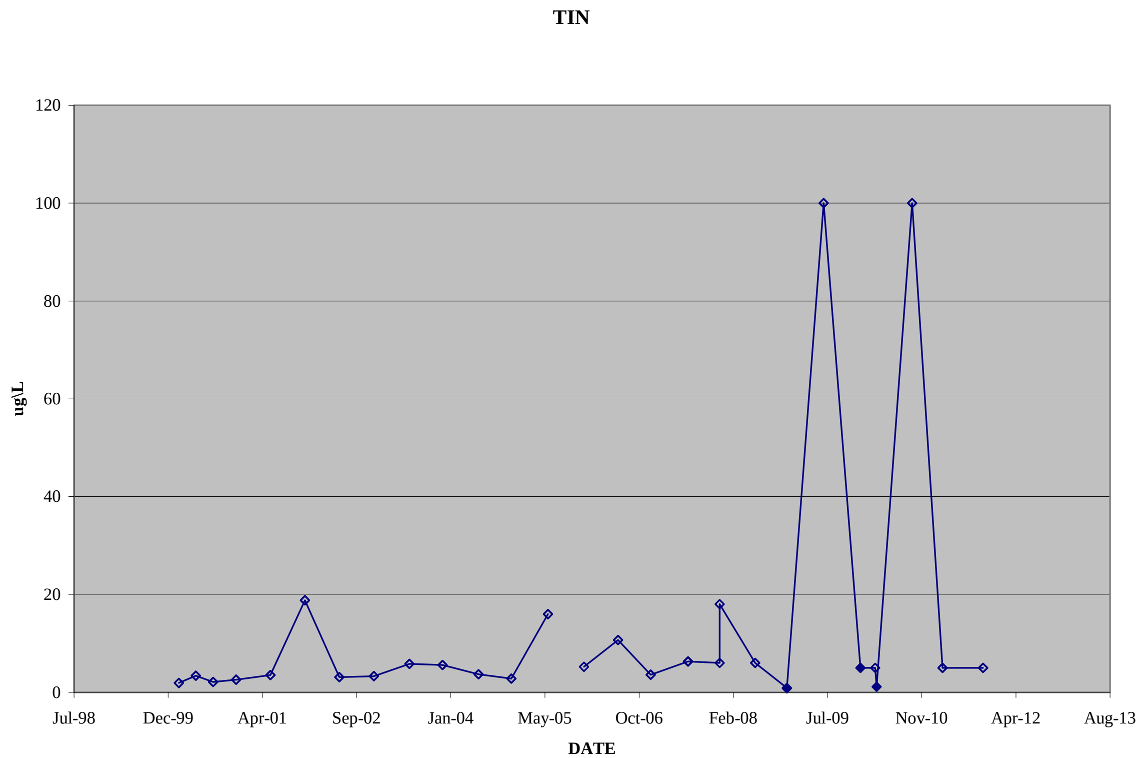
Apr-12
Aug-13
DATE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Apr-12
Aug-13
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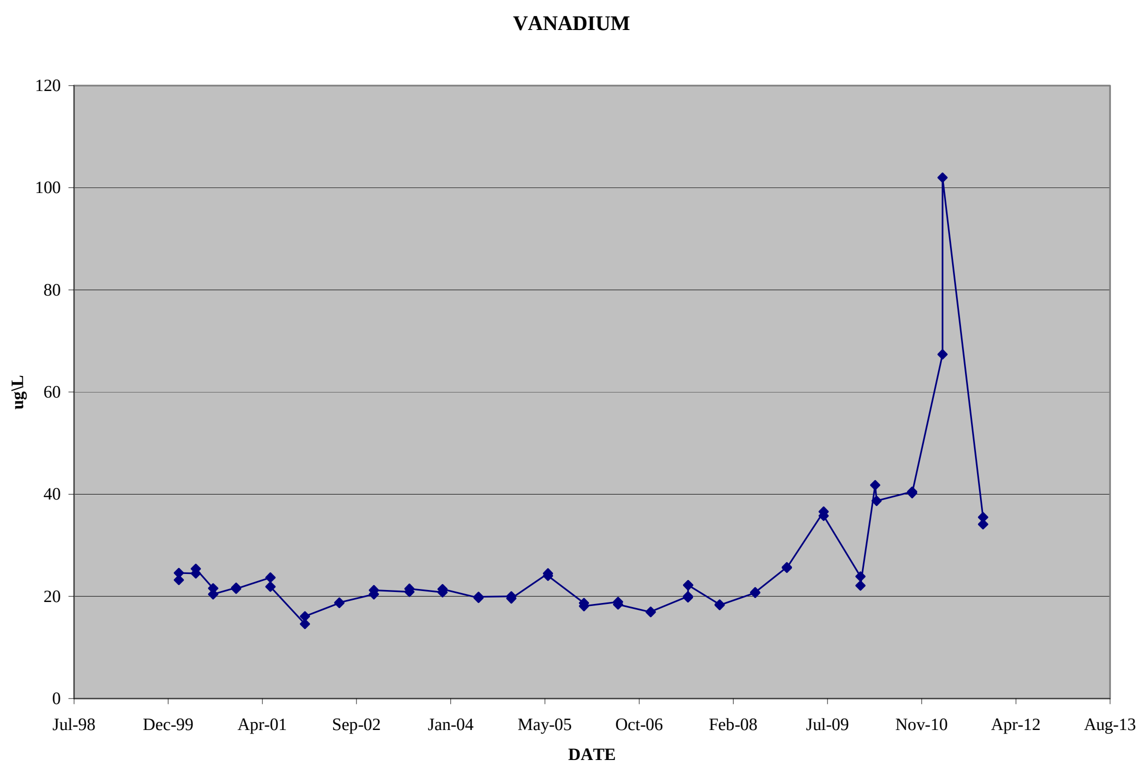
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Aug-13
