

**ANNUAL GROUNDWATER MONITORING REPORT
MONITORING YEAR 2011-2012 (PY4/PY5)**

**THIRD RUNWAY EMBANKMENT FILL
MONITORING PROGRAM
SEATTLE-TACOMA INTERNATIONAL AIRPORT**

August 2012

**ANNUAL GROUNDWATER MONITORING REPORT
MONITORING YEAR 2011-2012 (PY4/PY5)**

Prepared for:

**Port of Seattle
PO Box 68727
Seattle, Washington 98168
206.787.3000
www.portseattle.org**

Prepared by:

**Pacific Groundwater Group
2377 Eastlake Avenue East, Suite 200
Seattle, Washington 98102
206.329.0141
www.pgwg.com**

August 2012

JE0908

EFMP_AnnualGroundwater_2012.doc

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
1.1	MONITORING OBJECTIVES	1
1.2	REPORT ORGANIZATION	2
1.3	NOMENCLATURE.....	2
2.0	MONITORING WELL NETWORK	3
2.1	SITE CONDITIONS	3
2.2	EFMP MONITORING WELLS.....	4
3.0	GROUNDWATER MONITORING PROCEDURES	5
3.1	WATER LEVEL MEASUREMENT	5
3.2	SAMPLING METHODS.....	5
3.3	EFMP GROUNDWATER MONITORING WELLS SAMPLED.....	6
3.4	VERIFICATION RESAMPLING.....	6
4.0	LABORATORY ANALYSIS AND REPORTING.....	7
4.1	ANALYTICAL METHODS	7
4.2	DATA PACKAGES	8
4.3	DATA VALIDATION.....	8
4.4	WATER QUALITY ACTION LEVELS	9
5.0	RESULTS AND DATA EVALUATIONS.....	10
5.1	GROUNDWATER LEVELS.....	10
5.2	DATA SUMMARY	11
5.2.1	<i>Trace Metals</i>	11
5.2.2	<i>Petroleum Hydrocarbons</i>	11
5.2.3	<i>Conventional Analytes</i>	12
5.2.4	<i>Field Parameters</i>	12
5.3	PY4/PY5 DESCRIPTIVE STATISTICS FOR CONSTITUENTS OF INTEREST.....	12
5.3.1	<i>Trace Metals</i>	12
5.4	TIME SERIES AND TREND ANALYSIS.....	13
5.5	SPECIAL CONSIDERATION FOR ARSENIC	14
5.6	UPDATED BASELINE DATA SETS	15
5.6.1	<i>Site-Wide Baseline Data Statistical Analysis</i>	15
5.7	COMPARATIVE ANALYSIS OF TOTAL AND DISSOLVED METALS	16
5.7.1	<i>Paired Comparison</i>	16
5.7.2	<i>Correlation Analysis</i>	17
5.8	MERCURY AT MW-8A.....	17
6.0	CORRECTIVE ACTIONS PERFORMED DURING PY4/PY5	18
7.0	SUMMARY AND CONCLUSIONS.....	19
8.0	REFERENCES.....	21

TABLES

- Table 2-1: Well Construction Summary
- Table 3-1: PY4/PY5 Well Quarterly Sampling Summary
- Table 5-1: Groundwater Elevation Data
- Table 5-2: Site-Wide Summary and Statistical Analysis of Dissolved Metals July 2011 through June 2012 (PY4/PY5)
- Table 5-3: Dissolved Trace Metals in MW-1A: Significant Linear Regression Trend
- Table 5-4: Dissolved Trace Metals in MW-2A: Significant Linear Regression Trend
- Table 5-5: Dissolved Trace Metals in MW-4A: Significant Linear Regression Trend
- Table 5-6: Dissolved Trace Metals in MW-5: Significant Linear Regression Trend
- Table 5-7: Dissolved Trace Metals in MW-6: Significant Linear Regression Trend
- Table 5-8: Dissolved Trace Metals in MW-7: Significant Linear Regression Trend
- Table 5-9: Dissolved Trace Metals in MW-8A: Significant Linear Regression Trend
- Table 5-10: Dissolved Trace Metals in MW-9A: Significant Linear Regression Trend
- Table 5-11: Dissolved Trace Metals in MW-10: Significant Linear Regression Trend
- Table 5-12: Dissolved Trace Metals in MW-11: Significant Linear Regression Trend
- Table 5-13: Dissolved Trace Metals in MW-12: Significant Linear Regression Trend
- Table 5-14: Dissolved Trace Metals in MW-13B: Significant Linear Regression Trend
- Table 5-15: Summary of Significant Linear Regression Trends for Dissolved Trace Metals
- Table 5-16: Significant Upward Linear Regression Trend Figures
- Table 5-17: Arsenic in MW-6: Original and Seasonally-Corrected Data
- Table 5-18: Arsenic in MW-6: Combined Shewhart-CUSUM Chart for Seasonally-Corrected Arsenic Data
- Table 5-19: Baseline Antimony Data
- Table 5-20: Baseline Arsenic Data
- Table 5-21: Baseline Barium Data
- Table 5-22: Baseline Beryllium Data
- Table 5-23: Baseline Cadmium Data
- Table 5-24: Baseline Chromium Data
- Table 5-25: Baseline Copper Data
- Table 5-26: Baseline Lead Data
- Table 5-27: Baseline Mercury Data
- Table 5-28: Baseline Nickel Data
- Table 5-29: Baseline Selenium Data
- Table 5-30: Baseline Silver Data
- Table 5-31: Baseline Thallium Data
- Table 5-32: Baseline Zinc Data
- Table 5-33: Site-Wide Baseline Data Summary and Statistical Analysis
- Table 5-34: Comparative Analysis of Total and Dissolved Metals in Well MW-1A
- Table 5-35: Comparative Analysis of Total and Dissolved Metals in Well MW-2A

Table 5-36: Comparative Analysis of Total and Dissolved Metals in Well MW-4A
Table 5-37: Comparative Analysis of Total and Dissolved Metals in Well MW-5
Table 5-38: Comparative Analysis of Total and Dissolved Metals in Well MW-6
Table 5-39: Comparative Analysis of Total and Dissolved Metals in Well MW-7
Table 5-40: Comparative Analysis of Total and Dissolved Metals in Well MW-8A
Table 5-41: Comparative Analysis of Total and Dissolved Metals in Well MW-9A
Table 5-42: Comparative Analysis of Total and Dissolved Metals in Well MW-10
Table 5-43: Comparative Analysis of Total and Dissolved Metals in Well MW-11
Table 5-44: Comparative Analysis of Total and Dissolved Metals in Well MW-12
Table 5-45: Comparative Analysis of Total and Dissolved Metals in Well MW-13B
Table 5-46: Summary of the Comparison of Dissolved and Total Metals
Table 5-47: Site-Wide Paired Comparison Test and Correlation Analysis Summary
Table 5-48: MW-8A Mercury Summary

FIGURES

Figure 1-1: EFMP Monitoring Locations
Figure 2-1: Hyetograph for Seattle-Tacoma International Airport
Figure 5-1: Groundwater Elevations from August 2002 through April 2012
Figure 5-2: Conceptual Cross-Section of Groundwater Levels and Variations
Figure 5-3: MW-8A Mercury and TOC Trends
Figure 5-4: MW-12 and MW-13B Mercury and TOC Trends

APPENDICES

Appendix A: Data Validation Reports for EFMP-GMW PY4/PY5 Data
Appendix B: Data Summary Tables

SIGNATURE

This report, and Pacific Groundwater Group's work contributing to this report, were reviewed by the undersigned and approved for release.



Stephen P. Swope

A handwritten signature in blue ink that reads "Stephen Swope".

Stephen Swope
Principal Hydrogeologist
Washington State Hydrogeologist No. 1003



GLEN S WALLACE

Glen Wallace, Ph.D.
Geologist
Washington State Geologist No. 2664

1.0 INTRODUCTION

The Embankment Fill Monitoring Program (EFMP) was established by the Port of Seattle (Port) for compliance with the requirements of several permits issued for the Port's construction of a Third Runway at Seattle-Tacoma International Airport (Airport). These include the State of Washington's Section 401 Water Quality Certification (401 WQC) issued by the Washington Department of Ecology (Ecology) and the U.S. Army Corps of Engineers Section 404 Permit. More specifically, the Port is implementing the EFMP in fulfillment of Condition E-3 of the 401 WQC.

Under the EFMP, the Port has monitored groundwater and seeps along the toe of the Third Runway embankment during embankment construction, and will continue to monitor for 8 years following completion of construction. Construction of the Third Runway embankment was completed in 2007 and EFMP monitoring shifted from construction to post-construction monitoring effective January 1, 2008 (Kelly, 2008).

EFMP monitoring is performed to detect potential water quality impacts from the Third Runway embankment at the Airport. A map of the Third Runway embankment is presented in Figure 1-1. The *Final EFMP Groundwater Monitoring Work Plan* (Work Plan; Port of Seattle, 2006a) and *Final Seep Monitoring Work Plan* (Port of Seattle, 2006b) were issued on April 17, 2006. EFMP groundwater and seep monitoring are reported separately. This document reports groundwater monitoring results for quarterly post-construction monitoring for the 12-month period spanning July 2011 through June 2012 (Post-Construction Year 4/5 [PY4/PY5]). Future sampling will continue on the post-construction schedule described in the Work Plan.

AECOM performed groundwater monitoring for the Port through October 2009. Pacific Groundwater Group (PGG) assumed groundwater monitoring duties in January 2010 and will continue groundwater monitoring through the completion of the embankment fill monitoring program. For consistency, this report follows as closely as possible the format developed by AECOM and used for the previous construction and post-construction annual monitoring reports.

1.1 MONITORING OBJECTIVES

The primary objective of the EFMP monitoring program is to detect possible adverse groundwater quality impacts from embankment fill. A secondary objective of this annual report is the continued evaluation and comparison of total and dissolved metals concentrations.

Objective 1: Quarterly Monitoring of Constituents of Interest in EFMP Network Monitoring Wells

Objective 1 consists of quarterly monitoring of constituents of interest and comparison to water quality action levels for the site, and to determine whether there are trends in the concentrations of the constituents of interest that could result in action levels being exceeded in the future. Data collected to address this objective are evaluated in accordance with the Work Plan, and are reported on a quarterly and annual basis.

Quarterly technical memoranda present the post-baseline monitoring data, and include discussion of issues or problems encountered in the field or in the laboratory. For this monitoring year, the Port provided quarterly groundwater technical memoranda to Ecology on October 11, 2011; January 19, 2012; April 17, 2012; and June 29, 2012.

Annual reports present a compilation and evaluation of the monitoring data from the preceding monitoring year. This annual report focuses on results from filtered (dissolved) samples for comparison to previous annual reports and data.

Objective 2: Compare Total (Unfiltered) and Dissolved (Filtered) Concentrations of Trace Metals in the Groundwater Samples

EFMP quarterly groundwater monitoring samples are analyzed for both the total (unfiltered sample) and dissolved (filtered sample) concentrations of trace metals. Total and dissolved concentrations are compared in Section 5 to evaluate the extent to which the results correlate, and/or are statistically significantly different. The results of the comparison will form the basis for a discussion with Ecology regarding whether the total analyses can be removed from the program while ensuring protection of the receptors of concern.

1.2 REPORT ORGANIZATION

Section 1 of this report provides an introduction to the EFMP, and describes the EFMP groundwater monitoring objectives and reporting requirements. Section 2 summarizes the site conditions, and briefly describes the EFMP monitoring well network and changes to the network in the monitoring period. Section 3 describes the methods employed to measure groundwater levels and collect groundwater samples. Section 4 outlines the laboratory analytical methods, reporting protocols, and quality assurance/quality control (QA/QC) requirements. Section 5 presents the sampling and gauging results and data evaluations. Section 6 provides details of any corrective actions that were performed as a result of verified action level exceedances during PY4/PY5. Section 7 provides a summary of and conclusions about the PY4/PY5 monitoring data. Section 8 provides references to reports and publications cited in this annual report.

Appendix A provides the data validation reports for all sampling events within the monitoring period. Appendix B contains summary tables of the analytical data and field parameter measurements collected during the monitoring period.

1.3 NOMENCLATURE

This report refers to the July 2011-June 2012 report period as Post-Construction Year 4/Post-Construction Year 5 (PY4/PY5). Quarterly sampling event designations for this monitoring period are:

- PY4.3 (July 2011)
- PY4.4 (October 2011)
- PY5.1 (January 2012)

- PY5.2 (April 2012)

This annual report also refers to monitoring conducted during pre-construction monitoring (also called baseline monitoring in some reports), construction monitoring (referred to as post-baseline monitoring in some reports), and post-construction monitoring phases of the Embankment Fill Monitoring Program. These phases correspond to the concurrent placement of embankment fill materials and construction of the Third Runway. Pre-construction monitoring includes all routine monitoring data collected prior to July, 2004. Construction monitoring data includes all routine monitoring data collected between the end of the pre-construction period and the end of December, 2007. Post-construction monitoring includes all routine data collected after the end of the construction period (after January 1, 2008). Non-routine monitoring data is a broad category that includes data collected as a part of other work such as corrective actions, or groundwater assessments. This distinction is important within the context of this report for the construction of consistent data sets for statistical analyses.

2.0 MONITORING WELL NETWORK

2.1 SITE CONDITIONS

The Airport receives, on average, approximately 37 inches of annual precipitation. The majority of precipitation occurs as rainfall between October and March each year (Hart Crowser, 2004). Figure 2-1 compares the area average cumulative precipitation with the precipitation measured at the Airport throughout PY4/PY5¹. The graph shows that the cumulative rainfall amount was greater than average over the monitoring period with above-average rainfall events throughout fall and winter of 2011-2012.

Changes in precipitation amount and timing have the potential to directly or indirectly influence groundwater monitoring results. Arsenic, which has been shown to vary seasonally in certain monitoring wells (Port of Seattle, 2006a), may co-vary with seasonal precipitation patterns as a result of changes in redox conditions caused by differing amounts of rainfall infiltration. Surface runoff from the embankment occurs only during large rain events, and is collected and routed through stormwater management facilities and discharged through permitted stormwater outfalls. This runoff is monitored under the Port's National Pollutant Discharge Elimination System (NPDES) permit; thus, groundwater monitoring focuses on the quality of water percolating through the embankment.

¹ The average cumulative and PY4/PY5 precipitation data are plotted from daily measurements from Western Regional Climate Center (WRCC) records for station 457473, located at Seattle-Tacoma International Airport.

2.2 EFMP MONITORING WELLS

The EFMP monitoring well network is shown in Figure 1-1 with well details summarized in Table 2-1. Well MW-5 was converted from a flush-mount monument to a stickup monument in October, 2009; this conversion increased the top of casing measuring point by 3.12 feet. The monument and upper portion of casing at well MW-1A were found to be damaged in October 2011. The well was repaired and redeveloped in December 2011. No new wells were constructed and no wells were decommissioned during PY4/PY5.

3.0 GROUNDWATER MONITORING PROCEDURES

This section describes the methods used to record groundwater elevations and collect groundwater samples during the monitoring period.

3.1 WATER LEVEL MEASUREMENT

Water levels were measured using a water-level probe graduated in 0.01-foot increments. Depth to water was measured from the top of each casing and recorded to the nearest hundredth of a foot. Depth to water was converted to groundwater elevation by subtracting the depth to water from the surveyed elevation of the top of casing at each well. A monitoring well was declared “dry” if the water level probe did not measure any water in the well.

Groundwater level measurements were immediately recorded in the field on groundwater monitoring well gauging forms. These forms include the date and time of each measurement, the names of the field personnel, the weather, the measured total depth of the well, and the depth to water from the measuring point.

3.2 SAMPLING METHODS

Groundwater samples were collected from the EFMP wells for each of the four quarterly monitoring events using low-flow sampling techniques in accordance with the Work Plan. Each well was initially purged using a peristaltic pump with new disposable tubing at a flow rate of 0.1 to 0.5 L/min. During purging, the flow rates, water levels, and field water quality parameters (pH, temperature, electrical conductance, dissolved oxygen, turbidity, and redox) were measured. Purging continued until the field parameters stabilized. The optimal flow rate was determined in the field to ensure there was not excessive drawdown in the well. Final values for field parameters, together with interim field observations and flow rates, were recorded on a low-flow groundwater sampling form for each well during each sampling event.

Following stabilization, samples were collected using the peristaltic pump and tubing by directly filling laboratory-supplied, pre-cleaned containers. Due to the sensitivity of certain analytical methods specified in the monitoring program, samples were collected by two individuals, one handling only the sampling containers and the other handling the pump and tubing.

Quarterly groundwater samples were collected for analysis of total and dissolved metals, low detection level (total and dissolved) mercury, petroleum hydrocarbons, total suspended solids, total organic carbon (TOC), phosphorous, alkaline earth metals, redox indicators, conventional inorganic anions, hardness, and alkalinity (further details are provided in Section 4). Groundwater samples specified for analysis of dissolved metals were field-filtered through a 0.45- μm in-line filter prior to collection. Groundwater samples collected during the monthly baseline sampling

events were analyzed for an identical suite of parameters, except that only dissolved (filtered) samples were collected.

All samples were labeled, handled, and managed following proper chain-of-custody procedures in accordance with the Appendix B of the Work Plan.

In accordance with the Work Plan, one field replicate per sampling event was collected to provide additional volume for laboratory QA/QC procedures. Field rinse blank samples were not collected because samples were obtained using disposable tubing; hence, there was no potential for cross-contamination.

3.3 EFMP GROUNDWATER MONITORING WELLS SAMPLED

Groundwater samples were collected from 12 wells during the first, third and fourth quarters (PY4.3, PY5.1 and PY5.2 respectively), and from 10 wells during the second quarter (PY 4.4). MW-13B was not sampled in October 2011, and MW-14 and MW-15A were not sampled during any event in this annual report because they contained insufficient water for sampling according to the criteria contained in the Work Plan. MW-1A was not sampled in October 2011 because the monument was damaged. The sampling schedule is summarized in Table 3-1.

3.4 VERIFICATION RESAMPLING

The Work Plan states that in the event that a constituent of interest exceeds its action level in a post-baseline quarterly EFMP groundwater sample, the well will be resampled for the constituent that exceeded the action level (verification resampling) to confirm whether the exceedance is a false positive or a true change in water quality.

Verification samples were collected at MW-5 on September 1, 2011 and March 14, 2012 in response to mercury exceedances in the July 2011 and January 2012 sampling events.

4.0 LABORATORY ANALYSIS AND REPORTING

This section summarizes the laboratory analysis and reporting procedures, and the subsequent validation and use of the data.

PGG sent all groundwater samples to Analytical Resources, Inc. (ARI) in Tukwila, Washington for analysis during the PY4/PY5 sampling events. ARI is certified by the Washington Department of Ecology.

4.1 ANALYTICAL METHODS

EFMP groundwater samples were analyzed for constituents of concern (i.e., metals and petroleum hydrocarbons), and general chemistry parameters including TOC, hardness, total alkalinity, chloride, nitrate, nitrite and phosphate. The EFMP groundwater samples were analyzed using U.S. Environmental Protection Agency (USEPA) and Washington State methods, as appropriate, and in accordance with the Work Plan, as summarized below².

- **Trace metals (Sb, As, Be, Cd, Cr, Cu, Pb, Ni, Se, Ag, Tl, Zn and Ba):** SW-846 Method 6020
- **Low detection level mercury:** USEPA Method 1631E
- **Total petroleum hydrocarbons (HCID detection):** NWPH-G (contingent on HCID detection) and NWTPH-Dx (also contingent on HCID detection)
- **Total suspended solids:** Standard Method 2540D
- **Total organic carbon:** Standard Method 415.1³
- **Alkaline earth metals (Ca, Mg, K, Na):** SW-846 Method 6010B
- **Redox indicators (Fe, Mn):** SW-846 Method 6010B/6020
- **Conventional inorganic anions (Cl, NO₂-N, NO₃-N, SO₄):** USEPA Method 300.0
- **Phosphorous:** USEPA Method 365.3
- **Hardness:** Method SM 2340B and calculation
- **Alkalinity:** Standard Method 2320B.

² Total suspended solids, TOC, and alkalinity were analyzed using the Standard Methods comparable to the USEPA methods listed in the Work Plan. The Standard Methods were chosen over USEPA methods in response to the 40CFR Methods Update Rule, which took effect on 04/11/2007.

³ EPA Method 415.1 allows use of two equivalent analytical techniques: a wet-oxidation process and a flame-ignition process to quantify total organic carbon. ARI uses flame-ignition. During previous years, CAS used the wet-oxidation method. The two techniques produce comparable results in EFMP samples.

ARI was instructed to report sample concentrations to the method detection limit (MDL) rather than the higher method reporting limit (MRL). It is recognized that concentrations below the MRL have a greater degree of uncertainty; therefore, these results were qualified as estimated (J-flagged). Reporting results to the MDL minimizes the number of non-detected results included in statistical analysis of data sets (See Section 5).

Laboratory MRLs and MDLs for these methods met the goals in the Work Plan except in one case. The MRL and MDL for mercury (minimum value 0.15 ng/L) exceeded the requested MRL listed in the Work Plan (0.1 ng/L) for all of PY4/PY5. However, the reported MRL was still below the groundwater and surface water action levels (12 ng/L), and therefore no responsive action was required.

4.2 DATA PACKAGES

Samples from PY4/PY5 were analyzed by ARI. Laboratory data packages from ARI were provided to PGG as Contract Laboratory Program (CLP) Level IV data packages and electronic data deliverables (EDD) in Port of Seattle Format. The data packages were reviewed and validated by DMD, Inc., a PGG subcontractor. The validation reports and data packages were then returned to PGG for transmittal to the Port's database manager. Data validation procedures are discussed in Section 4.3.

4.3 DATA VALIDATION

DMD, Inc. reviewed data packages to assess whether analytical results met laboratory quality control procedures specified in Appendix C of the Work Plan; to evaluate the precision, accuracy, method compliance and completeness of the data set; and to evaluate the suitability of the data for their intended use. Data were evaluated based on validation criteria set forth in the *USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic/Inorganic Data Review* (USEPA, 1999 and 2004), and the *USEPA CLP National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA, 2005), as they applied to the reported methodologies. Ecology methods were reviewed in accordance with *Analytical Methods for Petroleum Hydrocarbons* (Ecology, 1997). USEPA method 1631 data were reviewed in accordance with *Guidance on the Documentation and Evaluation of Trace Metals Data Collected for Clean Water Act Compliance Monitoring* (USEPA, 1996a). Field duplicate Relative Percent Difference (RPD) control limits were taken from the *USEPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses* (USEPA, 1996b).

The dissolved mercury result for MW-9A was determined to be unusable and rejected as indicated with the "R" qualifier code so no value was reported. This was due to excessive bias likely associated with the field filtration. As a result, the field protocol was changed to allow the filter and associated tubing to flow for approx. 3 minutes prior to sample collection to flush out any background contamination.

4.4 WATER QUALITY ACTION LEVELS

The validated data from each EFMP monitoring event were compared to water quality action levels specified in the Work Plan (the action levels are summarized in Table B-1, Appendix B, of this annual report). The results of the comparisons of PY4/PY5 data are reported in Section 5 of this report.

As noted in the Work Plan, a site-wide background concentration for arsenic was developed during the EFMP baseline monitoring period, but, due to site-specific arsenic conditions, an arsenic action level was not established. The Work Plan specifies that if the arsenic concentration in an EFMP groundwater sample exceeds the site-wide background concentration, the sample data point is to be further evaluated using a Shewhart-CUSUM control chart method. The results of the comparisons of PY4/PY5 arsenic data to the site-wide background concentration for arsenic are reported in Section 5.5 of this report.

5.0 RESULTS AND DATA EVALUATIONS

This section presents a summary and an evaluation of the results from the four quarters of data collected during PY4/PY5.

5.1 GROUNDWATER LEVELS

Groundwater depths and elevations are reported in Table 5-1 and plotted as hydrographs of water level elevations on Figure 5-1. The hydrographs show that the groundwater level fluctuations in most of the EFMP monitoring wells had similar timing across the site and were similar to previous years, although the fluctuations varied in magnitude with hydrogeologic setting. Water levels at MW-13B ranged by nearly 10 feet. In MW-8A and MW-9A, the groundwater level fluctuations were less than one foot. The different behavior of water levels in wells MW-8A and MW-9A is a result of their location at the edges of wetlands that contain standing water for most of the year; water levels in these wells are strongly related to the surface water elevations around the wellheads.

The groundwater level data do not indicate any notable changes in groundwater flow direction or gradient compared to previous years. Groundwater levels increased throughout most of the site between the October and January measurements coinciding with heavy precipitation in November (Figures 2-1 and 5-1). These observations of relatively rapid water level responses to precipitation events are consistent with the conceptual model for the shallow groundwater zone monitored under the EFMP. On a larger timescale, response to precipitation expresses itself as seasonal changes in groundwater levels, with groundwater elevations higher during the wet winter months and declining through the dry summer months. Groundwater elevations and trends are consistent with data collected in previous years.

The Work Plan states that groundwater contours should be prepared using a representative dataset for the site. However, as discussed in previous annual reports, the Port has concluded that displaying groundwater data from the EFMP monitoring network by contouring is inappropriate (and potentially misleading) because the site hydrogeology suggests that there is only limited hydraulic connection (if any) between the wells. Typically, a groundwater elevation contour map prepared based on a set of wells implies that there is a significant degree of hydraulic connection, and therefore, that groundwater flow directions can be interpreted using the map. In reality, groundwater elevations throughout the EFMP monitoring area appear to be very closely tied to topography. While it can be intuitively argued that groundwater flow is to the west and piezometric contour maps can be produced to show that, it appears that those contours simply reflect the change in topography, and that the uppermost groundwater is present in discontinuous water-bearing zones. For these reasons the Port offers an alternative evaluation tool; Figure 5-2 presents the range of groundwater elevations throughout the monitoring year on a cross-section, and illustrates the relationship between groundwater elevation and land surface elevations.