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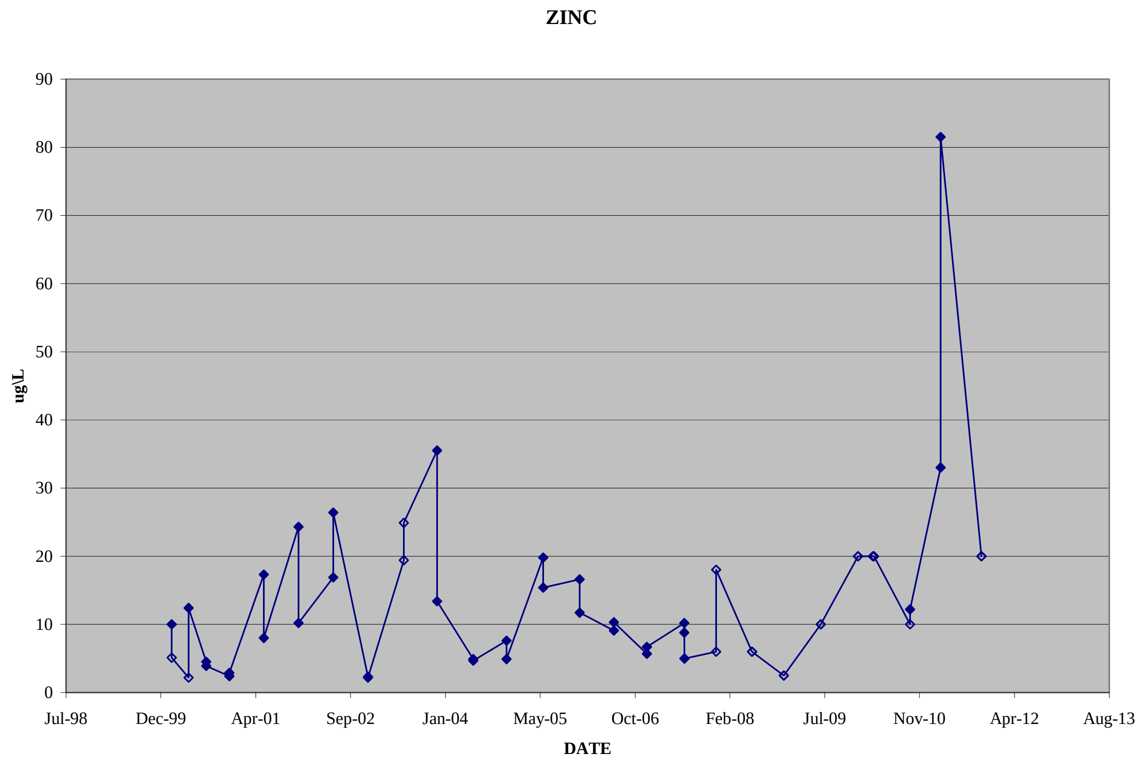
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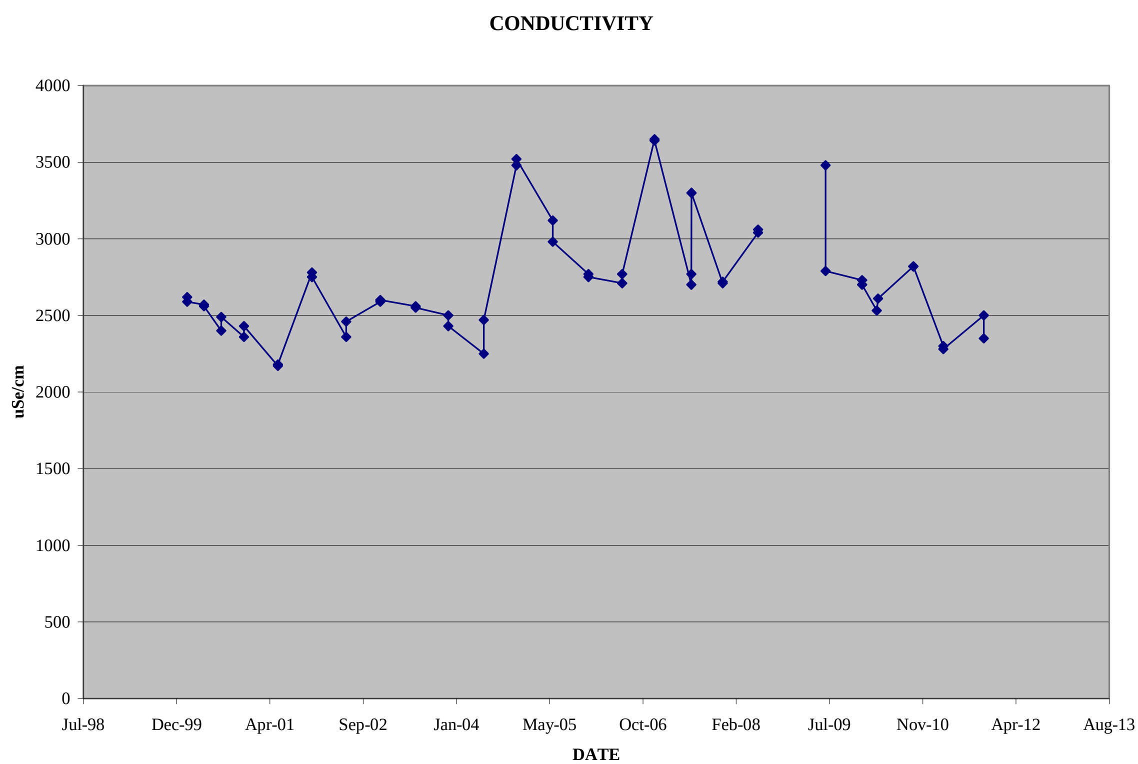
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Jan-04
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