The groundwater level measurements indicate that seasonal variability in groundwater elevations in 2011/12 ranged from 9.48 feet at MW-13B to 0.10 feet at MW-9A with an average range of 3.2feet. Groundwater flow directions inferred from water level measurements appear to have remained consistent with those of previous years.

5.2 DATA SUMMARY

This section provides a summary of the EFMP groundwater analytical data from PY4/PY5 quarterly sampling events. Each of the following subsections describes a subset of monitoring analytes or parameters including a listing of the included analytes, a comparison to action levels if appropriate, and explanatory notes. Data for the quarterly events is included in Appendix B.

5.2.1 Trace Metals

Groundwater samples were analyzed for a suite of 14 trace metals: antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc. All verified PY4/PY5 trace metal concentrations were below their respective surface water action levels (SWAL) (SWALs are given in Table 5-2) with the following exceptions:

- Total arsenic in MW-6 during the PY4.4 event (23.8 ug/L) and PY5.2 (18.7 ug/L) exceeded the statistically derived background concentration of 14 ug/l.
- Total mercury exceeded the SWAL (12 ng/L) in MW-5 during PY4.3 (17.2 ng/L) and PY5.1 (16.9 ng/L); verification samples were below the SWAL and did not confirm the exceedances.
- Total and dissolved mercury exceeded the SWAL (12 ng/L) at MW-12 during all four quarterly monitoring events.
- Total mercury exceeded the SWAL (12 ng/L) at MW-13B during the PY4.3 and PY5.2 events.
- Dissolved mercury exceeded the SWAL (12 ng/L) at MW-13B during the PY4.3 event.

Mercury exceedances at MW-12 and MW-13B are a recent occurrence and are discussed in Section 6. Section 5.4 describes arsenic concentrations and seasonality in MW-6. Recognized exceedances that are under corrective action do not trigger additional verification rounds. Total mercury exceedances at MW-5 in July 2011 and January 2012 triggered verification resampling events conducted in September 2011 and March 2012. The verification samples did not confirm the exceedance (were below the SWAL) and did not trigger corrective action.

5.2.2 Petroleum Hydrocarbons

No petroleum hydrocarbons were detected in any of the samples collected in PY4/PY5. Samples were analyzed for petroleum hydrocarbons using Ecology's NWTPH-HCID method. Results were provided for gasoline-range organics, diesel-range organics, and heavy oil (residual) range organics. In the event that petroleum was detected in the HCID analysis, quantitative follow-up testing was to be performed for the specific hydrocarbon range present using NWTPH-G or

NWTPH-Dx. Follow-up testing was not required during PY4/PY5 because petroleum hydrocarbons were not detected in the NWTPH-HCID screening analyses.

5.2.3 Conventional Analytes

Several conventional water quality analytes (alkaline earth metals, inorganic anions, hardness, alkalinity, total suspended solids, TOC, nitrate, nitrite, phosphorous, and redox indicators [total and dissolved iron and manganese]) were analyzed to further characterize groundwater. Results are listed by well in Appendix B. They are analyzed to provide additional information about the geochemical nature of the local groundwater, and may be used as appropriate for any future corrective action or groundwater assessment.

5.2.4 Field Parameters

Field parameters were measured in groundwater from each well using a flow-through cell prior to filling sample jars. Field parameters included temperature, pH, electrical conductivity, dissolved oxygen, turbidity, and redox potential (Eh). Field parameter measurements provide additional information about the geochemical nature of the local groundwater, and are used to establish when groundwater conditions stabilize during well purging (prior to sampling).

5.3 PY4/PY5 DESCRIPTIVE STATISTICS FOR CONSTITUENTS OF INTEREST

This section provides descriptive statistics for the EFMP constituents of interest. Petroleum hydrocarbons were not detected in groundwater collected from the EFMP monitoring wells during PY4/PY5 and are not discussed in detail in this section.

5.3.1 Trace Metals

The results of the site-wide statistical analyses for PY4/PY5 are described below and summarized in Table 5-2. Statistical analyses use dissolved trace metal groundwater data collected during the PY4/PY5 quarterly sampling events (July 2011, October 2011, January 2012, and April 2012), and are presented in Appendix B for reference.

The analytical results were modified to account for the presence of non-detect and duplicate results. Non-detect data values were set at one-half of the respective detection limit for descriptive site-wide statistical summaries. This approach allowed an initial estimate to be made for the mean and standard deviation of each data set, although the statistical parameters are of limited value in cases where more than half of the data set is non-detect. At locations where primary and duplicate samples were collected, only the primary sample data were used in statistical evaluation. The median value is used for comparison between PY4/PY5 and pre-construction data because the median is a measure of population centroid that is independent of population distribution; the mean is more susceptible to bias by lognormal and non-parametric distributions.

Site wide descriptive statistics for dissolved trace metals are presented in Table 5-2. Median and maximum values were compared to the median and maximum values in the site-wide pre-construction baseline data (Hart Crowser, 2004) with the following results:

- Maximum detected concentrations in PY4/PY5 were lower than the baseline maxima for all analytes except antimony (1.30 vs. 0.37 ug/L), barium (82.8 vs. 82.3 ug/L), mercury (115 vs. 11.6 ng/L) and thallium (0.080 vs 0.046 ug/L).
- Median concentrations in PY4/PY5 were higher than baseline medians for eleven out of fourteen constituents.
- All PY4/PY5 average and median dissolved trace metals concentrations were below action levels (Table 5-2).

5.4 TIME SERIES AND TREND ANALYSIS

In accordance with the Work Plan, the annual EFMP-GWM data evaluation includes a statistical analysis of concentration trends. Trends were evaluated using linear regression analyses, in which the slope of a trend line fitted to the recent data (the last 18 months of measurements) was calculated. If a trend line was determined to increase with a statistically significant slope⁴, the trend line was used to extrapolate to the time when the action level may be exceeded.

Linear regression trend analysis was applied to trace metal concentrations for the sampling period of January 2011 through April 2012. MW-14 and MW-15A are not included in the regression analysis because they had insufficient water to sample during the period of interest. The results of the trend analyses for each monitoring well are presented in Tables 5-3 through 5-14. A summary of the trend analyses is presented in Table 5-15. Table 5-16 includes linear regression plots for constituents with statistically significant upward trends. No constituents had statistically significant downward trends in PY4/PY5. Significant upward trends were found for:

- Antimony (MW-9A and MW-11)
- Barium (MW-1A and MW-9A)
- Chromium (MW-6 and MW-7)
- Copper (MW-1A and MW-6)
- Mercury (MW-1A and MW-12)
- Nickel (MW-1A, MW-2A, and MW-9A)
- Selenium (MW-6)
- Zinc (MW-5)

Linear regression trend lines were used to extrapolate to the year in which the action level would be reached. The projected exceedance year ranged from 2010 (the mercury action level has already been exceeded in MW-12 and MW-13B) to 2756 for Nickel in MW-1A. Excluding MW-12 and MW-13B, the next projected exceedance is projected for nickel in MW-2A in 2018.

⁴ A statistically significant trend is defined by reference to the confidence interval for the calculated value of the trend line slope; the trend is statistically significant only if the 95 percent confidence interval does not include the slope value of zero (i.e., no trend).

Therefore, none of the constituents which exhibited a significant linear upward trend is expected to approach the action level in the near future, with the exception of nickel at MW-2A.

5.5 SPECIAL CONSIDERATION FOR ARSENIC

Baseline monitoring (Hart Crowser, 2004) demonstrated that arsenic concentrations present a unique challenge to the Port's EFMP. While arsenic concentrations are low in most wells relative to local median arsenic concentrations (Papadopulos, 2005), they are significantly higher than the state groundwater quality standard of 0.05 µg/L (which is based on human consumption of groundwater as drinking water, and a maximum acceptable excess cancer risk of 1 in 1 million), and are substantially below the state surface water quality criterion (freshwater chronic) of 190 µg/L. In addition to arsenic concentrations being above the state groundwater quality criterion, arsenic concentrations in some wells show significant seasonal trends or temporal spikes. The data record to-date for arsenic in MW-6 (see Work Plan Appendix E) clearly shows a strong seasonal trend with arsenic concentrations increasing through the summer and early fall, then generally decreasing in the winter or spring months. This seasonality occurs mainly in response to oxygenated recharge water that has percolated down to the screened interval, leading to less-reducing conditions (signified by lower concentrations of arsenic and iron in the groundwater). Studies in the vicinity of the Airport report that this *in situ* geochemical effect is localized and highly variable over relatively short distances and depths, and is highly correlated with peat or fine-grained soils rich in organic matter (Aspect Consulting et al., 2004 and 2005; S.S. Papadopulos & Associates, 2005).

Despite the fact that the arsenic cycle and concentrations in MW-6 are natural and unrelated to fill placed for the Third Runway embankment, the seasonal peaks observed to-date show that comparisons to the site-wide baseline upper tolerance limits (UTLs⁵) will indicate exceedances and prompt unnecessary corrective actions when in fact the data continue to exhibit natural seasonal fluctuations. Well MW-6 arsenic data are, therefore, excluded from the generic data evaluation process described above, and instead are evaluated using a seasonal adjustment technique and combined Shewhart-CUSUM Control Chart Methodology described in Work Plan Appendix E.

The arsenic data from MW-6 spanning the period January 2006 through April 2012 were corrected for seasonal effects using the method of USEPA (1989, and Ecology 1996). The seasonally corrected arsenic concentrations are presented in Table 5-17. A combined Shewhart-CUSUM Chart using the corrected arsenic concentrations is provided in Table 5-18. Arsenic concentrations in MW-6 remained below the Shewhart control levels of 63.6 µg/L in PY4/PY5.

⁵ The site-wide baseline 95% Upper Tolerance Limit (17.4 ug/L) is used as an action level for arsenic because naturally-occurring background groundwater concentration exceeds the state groundwater criterion in WAC 173-200 (Hart Crowser, 2004).

5.6 UPDATED BASELINE DATA SETS

Baseline data sets provide a comprehensive description of the variability, distribution and statistical characteristics of trace metals at each well in addition to each trace metal as a pooled site-wide data set. Baseline data sets were first compiled in the *Groundwater Baseline Monitoring Report* (Hart Crowser, 2004) and are updated in each annual report (i.e., AECOM, 2009). Baseline data includes all routine monitoring data collected from the EFMP monitoring well network, excluding any data collected as part of corrective action or other non-routine investigation (Hart Crowser, 2004; ENSR, 2007).

This section presents analyses used to update the baseline data sets, and the updated baseline results. As monitoring data are collected under this EFMP-GWM, excluding data associated with any necessary corrective actions, the collected data will contribute to a progressive increase in understanding of the range of natural variability inherent in the monitoring parameters. The baseline data set was updated by adding the PY4/PY5 quarterly groundwater monitoring data to the existing baseline data set. Baseline data set statistics were calculated for dissolved concentrations of antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc in all monitoring wells except MW-14 and MW-15A, which were not sampled.

Summary statistics were calculated individually for each compound in each well from the updated baseline data (Tables 5-19 through 5-32) and are summarized in Table 5-33. Baseline data were tested for distribution type using the Shapiro-Wilks W-test for normality. Data that were not normally distributed were log-transformed using the natural logarithm. Data sets with less than a 50 percent detection rate were assumed to be non-parametric. Aitchison's Adjustment (USEPA, 1989) was used to adjust the mean and standard deviation of the data for data sets with greater than a 50 percent detection rate.

Upper tolerance limits (UTL) at the 95th and 99th percentiles provide statistically-generated upper limits for the expected values of analytes in future monitoring events under the presumption that groundwater quality has not changed. UTLs with 95 percent confidence and both 95 percent and 99 percent coverage were also determined using the methods presented in USEPA (1989 and 1992). The UTLs for non-parametric data sets were set to the maximum value (either detected or non-detect) in the data set, in accordance with USEPA (1992).

5.6.1 Site-Wide Baseline Data Statistical Analysis

Site-wide trends in trace metal characteristics are examined by comparing current baseline statistical results for monitoring data through April 2012 to results from the 2004 Groundwater Baseline Monitoring Report (Table 5-33) (Hart Crowser, 2004). Baseline statistics describe site wide characteristics of trace metal concentrations and were calculated for each analyte using all available monitoring data with non-detects included at half the MDL. Comparison of the current baseline results to the 2004 baseline results indicates:

- Detection frequency increased by 3.8 to 15.6% in 4 of 14 trace metals

- Detection frequency decreased in all other trace metals. Decreases ranged from 1.1 to 25.1%).
- The probability distribution for baseline trace metals included both lognormal and non-parametric data sets. The data distribution for all the current side-wide data sets is non-parametric.
- Mean concentrations increased over 2004 baseline monitoring report values for 7 of 14 trace metals.

The detection frequency trends appear to be a continuation of trends noted in previous annual reports. Decreasing detection trends were present prior to the change from CAS to ARI suggesting that the changes in detection frequency are not a result of a change in lab or analytical methods. All compounds with decreasing frequency also had decreasing average concentration with the exception of mercury and zinc, which had modest increases in average concentration. Elevated mercury concentrations at wells such as MW-8A are likely dependent on local characteristics such as the presence of peaty material rather than site-wide or embankment fill characteristics. Therefore the decreasing detection frequency and average concentrations are likely related, while inconsistent results such as for mercury are due to location specific characteristics resulting in elevated concentrations.

5.7 COMPARATIVE ANALYSIS OF TOTAL AND DISSOLVED METALS

The comparative analysis of dissolved and total concentrations was conducted using two techniques: a paired comparison test and a correlation analysis. Differences are expected in cases where suspended sediment is present and contributes to total metals concentrations.

5.7.1 Paired Comparison

The paired comparison test was conducted on the total and dissolved metal concentrations for antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc in all monitoring wells except MW-14 and MW-15A, which were not sampled. This test was also conducted on the pooled site-wide data set for each metal. Data pairs were analyzed using a paired t-test and the non-parametric Wilcoxon Signed-rank test. The paired t-test compares the means of normally-distributed data, while the Wilcoxon Signed-rank test compares the medians of ranked data. Results of the comparisons for each monitoring well are presented in Tables 5-34 through 5-45. A summary of the comparison analysis is presented in Table 5-46.

In reviewing the results for trace metals in individual EFMP wells, total and dissolved metals were not significantly different in 102 of 168 paired comparisons (61 percent of the total) (Table 5-46). Metals in the monitoring wells had significantly different dissolved and total metals concentrations in 66 instances (39 percent of the total).

By metal, significant differences were most common for lead, which had significant differences in all but one of the monitoring wells. Arsenic, barium, cadmium, copper and mercury all had

significant differences in total versus dissolved metals in at least half of the monitoring wells. Only selenium had no significant differences in any well; however, selenium has a high non-detect rate.

By well, fifty percent or more of metals had a significant difference between total and dissolved concentrations in MW-5, MW- 7, and MW-12.

In reviewing the results for the paired comparison analysis of the pooled site-wide data presented in Table 5-47, approximately 80 percent of the dissolved and total concentrations data sets were significantly different.

5.7.2 Correlation Analysis

A correlation analysis was conducted on the total and dissolved metal concentrations for antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc in all monitoring wells except MW-14 and MW-15A. This test was also conducted on the pooled site-wide data set for each element. The correlation analysis was conducted using the Pearson and Spearman correlation techniques. The Pearson method is used when data fit a known distribution. The Spearman technique is a correlation on data ranks, and is used when the data do not fit a known distribution (i.e., the data are non-parametric). Results of the correlation analyses for each monitoring well are presented in Tables 5-34 through 5-45. A summary of the correlation analyses is presented in Table 5-46.

Correlation results indicate a high degree of correlation between total and dissolved metals both on a per well and aggregate basis. There were significant positive correlations between total and dissolved metals 95 percent (160 instances) of the individual well comparisons (Table 5-46). Only lead concentrations did not correlate in most wells. The pooled site-wide data correlations presented in Table 5-47 indicated a similar, but stronger correlation in which all dissolved and total metal concentrations are significantly positively correlated.

5.8 MERCURY AT MW-8A

Mercury exceeded the EFMP action level (12 ng/L) at MW-8A in 2008 and 2009 triggering a groundwater assessment (AECOM, 2009). Elevated mercury at MW-8A was attributed to the influence of naturally occurring peaty material at the edge of the wetland and not to the placement of embankment fill. The conceptual model for mercury behavior is that mercury adsorbs to naturally occurring carbon in peaty wetland materials. Seasonal variations in the oxidation state of the shallow groundwater result in correlative changes in total organic carbon and mercury at MW-8A (Figure 5-3).

Sampling at MW-8A was expanded to include quarterly surface water sampling at upstream and downstream locations in Miller Creek following the groundwater assessment. Samples at Miller Creek are analyzed for trace metals in addition to methylmercury. Table 5-48 summarizes mercury and methylmercury results at MW-8A and Miller Creek from January 2011 through April 2012.

Methylmercury concentrations were higher in upstream and downstream samples collected from Miller Creek than in groundwater samples collected at MW-8A. Methylmercury concentrations in upstream samples were greater than or equal to downstream samples in four out of six events. Total and dissolved mercury concentrations were consistently higher in groundwater samples collected at MW-8A than in Miller Creek samples. The seasonal variation and correlation with total organic carbon concentrations (Figure 5-3) are consistent with the conceptual model developed in the groundwater assessment (AECOM, 2009).

6.0 CORRECTIVE ACTIONS PERFORMED DURING PY4/PY5

Verification sampling at MW-12 and MW-13B on May 28, 2010 confirmed exceedance of total and dissolved mercury at MW-13B and total mercury at MW-12. A groundwater assessment report was submitted to Ecology in September 2011 (PGG, 2011). The mercury exceedances were not found to be related to placement of embankment fill materials. Instead, the data indicated a similar relationship between TOC and mercury as documented at MW-8A.

7.0 SUMMARY AND CONCLUSIONS

Sampling and analysis were implemented in accordance with the Work Plan for 14 trace metals and petroleum hydrocarbons that comprise the EFMP constituents of interest. A total of 52 groundwater samples were collected as part of the routine quarterly monitoring in PY4/PY5. A total of 12 samples were collected from Miller Creek locations for comparison to MW-8A results. Data evaluation, which followed the requirements set forth in the Work Plan, involved comparisons of groundwater data against action levels protective of groundwater and surface water at the site.

During the monitoring year, no petroleum hydrocarbons were detected, and most trace metals remained below EFMP action levels. However, mercury concentrations at MW-12 and MW-13B exceeded their respective action levels. The Port submitted a Report to Ecology in September, 2011 presenting the results of the field investigation. The report found that increased mercury concentrations at MW-12 and MW-13B are likely due to degradation of organic material and subsequent mobilization of TOC similar to the mechanism identified at MW-8A. Total mercury exceeded at MW-5 in two events; however, the exceedances were not confirmed by verification samples and no additional corrective action was taken.

Linear regression trend analyses were performed on dissolved metals of interest at each well. Trend analyses indicate statistically significant upward trends for fifteen constituents. Excluding mercury and arsenic, the soonest any of the trends are projected to exceed action levels is the year 2018 for nickel in MW-2A.

Arsenic concentrations in MW-6 fluctuated seasonally, in a manner consistent with data collected during previous monitoring. These fluctuations resulted in arsenic concentrations that exceeded the site-wide UTL that had been defined from the site-wide arsenic data set. The alternate data evaluation approach provided in the Work Plan was applied, using a control chart to analyze for statistically significant changes in the seasonally corrected arsenic data. No exceedances of the control chart limit occurred.

Analysis showed a significant correlation between total and dissolved metals across the site. Total and dissolved concentrations significantly correlated in at least 95 percent of all well/analyte combinations. The Port will continue to measure both total and dissolved metals in all groundwater samples until a request is submitted to Ecology to modify the sampling plan.

In conclusion, the EFMP groundwater monitoring performed throughout the PY4/PY5 monitoring period and this report demonstrates the Port's compliance with E-3 of the Section 401 Water Quality Certification issued by Ecology for the Third Runway Project.

8.0 REFERENCES

- AECOM, 2009. Groundwater Assessment, Phase 1: Conceptual Framework and Geo-chemical Controls. Third Runway Embankment Fill Monitoring Program. April 2009.
- Aspect Consulting, LLC and S.S. Papadopoulos & Associates, 2004. Technical Memorandum 6: Preliminary Groundwater Quality Evaluation. Prepared for the Des Moines Creek Basin Committee. October 28.
- Aspect Consulting LLC & S.S. Papadopoulos & Associates, 2005. Phase 1 Groundwater Study Report, Seattle-Tacoma International Airport, SeaTac, Washington. Ecology Review Draft; unpublished report prepared for Port of Seattle. February 15.
- Ecology (Washington Department of Ecology), 1996. Implementation Guidance for the Groundwater Quality Standards, Washington State Department of Ecology Publication #96-02. April.
- Ecology, 1997. Analytical Methods for Petroleum Hydrocarbons. Toxics Cleanup Program and Ecology Environmental Laboratory. Publication No. ECY 97-602. June.
- ENSR, 2007. *Annual Groundwater Monitoring Report, Monitoring Year 2006-2007 (CY3)*. Prepared by ENSR. August 29.
- Hart Crowser, 2004. Groundwater Baseline Monitoring Report, Embankment Fill Monitoring Program, Third Runway Construction Project. Seattle-Tacoma International Airport, SeaTac, Washington. October 2004.
- Kelly, A., 2008. Washington Department of Ecology, Bellevue, Washington, letter to P. Agid, Port of Seattle, Seattle, Washington.
- Pacific Groundwater Group, 2011. *Mercury Assessment Report, EFMP MW-12 and MW-13B, Seattle-Tacoma International Airport*. September 30, 2011.
- Port of Seattle, 2006a. *Embankment Fill Monitoring Program, Groundwater Monitoring Plan. Final, Revision 1*. Seattle-Tacoma International Airport, Seattle, Washington. Prepared by Port of Seattle. April 17.
- Port of Seattle, 2006b. *Embankment Fill Monitoring Program, Seep Monitoring Plan. Final, Revision 1*. Seattle-Tacoma International Airport, Seattle, Washington. Prepared by Port of Seattle. April 17.
- S.S. Papadopoulos & Associates, 2005. *Technical Memorandum 4: Arsenic Mobility Evaluation*. Prepared for the Des Moines Creek Basin Committee. March 21.

- USEPA (U.S. Environmental Protection Agency), 1989. *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities*. Interim Final Guidance. Office of Solid Waste. February.
- USEPA, 1992. *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities*. Draft. Addendum to Interim Final Guidance. Office of Solid Waste. July.
- USEPA, 1996a. *Guidance on the Documentation and Evaluation of Trace Metals Data Collected for Clean Water Act Compliance Monitoring*. Draft. Office of Water, Office of Science and Technology. July.
- USEPA, 1996b. Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses – Revised Data Validation Guidance. Office of Environmental Measurement and Evaluation. December. <http://www.epa.gov/region01/oeme/>
- USEPA, 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. Office of Emergency and Remedial Response. Publication No. EPA540/R-99/008. October.
- USEPA, 2004. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. Office of Emergency and Remedial Response. Publication No. EPA540/R-04/004. October.
- USEPA, 2005. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review. Office of Superfund Remediation and Technology Innovation. Publication No. USEPA-540-R-04-009. January.

Table 2-1 Well Construction Summary

Well ID and Boring Number	Well Completion (Decommission) Date	Survey Northing (ft)	Survey Easting (ft)	Ground Surface Elevation (ft)	Top of Casing Elevation (ft)	Drilled Depth (ft)	Screen Top Elevation (feet)	Screen Bottom Elevation (feet)	Screened Formation ¹
<i>MW-1 HC02-B461</i>	<i>7/26/2002 (8/2/2004)</i>	22059	11293	275.1	277.76	23.3	262.7	252.7	<i>Till and Advance Outwash</i>
MW-1A HC04-B43	6/30/2004	22142	11329	269.5	272.46	20.0	261.4	251.4	Till and Advance Outwash
<i>MW-2 HC99-B33</i>	<i>2/15/1999 (8/9/2004)</i>	21798	10806	262.8	265.73	31.5	253.3	243.8	<i>Advance Outwash</i>
MW-2A	8/25/2005	21847	10730	265.1	268.05	16.5	260.1	250.1	Advance Outwash
<i>MW-3 HC00-B173</i>	<i>1/20/2000 (8/2/2004)</i>	21380	10710	274	276.52	25.8	263.9	258.9	<i>Recessional Outwash and Weathered Till</i>
<i>MW-4 HC02-B460</i>	<i>7/26/2002 (6/22/2004)</i>	20861	10650	283.3	286.78	16.5	279.6	269.6	<i>Alluvium, Recessional Outwash, and Till</i>
MW-4A HC04-B42	6/29/2004	21097	10509	274.2	277.22	15.0	269.6	259.6	Alluvium, Recessional Outwash, and Till
MW-5 HC00-B333	11/15/2000	20231	10569	281.4	281.06	20.8	271.4	262.9	Recessional Outwash and Till
MW-6 HC02-B456	7/24/2002	19286	10618	256.1	259.29	20.3	249.4	239.4	Till
MW-7 HC02-B457	7/24/2002	18997	10525	240.7	243.34	20.4	236.1	226.1	Weathered Till and Till
<i>MW-8 HC02-B459</i>	<i>7/25/2002</i>	18452	10603	227.7	230.95	15.7	225.0	215.0	<i>Alluvium, Recessional Outwash, and Advance Outwash</i>
MW-8A HC04-B41	6/28/2004	18295	10696	225.5	227.79	15.0	221.4	211.4	Recessional Outwash
<i>MW-9 HC99-B38</i>	<i>2/22/1999 (8/2/2004)</i>	18020	10828	226.7	230.09	20.3	217.7	207.7	<i>Alluvium and Advance Outwash</i>
MW-9A HC04-B40	6/28/2004	17952	10825	222.9	225.78	11.5	219.3	212.5	Alluvium and Recessional Outwash
MW-10 HC02-B455	7/23/2002	17730	10750	243.9	247.3	21.5	236.4	226.4	Weathered Till and Till
MW-11 HC02-B451	7/22/2002	17090	10761	331.6	334.06	16.0	327.5	317.5	Alluvium and Recessional Outwash
MW-12 HC02-B452	7/22/2002	16080	10913	360.9	363.53	23.9	357.6	347.6	Recessional Outwash and Till
<i>MW-13 HC02-B453</i>	<i>7/23/2002 (9/16/2005)</i>	15057	10883	350.4	350.18	45.5	347.1	337.1	<i>Weathered Till and Till</i>
<i>MW-13A</i>	<i>8/25/2005 (8/28/06)</i>	15584	10949	363.8	365.13	14.0	360.8	350.8	<i>Weathered Till and Till</i>
MW-13B	2/9/2007	15639	10921	363.5	365.38	13.5	360.5	350.5	Weathered Till and Till
MW-14 HC02-B454	7/23/2002	14697	10854	322.5	325.84	20.5	318.3	308.3	Till
<i>MW-15 HC02-B458</i>	<i>7/23/2002 (6/3/2005)</i>	13999	10881	312.4	315.31	29.5	300.2	290.2	<i>Till and Advance Outwash</i>
MW-15A	2/9/2007	13998	10861	316.6	318.5	24.7	304.6	294.6	Till and Advance Outwash

Gray italic font indicates that the well has been decommissioned.