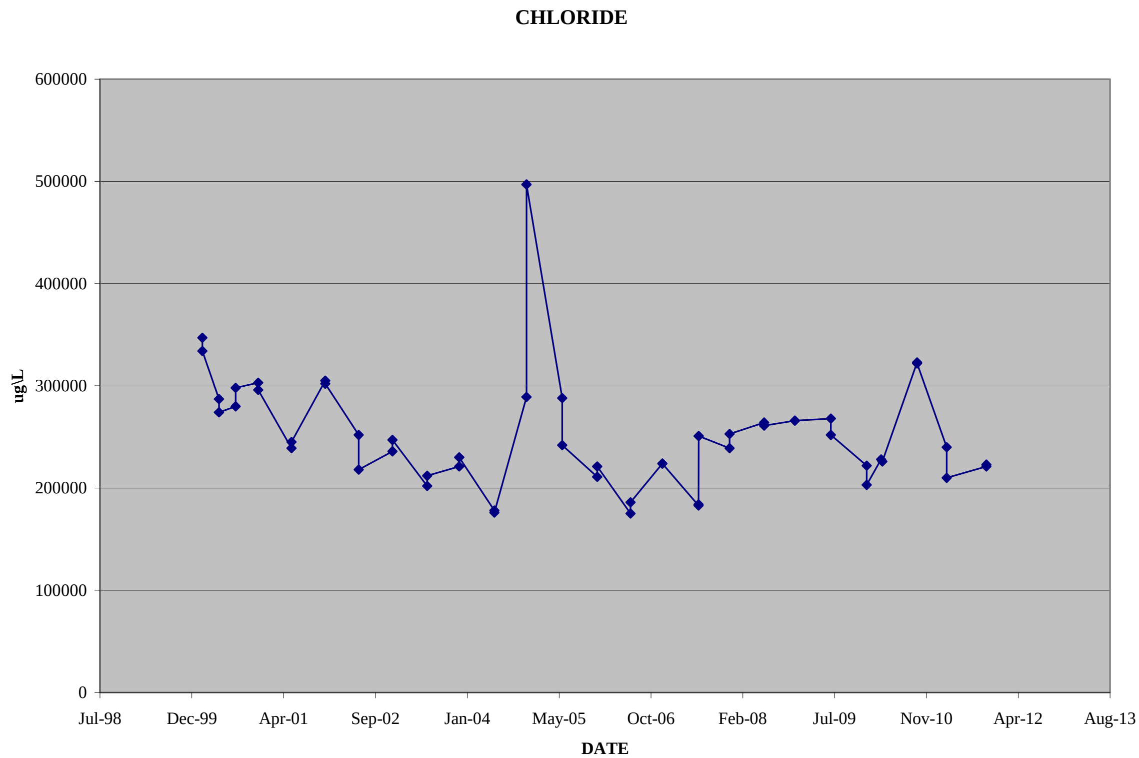
Apr-12
Aug-13
DATE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Apr-12
Aug-13
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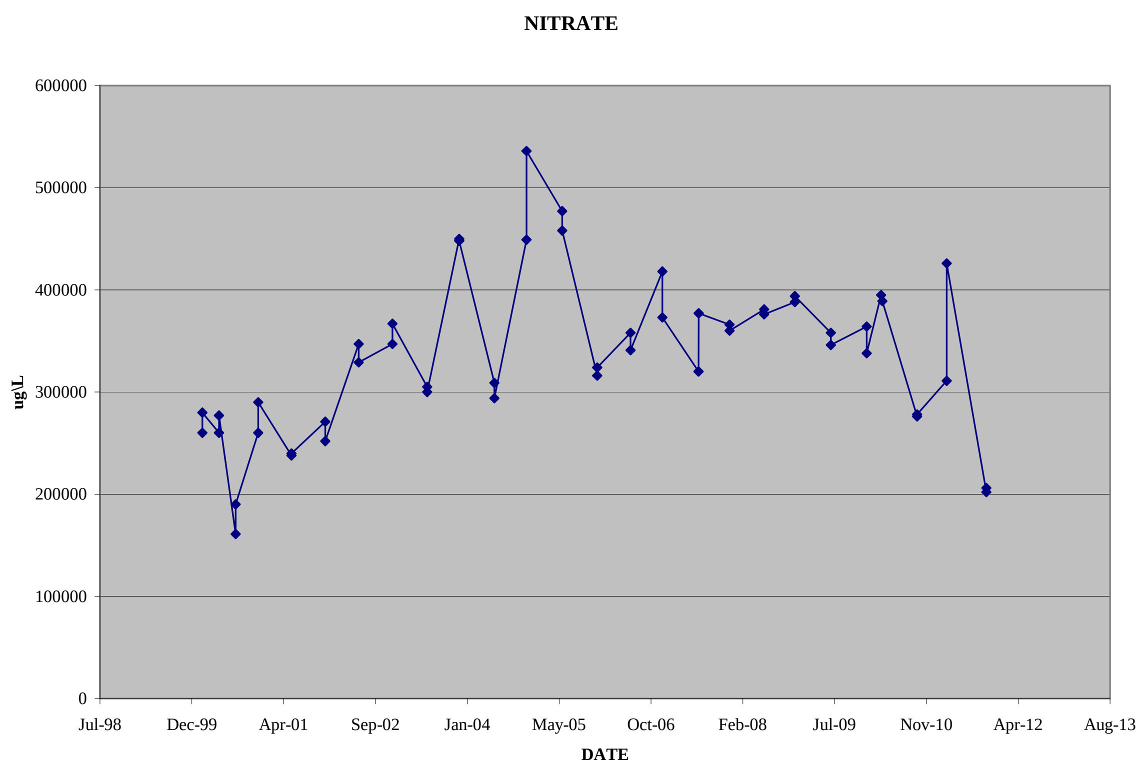
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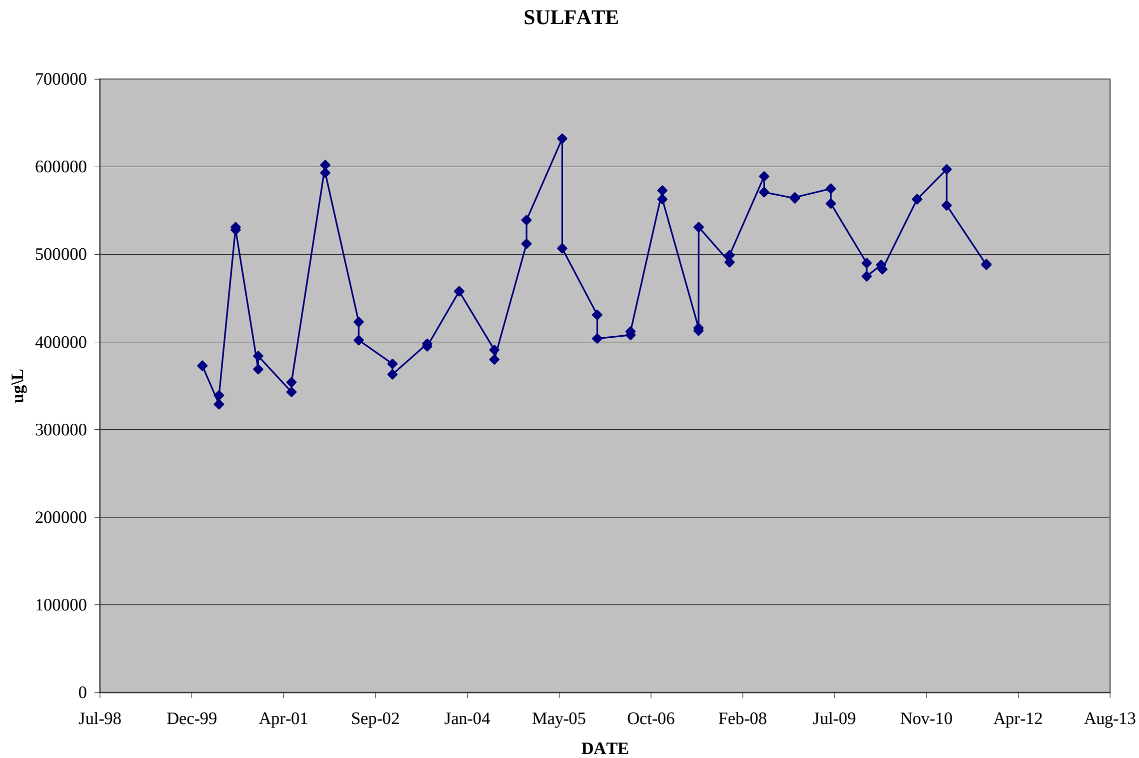