¹ Hart Crowser, 2004. Groundwater Baseline Monitoring Report, Embankment Fill Monitoring Program, Third Runway Construction Project.

All wells constructed of 2-inch diameter PVC casing and screen.

Table 3-1 PY4/PY5 Well Quarterly Sampling Summary

Quarter	Date	Total Wells													
		Sampled	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	
PY 4.3	Jul 2011	12	X	X	X	X	X	X	X	X	X	X	X	X	
Verification	Sep 2011	1				X									
PY 4.4	Oct 2011	10		X	X	X	X	X	X	X	X	X	X		
PY 5.1	Jan 2012	12	X	X	X	X	X	X	X	X	X	X	X	X	
Verification	Mar 2012	1				X									
PY 5.2	Apr 2012	12	X	X	X	X	X	X	X	X	X	X	X	X	

Notes:

Wells MW-14 and MW-15A did not have sufficient water for sampling.

PY 4.3 is the third quarter of project year 4.

Table 5-1 Groundwater Elevation Data

Date	MW-1		MW-1A		MW-2		MW-2A		MW-3		MW-4A	
	DTW	Elevation	DTW	Elevation	DTW	Elevation	DTW	Elevation	DTW	Elevation	DTW	Elevation
Aug-02	9.26	268.5	--	--	3.71	262.02	--	--	13.21	263.31	9.19	268.03
Sep-02	9.9	267.86	--	--	3.66	262.07	--	--	13.57	262.95	9.33	267.89
Oct-02	9.51	268.25	--	--	3.19	262.54	--	--	13.59	262.93	9.32	267.9
Nov-02	8.85	268.91	--	--	1.52	264.21	--	--	13.1	263.42	8.92	268.3
Dec-02	10.29	267.47	--	--	2.51	263.22	--	--	12.98	263.54	8.87	268.35
Jan-03	5.98	271.78	--	--	2	263.73	--	--	9.57	266.95	7.98	269.24
Feb-03	6.26	271.5	--	--	2.04	263.69	--	--	9.73	266.79	8	269.22
Mar-03	5.22	272.54	--	--	1.12	264.61	--	--	9.24	267.28	4.16	273.06
Apr-03	6.2	271.56	--	--	1.9	263.83	--	--	9.93	266.59	7.81	269.41
May-03	6.83	270.93	--	--	2.07	263.66	--	--	11.25	265.27	9.31	267.91
Jun-03	7.9	269.86	--	--	2.95	262.78	--	--	12.25	264.27	8.81	268.41
Jul-03	8.78	268.98	--	--	3.11	262.62	--	--	12.84	263.68	8.99	268.23
Aug-03	9.9	267.86	--	--	3.54	262.19	--	--	13.42	263.1	9.17	268.05
Sep-03	15.21	262.55	--	--	5.24	260.49	--	--	13.82	262.7	9.27	267.95
Oct-03	15.39	262.37	--	--	2.68	263.05	--	--	13.97	262.55	9.02	268.2
Nov-03	8	269.76	--	--	2.86	262.87	--	--	11.55	264.97	8.7	268.52
Dec-03	6.35	271.41	--	--	1.58	264.15	--	--	9.18	267.34	7.8	269.42
Jan-04	5.81	271.95	--	--	0.98	264.75	--	--	8.84	267.68	7.49	269.73
Feb-04	6.34	271.42	--	--	1.7	264.03	--	--	9.07	267.45	7.8	269.42
Mar-04	6.6	271.16	--	--	1.83	263.9	--	--	10.22	266.3	7.93	269.29
Apr-04	7.09	270.67	--	--	1.97	263.76	--	--	11.32	265.2	8.46	268.76
Jul-04	8.63	269.13	3.74	268.72	3.17	262.56	--	--	12.88	263.64	11.65	265.57
Oct-04	--	--	4.71	267.75	--	--	--	--	--	--	11.31	265.91
Jan-05	--	--	3.47	268.99	--	--	--	--	--	--	9.9	267.32
Feb-05	--	--	--	--	--	--	--	--	--	--	--	--
Apr-05	--	--	2.52	269.94	--	--	--	--	--	--	9.6	267.62
Jul-05	--	--	--	--	--	--	--	--	--	--	--	--
Aug-05	--	--	3.485	268.975	--	--	--	--	--	--	10.845	266.375
Sep-05	--	--	3.86	268.6	--	--	10.33	257.72	--	--	10.8	266.42
Oct-05	--	--	3.71	268.75	--	--	10.49	257.56	--	--	11.16	266.06
Nov-05	--	--	3.13	269.33	--	--	9.64	258.41	--	--	9.82	267.4
Dec-05	--	--	3.44	269.02	--	--	10.91	257.14	--	--	10.49	266.73
Jan-06	--	--	1.81	270.65	--	--	7.13	260.92	--	--	8.04	269.18
Feb-06	--	--	2.49	269.97	--	--	8.69	259.36	--	--	9.29	267.93
Mar-06	--	--	2.87	269.59	--	--	9.47	258.58	--	--	9.79	267.43
Apr-06	--	--	2.96	269.5	--	--	9.81	258.24	--	--	10.1	267.12
May-06	--	--	3.29	269.17	--	--	10.45	257.6	--	--	10.65	266.57
Jun-06	--	--	3.19	269.27	--	--	10.29	257.76	--	--	10.71	266.51
Jul-06	--	--	3.59	268.87	--	--	10.4	257.65	--	--	11.41	265.81
Aug-06	--	--	--	--	--	--	10.53	257.52	--	--	--	--
Oct-06	--	--	3.76	268.7	--	--	10.45	257.6	--	--	11.92	265.3
Jan-07	--	--	2.38	270.08	--	--	7.59	260.46	--	--	8.57	268.65
Feb-07	--	--	--	--	--	--	--	--	--	--	--	--
Mar-07	--	--	--	--	--	--	--	--	--	--	--	--
Apr-07	--	--	2.8	269.66	--	--	9.34	258.71	--	--	10.04	267.18
May-07	--	--	--	--	--	--	--	--	--	--	--	--
Jun-07	--	--	--	--	--	--	--	--	--	--	--	--
Jul-07	--	--	3.36	269.1	--	--	10.05	258	--	--	8.23	268.99
Aug-07	--	--	--	--	--	--	--	--	--	--	--	--
Sep-07	--	--	--	--	--	--	--	--	--	--	--	--
Oct-07	--	--	3.05	269.41	--	--	9.83	258.22	--	--	11.85	265.37
Nov-07	--	--	--	--	--	--	--	--	--	--	--	--
Dec-07	--	--	--	--	--	--	--	--	--	--	--	--
Jan-08	--	--	2.52	269.94	--	--	8.22	259.83	--	--	9.22	268
Apr-08	--	--	2.86	269.6	--	--	9.83	258.22	--	--	10.17	267.05
Jul-08	--	--	3.56	268.9	--	--	10.36	257.69	--	--	10.03	267.19
Oct-08	--	--	3.52	268.94	--	--	10.24	257.81	--	--	11.5	265.72
Jan-09	--	--	2	270.46	--	--	8.16	259.89	--	--	8.17	269.05
Apr-09	--	--	2.55	269.91	--	--	9.18	258.87	--	--	9.26	267.96
Jul-09	--	--	3.48	268.98	--	--	10.55	257.5	--	--	12.13	265.09
Oct-09	--	--	2.85	269.61	--	--	7.85	260.2	--	--	12.08	265.14
Jan-10	--	--	1.89	270.57	--	--	5.63	262.42	--	--	8.7	268.52
Apr-10	--	--	2.44	270.02	--	--	8.15	259.9	--	--	9.35	267.87
May-10	--	--	--	--	--	--	--	--	--	--	--	--
Jul-10	--	--	2.89	269.57	--	--	5.52	262.53	--	--	11.91	265.31
Oct-10	--	--	2.85	269.61	--	--	9.08	258.97	--	--	11.12	266.1
Jan-11	--	--	1.96	270.5	--	--	6.6	261.45	--	--	8.82	268.4
Mar-11	--	--	--	--	--	--	--	--	--	--	--	--
Apr-11	--	--	1.95	270.51	--	--	6.64	261.41	--	--	9.98	267.24
Jul-11	--	--	2.06	270.4	--	--	9.1	258.95	--	--	12.06	265.16
Sep-11	--	--	--	--	--	--	--	--	--	--	--	--
Oct-11	--	--	--	--	--	--	8.83	259.22	--	--	12.34	264.88
Jan-12	--	--	2.49	269.97	--	--	5.08	262.97	--	--	9.01	268.21
Apr-12	--	--	2.68	269.78	--	--	6.08	261.97	--	--	10.23	266.99

DTW is the depth to water measured from the top of well casing.

Elevation is the altitude of the water level surface in the well.

Well survey information is presented in Table 2-1.

Gray text indicates the well has been decommissioned.

All DTW and elevation values in feet. Port of Seattle Datum.

Table 5-1 Groundwater Elevation Data, cont.

Date	MW-5		MW-6		MW-7		MW-8		MW-8A		MW-9	
	DTW	Elevation	DTW	Elevation	DTW	Elevation	DTW	Elevation	DTW	Elevation	DTW	Elevation
Aug-02	15.31	259.51	9.82	249.47	10.93	232.41	7.19	223.76	--	--	6.31	223.78
Sep-02	17.12	257.7	11.4	247.89	10.99	232.35	7.34	223.61	--	--	6.36	223.73
Oct-02	17.89	256.93	10.53	248.76	11.05	232.29	7	223.95	--	--	5.85	224.24
Nov-02	18.21	256.61	8.45	250.84	10.69	232.65	5.71	225.24	--	--	4.89	225.2
Dec-02	16.83	257.99	6.58	252.71	6.42	236.92	5.43	225.52	--	--	4.74	225.35
Jan-03	10.12	264.7	6.27	253.02	5.4	237.94	4.43	226.52	--	--	4.52	225.57
Feb-03	10.36	264.46	6.9	252.39	5.39	237.95	4.67	226.28	--	--	4.58	225.51
Mar-03	9.35	265.47	5.22	254.07	4.7	238.64	4.03	226.92	--	--	4.22	225.87
Apr-03	9.89	264.93	6.17	253.12	5.13	238.21	4.35	226.6	--	--	4.27	225.82
May-03	10.61	264.21	7.53	251.76	5.58	237.76	4.85	226.1	--	--	4.54	225.55
Jun-03	11.43	263.39	8.2	251.09	7.79	235.55	6.11	224.84	--	--	5.59	224.5
Jul-03	13.54	261.28	8.77	250.52	9.64	233.7	6.75	224.2	--	--	6.08	224.01
Aug-03	16.09	258.73	10.02	249.27	12.28	231.06	7.13	223.82	--	--	6.5	223.59
Sep-03	17.77	257.05	11.19	248.1	12.08	231.26	7.57	223.38	--	--	6.84	223.25
Oct-03	20.05	254.77	10.43	248.86	11.92	231.42	7.03	223.92	--	--	6.18	223.91
Nov-03	12.12	262.7	7.35	251.94	6.73	236.61	5.1	225.85	--	--	5	225.09
Dec-03	9.21	265.61	5.44	253.85	5.37	237.97	4.12	226.83	--	--	4.57	225.52
Jan-04	8.57	266.25	5.8	253.49	5.38	237.96	4.27	226.68	--	--	4.41	225.68
Feb-04	8.74	266.08	6.55	252.74	5.1	238.24	4.75	226.2	--	--	4.49	225.6
Mar-04	9.31	265.51	3.82	255.47	5.44	237.9	4.6	226.35	--	--	4.6	225.49
Apr-04	9.87	264.95	7.71	251.58	5.85	237.49	4.9	226.05	--	--	4.76	225.33
Jul-04	14.16	260.66	8.35	250.94	9.29	234.05	--	--	3.67	224.12	6.27	223.82
Oct-04	15.11	259.71	6.75	252.54	6.07	237.27	--	--	2.86	224.93	--	--
Jan-05	12.37	262.45	6.79	252.5	5.67	237.67	--	--	2.42	225.37	--	--
Feb-05	11.79	263.03	--	--	--	--	--	--	--	--	--	--
Apr-05	13.4	261.42	5.15	254.14	4.95	238.39	--	--	2.08	225.71	--	--
Jul-05	15.02	259.8	--	--	--	--	--	--	2.08	225.71	--	--
Aug-05	16.44	258.38	7.325	251.965	6.45	236.89	--	--	2.08	225.71	--	--
Sep-05	17.24	257.58	7.37	251.92	6.39	236.95	--	--	1.72	226.07	--	--
Oct-05	18.25	256.57	7.02	252.27	5.45	237.89	--	--	1.41	226.38	--	--
Nov-05	16.04	258.78	5.41	253.88	4.27	239.07	--	--	1.42	226.37	--	--
Dec-05	13.39	261.43	5.71	253.58	5.37	237.97	--	--	1.5	226.29	--	--
Jan-06	7.55	267.27	4.8	254.49	4.49	238.85	--	--	1.34	226.45	--	--
Feb-06	9.44	265.38	5.83	253.46	4.89	238.45	--	--	1.35	226.44	--	--
Mar-06	--	--	6.06	253.23	5.12	238.22	--	--	1.35	226.44	--	--
Apr-06	10.84	263.98	6.45	252.84	4.32	239.02	--	--	1.3	226.49	--	--
May-06	13.12	261.7	7.18	252.11	5.81	237.53	--	--	1.5	226.29	--	--
Jun-06	14.08	260.74	6.37	252.92	3.88	239.46	--	--	1.36	226.43	--	--
Jul-06	16.75	258.07	7.454	251.836	6.81	236.53	--	--	1.55	226.24	--	--
Aug-06	--	--	--	--	--	--	--	--	--	--	--	--
Oct-06	20.35	254.47	7.71	251.58	6.3	237.04	--	--	1.55	226.24	--	--
Jan-07	7.79	267.03	6.03	253.26	3.82	239.52	--	--	1.45	226.34	--	--
Feb-07	--	--	--	--	--	--	--	--	--	--	--	--
Mar-07	--	--	--	--	--	--	--	--	--	--	--	--
Apr-07	10.43	264.39	7.02	252.27	4.88	238.46	--	--	1.31	226.48	--	--
May-07	--	--	--	--	--	--	--	--	--	--	--	--
Jun-07	--	--	--	--	--	--	--	--	--	--	--	--
Jul-07	18.24	256.58	7.91	251.38	7.62	235.72	--	--	1.72	226.07	--	--
Aug-07	--	--	--	--	--	--	--	--	--	--	--	--
Sep-07	--	--	--	--	--	--	--	--	--	--	--	--
Oct-07	20.29	254.53	6.86	252.43	4.25	239.09	--	--	1.39	226.4	--	--
Nov-07	--	--	--	--	--	--	--	--	--	--	--	--
Dec-07	--	--	--	--	--	--	--	--	--	--	--	--
Jan-08	9.32	265.5	5.98	253.31	3.63	239.71	--	--	1.54	226.25	--	--
Apr-08	10.28	264.54	6.71	252.58	4.31	239.03	--	--	1.7	226.09	--	--
Jul-08	17.6	257.22	8.02	251.27	8.4	234.94	--	--	1.95	225.84	--	--
Oct-08	20.29	254.53	7.92	251.37	7.4	235.94	--	--	1.59	226.2	--	--
Jan-09	8.18	266.64	4.99	254.3	3.61	239.73	--	--	1.72	226.07	--	--
Apr-09	9.87	264.95	5.42	253.87	3.57	239.77	--	--	1.74	226.05	--	--
Jul-09	15.66	259.16	7.98	251.31	9.34	234	--	--	2.18	225.61	--	--
Oct-09	15.2	259.62	7.2	252.09	4.16	239.18	--	--	1.5	226.29	--	--
Jan-10	8.88	272.18	4.95	254.34	3.43	239.91	--	--	1.66	226.13	--	--
Apr-10	9.19	271.87	6.28	253.01	3.78	239.56	--	--	1.63	226.16	--	--
May-10	--	--	--	--	--	--	--	--	--	--	--	--
Jul-10	13.44	267.62	7.93	251.36	8.08	235.26	--	--	1.83	225.96	--	--
Oct-10	15.74	265.32	6.12	253.17	5.04	238.3	--	--	1.54	226.25	--	--
Jan-11	6.83	274.23	5.32	253.97	3.66	239.68	--	--	1.69	226.1	--	--
Mar-11	--	--	--	--	--	--	--	--	--	--	--	--
Apr-11	8.34	272.72	6.32	252.97	3.85	239.49	--	--	1.61	226.18	--	--
Jul-11	12.38	268.68	7.75	251.54	7.58	235.76	--	--	1.67	226.12	--	--
Sep-11	16.13	264.93	--	--	--	--	--	--	--	--	--	--
Oct-11	17.35	263.71	7.21	252.08	7.79	235.55	--	--	1.61	226.18	--	--
Jan-12	9.79	271.27	4.88	254.41	3.52	239.82	--	--	1.6	226.19	--	--
Apr-12	8.78	272.28	6.3	252.99	4.37	238.97	--	--	1.6	226.19	--	--

DTW is the depth to water measured from the top of well casing.

Elevation is the altitude of the water level surface in the well.

Well survey information is presented in Table 2-1.

Gray text indicates the well has been decommissioned.

All DTW and elevation values in feet. Port of Seattle Datum.

Table 5-1 Groundwater Elevation Data, cont.

Date	MW-9A		MW-10		MW-11		MW-12		MW-13		MW-13A		MW-13B	
	DTW	Elevation	DTW	Elevation	DTW	Elevation	DTW	Elevation	DTW	Elevation	DTW	Elevation	DTW	Elevation
Aug-02	--	--	--	--	10.81	323.25	12.88	350.65	--	--	--	--	--	--
Sep-02	--	--	--	--	11.51	322.55	12.15	351.38	--	--	--	--	--	--
Oct-02	--	--	--	--	12.13	321.93	12.98	350.55	--	--	--	--	--	--
Nov-02	--	--	--	--	12.25	321.81	13.27	350.26	--	--	--	--	--	--
Dec-02	--	--	--	--	12.08	321.98	11.35	352.18	--	--	--	--	--	--
Jan-03	--	--	--	--	8.76	325.3	4.36	359.17	6.95	343.23	--	--	--	--
Feb-03	--	--	--	--	7.24	326.82	4.88	358.65	6.16	344.02	--	--	--	--
Mar-03	--	--	--	--	7.05	327.01	4.35	359.18	5.8	344.38	--	--	--	--
Apr-03	--	--	--	--	7.95	326.11	4.59	358.94	6.11	344.07	--	--	--	--
May-03	--	--	--	--	8.34	325.72	5.58	357.95	9.13	341.05	--	--	--	--
Jun-03	--	--	13.05	234.25	8.99	325.07	8.33	355.2	--	--	--	--	--	--
Jul-03	--	--	13.78	233.52	9.78	324.28	9.47	354.06	--	--	--	--	--	--
Aug-03	--	--	14.37	232.93	10.77	323.29	10.82	352.71	--	--	--	--	--	--
Sep-03	--	--	14.81	232.49	11.51	322.55	11.9	351.63	--	--	--	--	--	--
Oct-03	--	--	15.29	232.01	12.15	321.91	12.8	350.73	--	--	--	--	--	--
Nov-03	--	--	13.26	234.04	10.34	323.72	5.66	357.87	--	--	--	--	--	--
Dec-03	--	--	11.08	236.22	6.93	327.13	4.33	359.2	6.3	343.88	--	--	--	--
Jan-04	--	--	10.76	236.54	6.24	327.82	4.3	359.23	5.71	344.47	--	--	--	--
Feb-04	--	--	11.1	236.2	6.4	327.66	4.55	358.98	5.96	344.22	--	--	--	--
Mar-04	--	--	11.57	235.73	7	327.06	4.55	358.98	8.41	341.77	--	--	--	--
Apr-04	--	--	12.09	235.21	7.87	326.19	4.96	358.57	12.05	338.13	--	--	--	--
Jul-04	5.09	220.69	13.82	233.48	10.07	323.99	9.21	354.32	12.74	337.44	--	--	--	--
Oct-04	5.6	220.18	12.2	235.1	10.68	323.38	8.24	355.29	12.74	337.44	--	--	--	--
Jan-05	4.82	220.96	11.85	235.45	8.18	325.88	4.21	359.32	12.72	337.46	--	--	--	--
Feb-05	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Apr-05	2.82	222.96	10.97	236.33	6.86	327.2	4.2	359.33	8.51	341.67	--	--	--	--
Jul-05	2.67	223.11	11.98	235.32	--	--	--	--	12.75	337.43	--	--	--	--
Aug-05	2.7	223.08	12.21	235.09	9.95	324.11	8.6	354.93	12.76	337.42	--	--	--	--
Sep-05	2.57	223.21	12.34	234.96	10.82	323.24	9.67	353.86	--	--	15.52	349.61	--	--
Oct-05	2.53	223.25	12.06	235.24	11.26	322.8	9.04	354.49	--	--	--	--	--	--
Nov-05	2.53	223.25	10.44	236.86	9.15	324.91	4.56	358.97	--	--	--	--	--	--
Dec-05	2.59	223.19	11.53	235.77	9.01	325.05	6.14	357.39	--	--	13.39	351.74	--	--
Jan-06	2.5	223.28	10.01	237.29	6.37	327.69	3.89	359.64	--	--	5.98	359.15	--	--
Feb-06	2.51	223.27	11.1	236.2	7.23	326.83	4.32	359.21	--	--	6.82	358.31	--	--
Mar-06	2.5	223.28	11.22	236.08	7.96	326.1	4.04	359.49	--	--	7.82	357.31	--	--
Apr-06	2.51	223.27	11.45	235.85	7.87	326.19	4.09	359.44	--	--	8.75	356.38	--	--
May-06	2.57	223.21	11.97	235.33	8.32	325.74	5.59	357.94	--	--	10.17	354.96	--	--
Jun-06	2.53	223.25	11.45	235.85	8.5	325.56	4.49	359.04	--	--	10.13	355	--	--
Jul-06	2.59	223.19	12.25	235.05	9.81	324.25	6.76	356.77	--	--	12.1	353.03	--	--
Aug-06	--	--	--	--	--	--	--	--	--	--	14.28	350.85	--	--
Oct-06	2.71	223.07	12.22	235.08	11.95	322.11	6.82	356.71	--	--	--	--	--	--
Jan-07	2.61	223.17	10.89	236.41	6.42	327.64	4.16	359.37	--	--	--	--	--	--
Feb-07	--	--	--	--	--	--	--	--	--	--	--	--	7.59	357.79
Mar-07	--	--	--	--	--	--	--	--	--	--	--	--	6.02	359.36
Apr-07	2.64	223.14	11.41	235.89	7.4	326.66	4.28	359.25	--	--	--	--	7.89	357.49
May-07	--	--	--	--	--	--	--	--	--	--	--	--	9.6	355.78
Jun-07	--	--	--	--	--	--	--	--	--	--	--	--	11.8	353.58
Jul-07	2.77	223.01	12.53	234.77	10.02	324.04	7.42	356.11	--	--	--	--	14.49	350.89
Aug-07	--	--	--	--	--	--	--	--	--	--	--	--	14.99	350.39
Sep-07	--	--	--	--	--	--	--	--	--	--	--	--	15	350.38
Oct-07	2.79	222.99	11.2	236.1	10.35	323.71	4.13	359.4	--	--	--	--	15.04	350.34
Nov-07	--	--	--	--	--	--	--	--	--	--	--	--	15	350.38
Dec-07	--	--	--	--	--	--	--	--	--	--	--	--	7.98	357.4
Jan-08	2.75	223.03	10.83	236.47	7.23	326.83	4	359.53	--	--	--	--	6.73	358.65
Apr-08	2.73	223.05	11.15	236.15	8.25	325.81	4.16	359.37	--	--	--	--	7.53	357.85
Jul-08	2.83	222.95	12.59	234.71	10.79	323.27	7.32	356.21	--	--	--	--	13.28	352.1
Oct-08	2.75	223.03	11.71	235.59	11.34	322.72	5.39	358.14	--	--	--	--	14.98	350.4
Jan-09	2.67	223.11	10.15	237.15	6.71	327.35	3.45	360.08	--	--	--	--	6.13	359.25
Apr-09	2.75	223.03	10.37	236.93	7.32	326.74	3.76	359.77	--	--	--	--	6.19	359.19
Jul-09	2.77	223.01	12.53	234.77	10.4	323.66	7.7	355.83	--	--	--	--	12.58	352.8
Oct-09	2.72	223.06	10.91	236.39	10.5	323.56	5.02	358.51	--	--	--	--	14.97	350.41
Jan-10	2.63	223.15	8.94	238.36	6.16	327.9	3.24	360.29	--	--	--	--	5.03	360.35
Apr-10	2.66	223.12	11.2	236.1	7.9	326.16	3.74	359.79	--	--	--	--	6.88	358.5
May-10	--	--	--	--	--	--	3.45	360.08	--	--	--	--	9.06	356.32
Jul-10	2.71	223.07	12.62	234.68	10.26	323.8	6.63	356.9	--	--	--	--	11.06	354.32
Oct-10	2.71	223.07	11.45	235.85	10.63	323.43	4.34	359.19	--	--	--	--	14.98	350.4
Jan-11	2.62	223.16	10.38	236.92	6.75	327.31	3.37	360.16	--	--	--	--	5.43	359.95
Mar-11	--	--	--	--	--	--	3.54	359.99	--	--	--	--	6.42	358.96
Apr-11	2.55	223.23	11.32	235.98	7.68	326.38	3.6	359.93	--	--	--	--	7.49	357.89
Jul-11	2.63	223.15	12.31	234.99	10.64	323.42	6.51	357.02	--	--	--	--	12.08	353.3
Sep-11	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Oct-11	2.66	223.12	11.64	235.66	12.98	321.08	4.53	359	--	--	--	--	14.98	350.4
Jan-12	2.56	223.22	9.6	237.7	8.4	325.66	3.35	360.18	--	--	--	--	5.5	359.88
Apr-12	2.59	223.19	11.3	236	8.27	325.79	3.98	359.55	--	--	--	--	7.72	357.66

DTW is the depth to water measured from the top of well casing.