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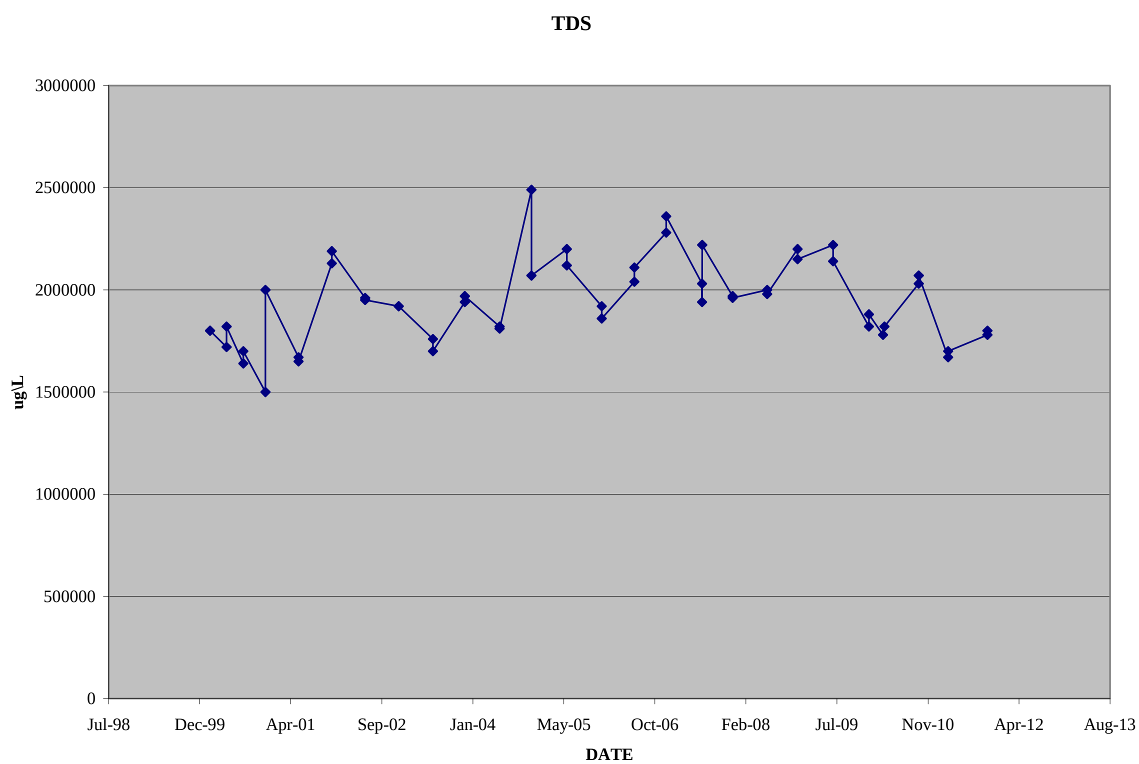
Apr-12
Aug-13
DATE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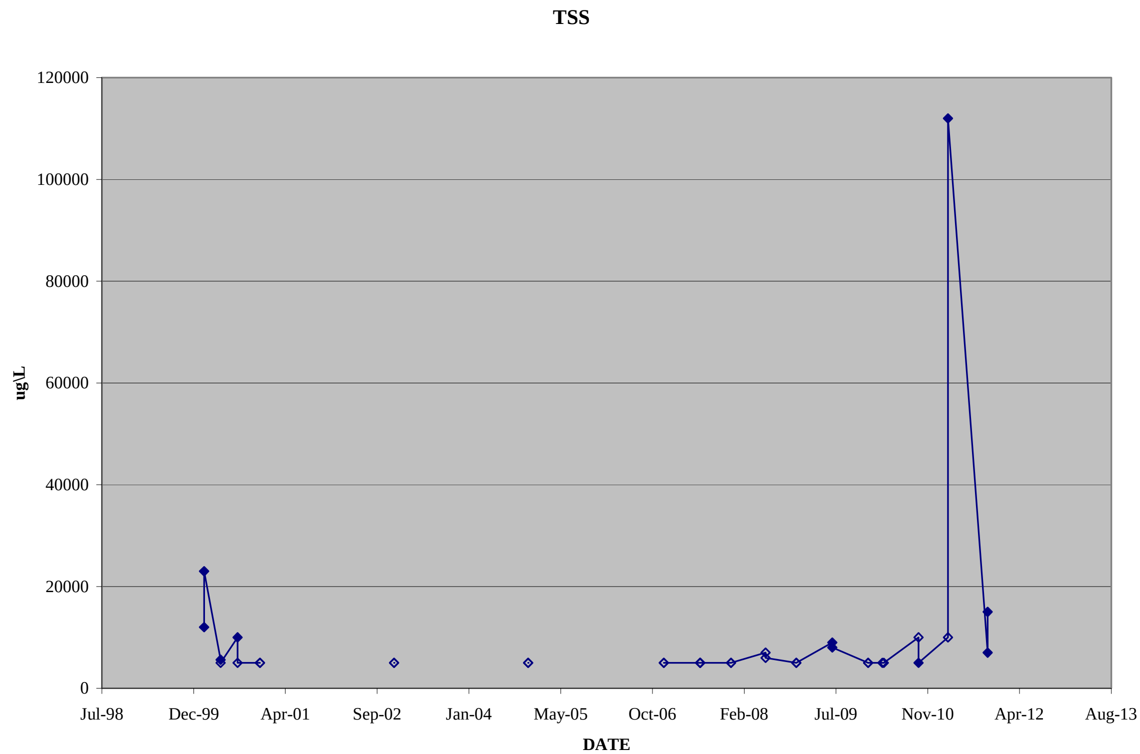
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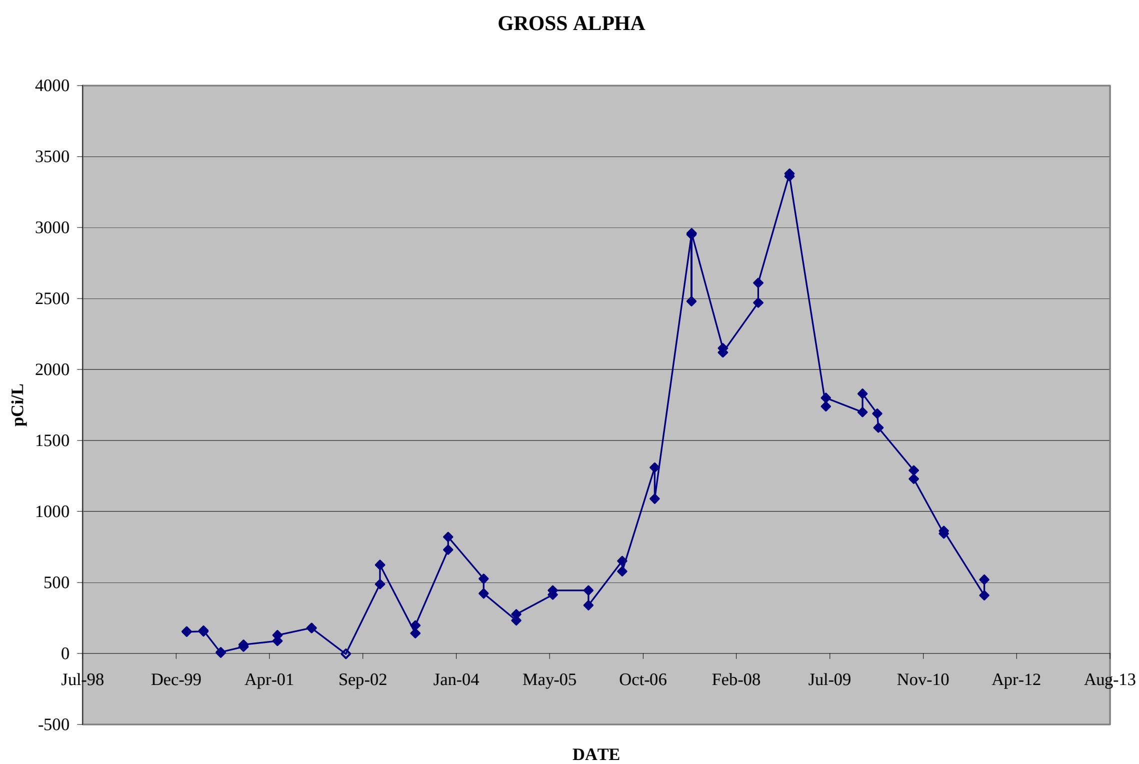
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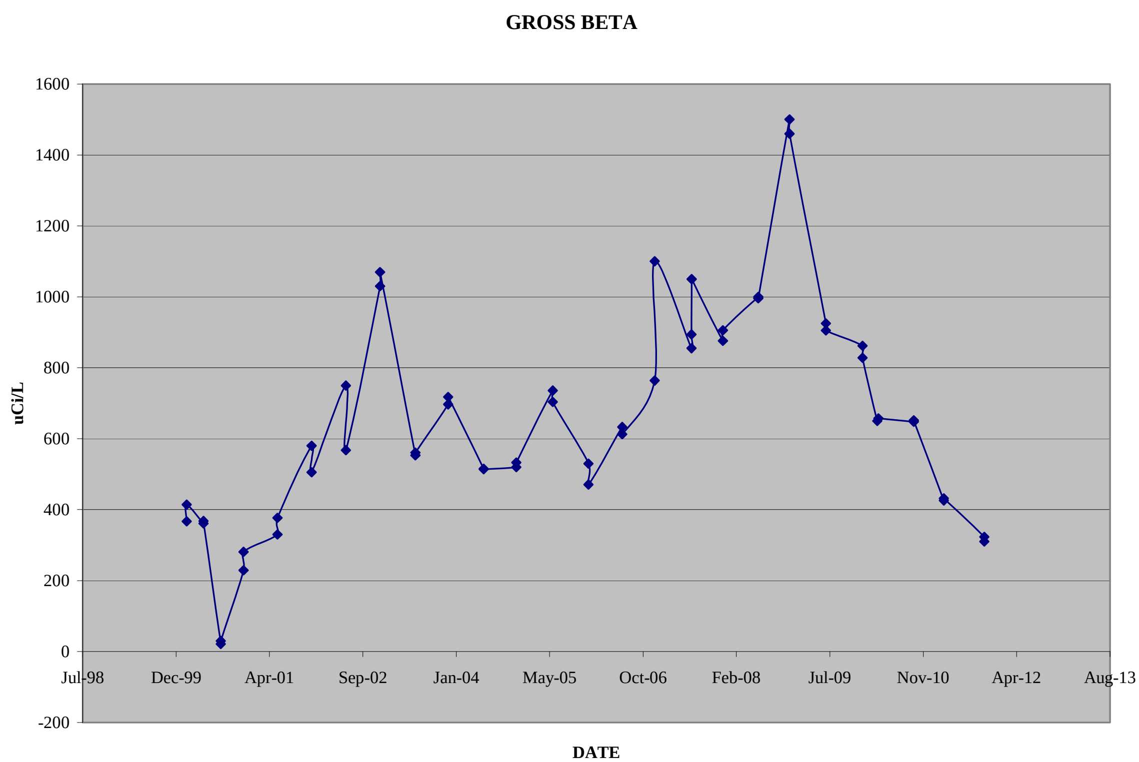
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uCi/L
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May-05