Elevation is the altitude of the water level surface in the well.

Well survey information is presented in Table 2-1.

Gray text indicates the well has been decommissioned.

All DTW and elevation values in feet. Port of Seattle Datum.

Table 5-1 Groundwater Elevation Data, cont.

Date	MW-14		MW-15		MW-15A	
	DTW	Elevation	DTW	Elevation	DTW	Elevation
Aug-02	17.18	308.66	22.97	292.34	--	--
Sep-02	17.18	308.66	23.32	291.99	--	--
Oct-02	17.3	308.54	23.45	291.86	--	--
Nov-02	17.17	308.67	23.43	291.88	--	--
Dec-02	--	--	23.27	292.04	--	--
Jan-03	--	--	21.93	293.38	--	--
Feb-03	--	--	21.03	294.28	--	--
Mar-03	--	--	21.93	293.38	--	--
Apr-03	17.25	308.59	21.22	294.09	--	--
May-03	17.18	308.66	21.84	293.47	--	--
Jun-03	--	--	22.5	292.81	--	--
Jul-03	--	--	22.83	292.48	--	--
Aug-03	--	--	24.33	290.98	--	--
Sep-03	--	--	23.71	291.6	--	--
Oct-03	17.2	308.64	23.87	291.44	--	--
Nov-03	--	--	22.4	292.91	--	--
Dec-03	17.19	308.65	21.12	294.19	--	--
Jan-04	16.6	309.24	21.51	293.8	--	--
Feb-04	17.16	308.68	20.54	294.77	--	--
Mar-04	--	--	21.66	293.65	--	--
Apr-04	17.23	308.61	22.3	293.01	--	--
Jul-04	17.22	308.62	23.11	292.2	--	--
Oct-04	--	--	23.59	291.72	--	--
Jan-05	17.18	308.66	22.47	292.84	--	--
Feb-05	--	--	--	--	--	--
Apr-05	--	--	22.24	293.07	--	--
Jul-05	--	--	--	--	--	--
Aug-05	17.17	308.67	--	--	--	--
Sep-05	17.17	308.67	--	--	--	--
Oct-05	17.18	308.66	--	--	--	--
Nov-05	17.17	308.67	--	--	--	--
Dec-05	17.19	308.65	--	--	--	--
Jan-06	15.89	309.95	--	--	--	--
Feb-06	17.16	308.68	--	--	--	--
Mar-06	17.17	308.67	--	--	--	--
Apr-06	17.17	308.67	--	--	--	--
May-06	17.18	308.66	--	--	--	--
Jun-06	17.2	308.64	--	--	--	--
Jul-06	17.2	308.64	--	--	--	--
Aug-06	--	--	--	--	--	--
Oct-06	17.18	308.66	--	--	--	--
Jan-07	17.18	308.66	--	--	--	--
Feb-07	--	--	--	--	23.83	294.67
Mar-07	--	--	--	--	23.77	294.73
Apr-07	17.17	308.67	--	--	23.75	294.75
May-07	--	--	--	--	24.18	294.32
Jun-07	--	--	--	--	24.36	294.14
Jul-07	17.17	308.67	--	--	24.43	294.07
Aug-07	--	--	--	--	24.43	294.07
Sep-07	--	--	--	--	24.43	294.07
Oct-07	17.22	308.62	--	--	24.49	294.01
Nov-07	--	--	--	--	24.43	294.07
Dec-07	--	--	--	--	23.23	295.27
Jan-08	17.15	308.69	--	--	23.34	295.16
Apr-08	17.17	308.67	--	--	23.93	294.57
Jul-08	17.18	308.66	--	--	24.42	294.08
Oct-08	17.18	308.66	--	--	24.44	294.06
Jan-09	15.89	309.95	--	--	22.95	295.55
Apr-09	16.5	309.34	--	--	23.95	294.55
Jul-09	17.17	308.67	--	--	24.4	294.1
Oct-09	17.16	308.68	--	--	24.43	294.07
Jan-10	16	309.84	--	--	23.89	294.61
Apr-10	17.18	308.66	--	--	23.56	294.94
May-10	--	--	--	--	--	--
Jul-10	17.18	308.66	--	--	24.42	294.08
Oct-10	17.18	308.66	--	--	24.34	294.16
Jan-11	15.41	310.43	--	--	23.01	295.49
Mar-11	--	--	--	--	--	--
Apr-11	17.17	308.67	--	--	23.15	295.35
Jul-11	Dry	--	--	--	23.86	294.64
Sep-11	--	--	--	--	--	--
Oct-11	Dry	--	--	--	24.19	294.31
Jan-12	Dry	--	--	--	23.23	295.27
Apr-12	Dry	--	--	--	23.12	295.38

DTW is the depth to water measured from the top of well casing.

Elevation is the altitude of the water level surface in the well.

Well survey information is presented in Table 2-1.

Gray text indicates the well has been decommissioned.

All DTW and elevation values in feet. Port of Seattle Datum.

**Table 5-2 Site-Wide Summary and Statistical Analysis of Dissolved Metals
July 2011 through June 2012 (PY4/PY5)**

Analyte	Lowest Action Level ¹	Units	Statistical Results								Pre-Construction Baseline Results				
			Count	Detects	Non-Detects	Median	Mean	Standard Deviation	Maximum Concentration	Minimum Concentration	Median	Mean	Standard Deviation	Maximum Concentration	Minimum Concentration
Antimony	6	ug/L	46	37	9	0.09	0.156	0.231	1.300	0.020	0.06	0.07	0.06	0.37	0.003
Arsenic	17.4	ug/L	46	44	2	1.40	3.476	4.502	16.200	0.160	0.90	3.51	6.44	41.4	0.1
Barium	1000	ug/L	46	46	0	24.20	26.948	20.344	82.800	7.100	19.00	19.31	10.29	82.3	5.07
Beryllium	4	ug/L	46	2	44	0.03	0.030	0.000	0.030	0.030	0.01	0.01	0.02	0.16	0.0025
Cadmium	1.2	ug/L	46	31	15	0.03	0.044	0.039	0.200	0.020	0.03	0.04	0.05	0.442	0.003
Chromium	50	ug/L	46	26	20	0.15	0.343	0.410	1.700	0.050	0.45	0.85	1.28	12	0.02
Copper	13	ug/L	46	46	0	0.85	1.003	0.883	5.200	0.170	0.65	1.01	1.26	10.8	0.025
Lead	3	ug/L	46	2	44	0.14	0.140	0.085	0.200	0.080	0.04	0.07	0.20	2.51	0.002
Mercury	12	ng/L	46	40	6	1.90	11.000	25.532	115.000	0.200	0.60	1.13	1.75	11.6	0.1
Nickel	100	ug/L	46	46	0	2.75	5.852	8.704	32.000	0.290	1.76	5.42	8.25	35.3	0.01
Selenium	5	ug/L	46	28	18	0.34	0.451	0.281	1.000	0.140	0.40	0.42	0.33	1.8	0.05
Silver	1	ug/L	46	12	34	0.01	0.011	0.003	0.020	0.010	0.01	0.01	0.02	0.262	0.0015
Thallium	2	ug/L	46	20	26	0.01	0.020	0.018	0.080	0.010	0.01	0.01	0.01	0.046	0.001
Zinc	121	ug/L	46	42	4	1.27	2.053	3.545	24.000	0.560	1.30	1.70	2.16	24.6	0.035

¹ The lower value—groundwater criterion or surface water criterion—is presented, except for arsenic, for which the action level is based on ambient background concentrations.

² non-detect results set to half the MDL.

Baseline data includes all groundwater monitoring through April 2004.

Table 5-3 Dissolved Trace Metals in MW-1A: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.1	13	28	0.1	0.1	0.25	0.27	0.2	0.15	0.36	0.24	0.1	0.1	2
Apr-11	0.1	12.7	30.3	0.1	0.05	0.25	0.25	0.05	0.2	0.45	0.31	0.1	0.1	2
Jul-11	0.02	12.2	25	0.1	0.05	0.25	0.3	0.05	0.25	0.37	0.19	0.1	0.1	0.72
Jan-12	0.1	12.4	32.4	0.1	0.05	0.25	0.35	0.05	0.2	0.41	0.25	0.1	0.1	1.13
Apr-12	0.1	12.4	35.9	0.1	0.05	0.25	0.44	0.05	0.62	0.6	0.23	0.1	0.1	1.13
Slope	NA	-0.001	0.016	NA	0.000	NA	0.000	0.000	0.001	0.000	0.000	NA	NA	-0.002
Intercept	NA	58.07	-635.76	NA	3.16	NA	-14.77	9.38	-30.35	-14.42	2.40	NA	NA	81.41
r-squared	NA	0.46	0.56	NA	0.42	NA	0.86	0.42	0.56	0.51	0.05	NA	NA	0.42
Pearson	NA	-0.68	0.75	NA	-0.65	NA	0.93	-0.65	0.75	0.71	-0.23	NA	NA	-0.65
Significant ?	NA	No	Yes	NA	No	NA	Yes	No	Yes	Yes	No	NA	NA	No

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-4 Dissolved Trace Metals in MW-2A: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.03	5	30.6	0.1	0.1	0.08	0.44	0.2	0.31	2.5	0.9	0.1	0.1	0.85
Apr-11	0.04	3.5	36.5	0.1	0.02	0.1	0.43	0.05	0.79	3.1	1.1	0.1	0.1	2
Jul-11	0.05	0.9	47	0.03	0.03	0.06	0.37	0.05	0.26	3.3	1	0.01	0.01	1
Oct-11	0.04	5.7	39	0.1	0.02	0.12	0.6	0.05	0.97	3.4	0.8	0.1	0.1	1.02
Jan-12	1.3	4.7	23.4	0.1	0.2	0.88	5.2	0.2	6.32	4.2	0.41	0.01	0.01	24
Apr-12	0.02	2.5	46.3	0.1	0.02	0.25	0.6	0.05	1.22	4.1	0.9	0.1	0.1	1.73
Slope	0.001	-0.001	0.009	NA	NA	0.001	0.005	0.000	0.007	0.004	-0.001	NA	NA	0.022
Intercept	-47.22	52.34	-346.74	NA	NA	-41.23	-194.54	3.90	-277.58	-141.51	29.76	NA	NA	-894.29
r-squared	0.15	0.01	0.03	NA	NA	0.30	0.18	0.04	0.26	0.91	0.26	NA	NA	0.17
Pearson	0.39	-0.11	0.18	NA	NA	0.55	0.43	-0.21	0.51	0.96	-0.51	NA	NA	0.41
Significant ?	No	No	No	NA	NA	No	No	No	No	Yes	No	NA	NA	No

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-5 Dissolved Trace Metals in MW-4A: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.14	1.1	29.6	0.1	0.05	0.31	1.9	0.2	2.86	0.6	0.34	0.1	0.1	1.05
Apr-11	0.11	0.2	10.5	0.1	0.02	0.16	1.1	0.05	1.82	0.36	0.25	0.1	0.1	2
Jul-11	0.1	0.6	16.5	0.1	0.02	0.1	0.9	0.05	1.13	1	0.22	0.01	0.01	2
Oct-11	0.4	1	30.4	0.1	0.1	0.5	0.8	0.05	1.12	2.5	0.35	0.1	0.08	0.9
Jan-12	0.12	0.3	35.6	0.1	0.02	0.12	1.3	0.05	1.12	0.6	0.28	0.1	0.01	1.08
Apr-12	0.09	0.2	9.8	0.1	0.02	0.06	0.9	0.05	1.94	0.41	0.25	0.1	0.1	2
Slope	0.000	-0.001	-0.003	NA	0.000	0.000	-0.001	NA	-0.002	0.000	0.000	NA	0.000	0.000
Intercept	-0.97	49.08	144.48	NA	0.90	12.36	58.24	NA	86.60	-15.26	3.14	NA	2.53	-9.38
r-squared	0.00	0.26	0.00	NA	0.01	0.09	0.35	NA	0.27	0.01	0.05	NA	0.05	0.01
Pearson	0.04	-0.51	-0.05	NA	-0.11	-0.31	-0.59	NA	-0.51	0.08	-0.23	NA	-0.23	0.08
Significant ?	No	No	No	NA	No	No	No	NA	No	No	No	NA	No	No