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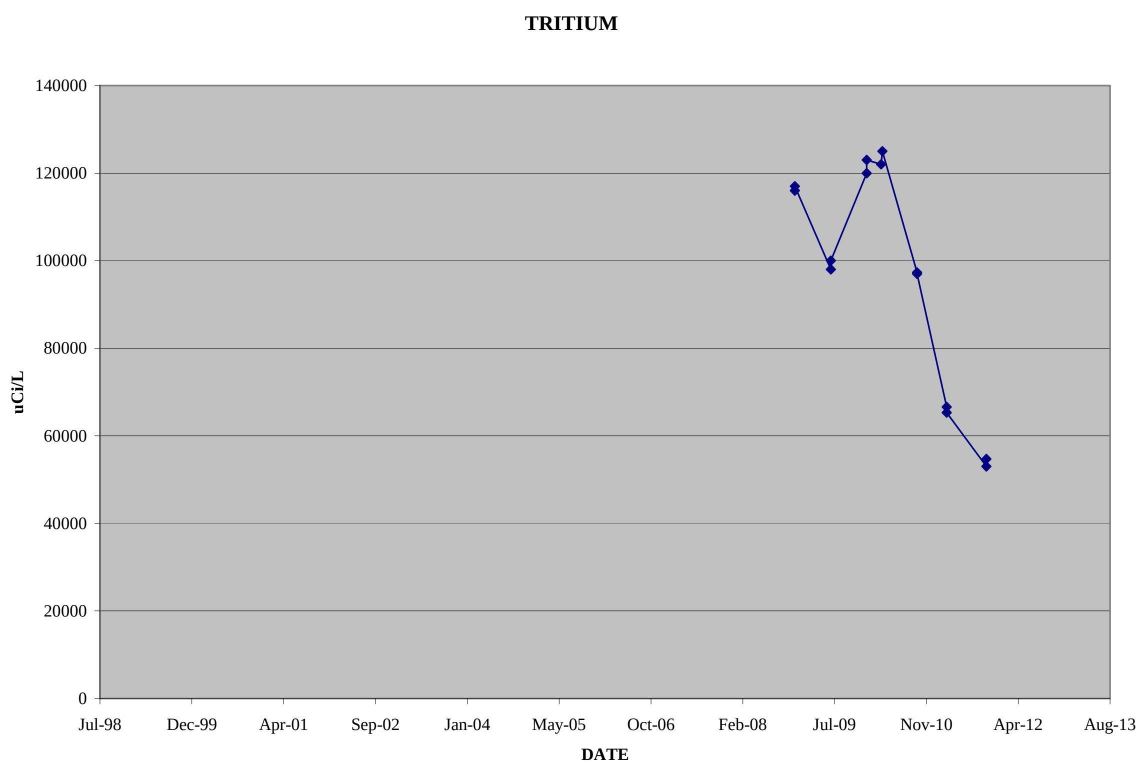
Apr-12
Aug-13
DATE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uCi/L
Jul-98
Dec-99
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Sep-02
Jan-04
May-05
Oct-06
Feb-08
Jul-09
Nov-10
Apr-12
Aug-13
DATE

APPENDIX E

ERDF LYSIMETER SAMPLING, CY 2011

Table E-1. Lysimeter Analytical Results. (2 Pages)

Constituent	Cell 5 April 2011	Cell 6 April 2011	Cell 7 April 2011	Cell 7 (Duplicate Sample) April 2011	Cell 8 April 2011	Cell 9 (Initial Sample) Feb 2011	Cell 9 (Duplicate Sample) Feb 2011	Cell 10 (Initial Sample) June 2011	Cell 10 (Duplicate Sample) June 2011	Units
Arsenic						5.1B	6.13B	9.02B	9.54B	ug/L
Barium						80.1	77.1	94.4	93.9	ug/L
Beryllium						1U	1U	1U	1U	ug/L
Calcium	498,000	488,000	242,000	259,000	305,000	85,000	87,000	144,000	144,000	ug/L
Chromium						4.73	3.53	5.94	5.28	ug/L
Lead						3.46B	10U	10U	10U	ug/L
Magnesium	90,200	87,500	51,700	52,100	22,400					ug/L
Potassium	25,200	23,600	20,200	20,400	21,700	9340	9550	11,000	11,000	ug/L
Selenium						3.4B	10U	10U	10U	ug/L
Silcon						15,800	15,400	17,200	17,100	ug/L
Sodium	144,000	136,000	228,000	223,000	149,000	64,600	66,000	83,200	83,100	ug/L
Tin						5U	5U	5U	5U	ug/L
Thallium						5U	5U	5U	5U	ug/L
Vanadium						17	16.4	9.33	9.09	ug/L
Zinc						26.9	23.4	20U	20U	ug/L
Carbon tetrachloride						5U	5U	5U	5U	ug/L
Trichloroethylene						5U	5U	5U	5U	ug/L
Bromide						5U	5U	0.17B	0.19B	mg/L
Chloride	75.5	75.6	55.6	56.2	85.8	29.8	33.7	38.8	39.4	mg/L
Fluoride						5U	5U	0.12B	0.12B	mg/L
Nitrogen (in nitrite/nitrate	56.4D	58.4D	0.502	0.463	55.7D	1.46D	0.86	0.015B	0.05U	mg/L
Nitrate	227	246	1.58	1.33	231			0.5U	0.5U	mg/L
Nitrite								0.5U	0.5U	mg/L
Sulfate	1470	1370	1060	1050	900	337	386	452	451	mg/L
Total Dissolved Solids	2680	2750	1830	1770	1860	586	639	872B	864B	mg/L
Total Suspended Solids	376	122	668	558	50	22	88	17	18	mg/L
Total Organic Compounds	13.1D	13.1D	12.2D	12.3D	13.4D	8.2	8.68	15.7	12.7	mg/L
Total Organic Halides						27.4B	24B	26.6B	28.5B	ug/L
Alkalinity						56.2	44.5	46.1	45.1	mg/L
Gross Alpha	34.2	45.6	39.1	26.3	11.4	5.72	3.17	1.8U	0.827U	pCi/L

Table E-1. Lysimeter Analytical Results. (2 Pages)

Constituent	Cell 5 April 2011	Cell 6 April 2011	Cell 7 April 2011	Cell 7 (Duplicate Sample) April 2011	Cell 8 April 2011	Cell 9 (Initial Sample) Feb 2011	Cell 9 (Duplicate Sample) Feb 2011	Cell 10 (Initial Sample) June 2011	Cell 10 (Duplicate Sample) June 2011	Units
Gross Beta	40.6	25	32.4	27.2	18.9	10	8.6	10	9.14	pCi/L
Carbon-14						17.3U	13.2U	-1.35U	-11.6U	pCi/L
Technetium-99	-0.112U	-0.778U	-1.97U	-0.984U	0.619U	-1.03U	-0.537U	-0.917U	-0.403U	pCi/L
Uranium (Total)	32.7	33	20.9	19.7	7.36	0.803	0.757	0.177	0.222	ug/L
Uranium (Filtered)	31.6	34.7	19.7	17.8	7.3					ug/L
Iodine-129						-1.38U	-1.88U	0.17U	-0.72U	pCi/L
pH	7.82	7.79	7.95	7.96	8.34	7.62	7.74	7.71	7.75	pH
Specific Conductance	2,990	3,000	2,280	2,280	2250	804	792	1100	1120	µS/cm

B = Organics: Method blanks contamination. Inorganics: Value is an estimate.
D = Result reported from secondary dilution.
U = Result is nondetected.

APPENDIX F

ERDF LEACHATE DELISTING EVALUATION, 2008 – 2010

Table F-1. Chemicals on "Non-WAC" 2008 – 2010 List With Existing Delist Limits

Constituent	Constituent
50-00-0 Formaldehyde	98-95-3 Nitrobenzene
50-32-8 Benzo(a)pyrene	100-25-4 1,4-Dinitrobenzene
51-28-5 2,4-Dinitrophenol	100-51-6 Benzyl alcohol
53-70-3 Dibenz(a,h)anthracene	106-46-7 1,4-Dichlorobenzene (typo on list)
56-55-3 Benzo(a)anthracene	107-13-1 Acrylonitrile
58-89-9 Gamma-BHC (Lindane)	108-10-1 4-Methyl-2-pentanone (MIBK, hexone)
59-50-7 4-Chloro-3-methylphenol	108-95-2 Phenol
60-57-1 Dieldrin	110-86-1 Pyridine
62-53-3 Analine	111-44-4 bis (2-Chloroethyl) ether
62-75-9 N-Nitrosodimethylamine	117-81-7 bis (2-Ethylhexyl) phthalate
71-36-3 Butanol	117-84-0 Di-n-octylphthalate
71-43-2 Benzene	120-12-7 Anthracene
71-55-6 1,1,1-Trichloroethane	122-39-4 Diphenylamine (typo on list)
75-01-4 Vinyl chloride	129-00-0 Pyrene
75-05-8 Acetonitrile	131-11-3 Dimethyl phthalate
78-83-1 Isobutyl alcohol	193-39-5 Indeno(1,2,3-c,d)pyrene
78-93-3 2-Butanone	205-99-2 Benzo(b)fluoranthene
83-32-9 Acenaphthene	207-08-9 Benzo(k)fluoranthene
84-66-2 Diethylphthalate	218-01-9 Chrysene
86-30-6 N-Nitrosodiphenylamine	309-00-2 Aldrin
86-73-7 Fluorene	319-85-7 beta-1,2,3,4,5,6-Hexachlorocyclohexane (typo in CAS no. on list)
91-58-7 2-Chlorophenol	541-73-1 1,3-Dichlorobenzene (typo on list)
95-50-1 1,2-Dichlorobenzene (typo on list)	621-64-7 N-Nitroso-di-n-propylamine
95-95-4 2,4,5-Trichlorophenol	744-28-0 Thallium
98-86-2 Acetophenone	8001-35-2 Toxaphene

Table F-2. Chemicals on "Non-WAC" 2008 – 2010 List Shown In DRAS 2.0

Constituent	Constituent
56-38-2 Parathion (delist limit established in previous report)	91-94-1 3,3-Dichlorobenzidine (delist limit established in previous report)
57-74-9 Chlordane (delist limit established in previous report)	106-47-8 p-Chloroaniline (delist limit established in previous report)
58-90-2 2,3,4,6-tetrachlorophenol (delist limit established in previous report)	110-80-5 Cellosolve solvent (delist limit established in previous report)
60-51-5 Dimethoate New delist limit: 31.5 mg/L (GW ingestion pathway)	95-48-7 2-Methylphenol (o-cresol) (delist limit established in previous report)
62-38-4 Mercury phenyl (delist limit established in previous report)	99-09-2 3-Nitroaniline (No DRAS 2.0 values to calculate delist limit)
65-85-0 Benzoic acid (delist limit established in previous report)	101-55-3 4-Bromophenyl-phenylether (Table 2 constituent) (No DRAS 2.0 values to calculate delist limit)
72-43-5 Methoxychlor (delist limit established in previous report)	111-91-1 bis (2-Chloroethoxy) methane (Table 2 constituent) (No DRAS 2.0 values to calculate delist limit)
75-00-3 Chloroethane (Table 2 constituent) (delist limit established in previous report)	132-64-9 Dibenzofuran (No DRAS 2.0 values to calculate delist limit)

Table F-2. Chemicals on "Non-WAC" 2008 – 2010 List Shown In DRAS 2.0

Constituent	Constituent
75-45-6 Chlorodifluoromethane New delist limit: 42.4 mg/L (Groundwater inhalation pathway)	191-24-2 Benzo(g,h,i)perylene (No DRAS 2.0 values to calculate delist limit)
76-01-7 Pentachloroethane (No DRAS 2.0 values to calculate delist limit)	208-96-8 Acenaphthylene (No DRAS 2.0 values to calculate delist limit)
77-47-4 Hexachlorocyclopentadiene (delist limit established in previous report)	298-02-2 Phorate (delist limit established in previous report)
79-06-1 Acrylamide New delist limit: 0.0002 mg/L (Groundwater ingestion pathway)	298-04-4 Disulfoton (delist limit established in previous report)
80-62-6 Methyl ester methacrylic acid (delist limit established in previous report)	606-20-2 2,6-Dinitrotoluene (delist limit established in previous report)
85-01-8 Phenanthrene (No DRAS 2.0 values to calculate delist limit)	1024-57-3 Heptachlor epoxide New delist limit: 4.73 mg/kg (air volatile inhalation pathway)
88-74-4 2-Nitroaniline (delist limit established in previous report)	7005-72-3 4-Chloropheny-phenylether (No DRAS 2.0 values to calculate delist limit)
88-75-5 2-Nitrophenol (No DRAS 2.0 values to calculate delist limit)	7782-50-5 Chlorine (delist limit established in previous report)

Table F-3. Chemicals on "Non-WAC" 2008 – 2010 List On Table 2, Not In DRAS 2.0

Constituent	
106-99-0	1,3-Butadiene
134-32-7	alpha-Naphthylamine

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