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-6 Dissolved Trace Metals in MW-5: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.14	0.9	41	0.1	0.04	0.11	0.5	0.2	4.44	5.5	1.7	0.1	0.03	2.22
Apr-11	0.2	0.7	44.6	0.1	0.05	0.19	0.7	0.05	2.68	5.7	1	0.01	0.04	2
Jul-11	0.15	3.1	36.2	0.03	0.03	0.13	0.6	0.08	5.23	16.2	1	0.01	0.03	2.15
Oct-11	0.1	5.1	43.9	0.1	0.06	0.12	0.6	0.05	6.63	14.6	1	0.1	0.04	2.4
Jan-12	0.14	3.5	29.6	0.1	0.04	0.17	0.9	0.05	2.78	5.6	0.8	0.01	0.02	2.96
Apr-12	0.1	2.3	46	0.1	0.03	0.11	0.7	0.05	2.8	4.3	1	0.1	0.04	2.96
Slope	0.000	0.005	-0.004	NA	0.000	0.000	0.001	0.000	-0.002	-0.003	-0.001	NA	0.000	0.002
Intercept	5.54	-217.16	188.78	NA	0.65	0.95	-19.75	10.04	87.95	114.77	53.30	NA	0.02	-83.91
r-squared	0.38	0.31	0.01	NA	0.05	0.01	0.40	0.49	0.05	0.01	0.50	NA	0.00	0.77
Pearson	-0.61	0.56	-0.10	NA	-0.22	-0.10	0.63	-0.70	-0.22	-0.08	-0.71	NA	0.01	0.88
Significant ?	No	No	No	NA	No	No	No	No	No	No	No	NA	No	Yes

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-7 Dissolved Trace Metals in MW-6: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.1	9.8	13.1	0.1	0.1	0.25	0.24	0.2	0.33	0.31	0.13	0.1	0.1	2
Apr-11	0.1	9.8	12.6	0.1	0.05	0.25	0.18	0.05	0.22	0.32	0.16	0.1	0.1	2
Jul-11	0.1	13.6	12.4	0.1	0.05	0.25	0.17	0.05	0.2	0.7	0.25	0.1	0.1	0.56
Oct-11	0.1	16.2	14.3	0.1	0.02	0.5	0.18	0.05	0.65	0.9	0.25	0.1	0.1	1
Jan-12	0.1	12.9	11.5	0.1	0.05	0.5	0.42	0.05	0.205	0.8	0.25	0.1	0.1	1.16
Apr-12	0.1	12.1	10.4	0.1	0.05	0.5	1.1	0.05	1.39	0.29	0.25	0.1	0.1	0.92
Slope	NA	0.007	-0.005	NA	NA	0.001	0.002	NA	0.002	0.000	0.000	NA	NA	-0.002
Intercept	NA	-282.66	200.19	NA	NA	-28.20	-63.18	NA	-71.70	-18.86	-10.76	NA	NA	94.92
r-squared	NA	0.26	0.35	NA	NA	0.78	0.54	NA	0.42	0.09	0.71	NA	NA	0.44
Pearson	NA	0.51	-0.59	NA	NA	0.88	0.74	NA	0.65	0.30	0.84	NA	NA	-0.66
Significant ?	NA	No	No	NA	NA	Yes	Yes	NA	No	No	Yes	NA	NA	No

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-8 Dissolved Trace Metals in MW-7: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.5	0.4	7.8	0.1	0.1	0.12	2.4	0.2	1.27	1.8	0.23	0.1	0.1	1.57
Apr-11	0.2	0.7	9.8	0.1	0.02	0.06	0.8	0.05	0.73	2.5	0.42	0.1	0.1	2
Jul-11	0.16	3	22.4	0.1	0.05	0.25	0.8	0.05	0.83	7	1	0.1	0.1	1.18
Oct-11	0.4	1	27.1	0.1	0.1	0.25	0.9	0.05	3.13	14.1	1	0.1	0.02	2.05
Jan-12	0.6	0.4	7.1	0.1	0.02	0.25	3	0.05	0.74	1.3	0.3	0.1	0.1	2.06
Apr-12	0.2	0.7	10.4	0.1	0.05	0.25	1.1	0.05	1.09	2.4	0.42	0.1	0.1	1.17
Slope	0.000	0.000	0.003	NA	0.000	0.000	0.000	0.000	0.000	0.002	0.000	NA	NA	0.000
Intercept	1.09	19.92	-105.36	NA	2.63	-15.14	-0.62	9.65	-17.06	-78.30	-6.81	NA	NA	12.73
r-squared	0.00	0.01	0.00	NA	0.09	0.58	0.00	0.44	0.01	0.00	0.01	NA	NA	0.01
Pearson	-0.02	-0.08	0.06	NA	-0.30	0.76	0.01	-0.66	0.08	0.07	0.09	NA	NA	-0.11
Significant ?	No	No	No	NA	No	Yes	No	No	No	No	No	NA	NA	No

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-9 Dissolved Trace Metals in MW-8A: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.09	2.4	24.6	0.1	0.08	0.5	1.2	0.2	8.81	31.5	1	0.1	0.01	1.67
Apr-11	0.07	2.6	22.5	0.1	0.04	0.25	1	0.05	4.56	26.8	0.59	0.1	0.01	2
Jul-11	0.1	2.8	26.7	0.1	0.06	0.25	1.1	0.05	6.47	30.5	1	0.01	0.01	1.04
Oct-11	0.1	3	28.7	0.1	0.07	0.25	1.1	0.05	5.64	32	1	0.1	0.01	1.52
Jan-12	0.09	2.3	25.5	0.1	0.06	0.25	1.4	0.05	6.64	31.1	1	0.01	0.01	2.52
Apr-12	0.06	2.4	25.2	0.1	0.1	0.5	1.2	0.05	5.32	30.9	1	0.02	0.03	0.83
Slope	0.000	0.000	0.004	NA	0.000	0.000	0.000	0.000	-0.004	0.003	0.000	NA	NA	-0.001
Intercept	1.24	11.41	-149.34	NA	-2.05	0.47	-13.91	9.63	161.59	-110.48	-14.24	NA	NA	27.82
r-squared	0.09	0.02	0.13	NA	0.19	0.00	0.22	0.43	0.20	0.10	0.15	NA	NA	0.03
Pearson	-0.30	-0.14	0.36	NA	0.44	0.00	0.47	-0.66	-0.45	0.32	0.38	NA	NA	-0.18
Significant ?	No	No	No	NA	No	No	No	No	No	No	No	NA	NA	No

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-10 Dissolved Trace Metals in MW-9A: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.01	1.6	66.4	0.1	0.1	0.5	0.29	0.2	0.24	0.23	0.9	0.1	0.1	2
Apr-11	0.02	1.8	75.2	0.1	0.05	0.25	0.3	0.05	0.97	0.35	1	0.1	0.1	2
Jul-11	0.05	3	78.1	0.1	0.02	0.08	0.35	0.05	0.205	0.5	0.19	0.1	0.1	0.59
Oct-11	0.04	3.9	78.9	0.1	0.03	0.12	0.22	0.05	0.05	0.6	1	0.1	0.1	1.16
Jan-12	0.03	1.4	80.7	0.1	0.05	0.5	0.29	0.05	0.205	0.5	0.9	0.1	0.1	1.65
Apr-12	0.1	1.4	82.8	0.1	0.02	0.5	0.33	0.05	0.2	0.5	0.9	0.01	0.1	2
Slope	0.000	0.000	0.031	NA	0.000	0.000	0.000	0.000	-0.001	0.001	0.000	NA	NA	0.000
Intercept	-5.88	18.86	-1181.87	NA	4.98	-9.68	-0.13	9.63	29.67	-23.61	-6.46	NA	NA	6.68
r-squared	0.61	0.00	0.84	NA	0.48	0.04	0.00	0.43	0.16	0.58	0.01	NA	NA	0.00
Pearson	0.78	-0.07	0.92	NA	-0.69	0.21	0.04	-0.66	-0.40	0.76	0.10	NA	NA	-0.04
Significant ?	Yes	No	Yes	NA	No	No	No	No	No	Yes	No	NA	NA	No

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-11 Dissolved Trace Metals in MW-10: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.4	0.3	11.4	0.1	0.1	0.13	2.4	0.2	2.61	1.3	0.34	0.1	0.1	0.9
Apr-11	0.13	0.3	10.3	0.1	0.05	0.17	1.8	0.05	1.9	2.3	0.36	0.1	0.01	2
Jul-11	0.09	0.2	9.6	0.1	0.03	0.07	1.4	0.05	1.19	3.5	0.48	0.1	0.1	1.38
Oct-11	0.08	0.3	9	0.1	0.02	0.06	1.3	0.05	1.99	3.3	0.45	0.1	0.01	1.29
Jan-12	0.4	0.3	13.5	0.1	0.05	0.05	2.7	0.05	1.65	1.6	0.32	0.1	0.1	2.63
Apr-12	0.12	0.2	10.7	0.1	0.02	0.18	1.9	0.05	2.06	2.3	0.3	0.01	0.01	1.3
Slope	0.000	0.000	0.002	NA	0.000	0.000	0.000	NA	-0.001	0.001	0.000	NA	NA	0.001
Intercept	7.85	5.22	-58.95	NA	5.24	1.58	0.61	NA	35.72	-31.37	4.87	NA	NA	-47.47
r-squared	0.04	0.16	0.03	NA	0.53	0.01	0.00	NA	0.09	0.03	0.07	NA	NA	0.11
Pearson	-0.21	-0.40	0.19	NA	-0.73	-0.11	0.01	NA	-0.30	0.16	-0.26	NA	NA	0.33
Significant ?	No	No	No	NA	No	No	No	NA	No	No	No	NA	NA	No

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-12 Dissolved Trace Metals in MW-11: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.02	0.5	7.5	0.1	0.1	0.6	0.5	0.2	0.65	3.5	0.25	0.1	0.1	0.93
Apr-11	0.04	0.6	9.6	0.1	0.05	0.39	0.5	0.05	0.63	4.1	0.17	0.1	0.1	2
Jul-11	0.05	1.1	12	0.1	0.05	1	0.6	0.05	0.93	7.5	0.27	0.1	0.1	0.87
Oct-11	0.04	0.9	11.5	0.1	0.05	1.7	0.32	0.05	1.86	6.7	0.25	0.1	0.1	0.73
Jan-12	0.05	0.5	9.5	0.1	0.05	1	0.9	0.05	0.59	4	0.17	0.1	0.1	1.89
Apr-12	0.1	0.5	9.5	0.1	0.05	0.7	0.7	0.05	0.76	3.9	0.14	0.01	0.1	2
Slope	0.000	0.000	0.003	NA	0.000	0.001	0.001	0.000	0.000	0.000	0.000	NA	NA	0.002
Intercept	-5.26	7.33	-105.86	NA	3.24	-37.36	-23.58	9.63	-16.49	-4.51	7.52	NA	NA	-61.36
r-squared	0.70	0.01	0.09	NA	0.43	0.12	0.26	0.43	0.02	0.00	0.32	NA	NA	0.18
Pearson	0.83	-0.11	0.30	NA	-0.66	0.35	0.51	-0.66	0.15	0.02	-0.57	NA	NA	0.43
Significant ?	Yes	No	No	NA	No	No	No	No	No	No	No	NA	NA	No

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-13 Dissolved Trace Metals in MW-12: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.08	0.4	7.1	0.1	0.03	0.15	0.7	0.2	33.2	1.7	0.5	0.1	0.1	1.23
Apr-11	0.1	0.16	7.2	0.1	0.05	0.06	0.6	0.05	30.6	2.4	1	0.1	0.01	2
Jul-11	0.11	0.5	18.7	0.1	0.03	0.25	0.6	0.05	49.7	8.1	0.28	0.1	0.01	1.24
Oct-11	0.15	0.25	11.9	0.1	0.08	0.2	0.9	0.05	101	3	1	0.1	0.01	3.24
Jan-12	0.09	0.16	7.4	0.1	0.02	0.29	1	0.05	56	1.6	1	0.1	0.1	1.84
Apr-12	0.06	0.25	11.3	0.1	0.03	0.22	0.8	0.05	115	3.2	1	0.1	0.01	0.79
Slope	0.000	0.000	0.004	0.000	0.000	0.000	0.001	-0.0002	0.1656	0.000	0.001	NA	NA	0.000
Intercept	1.20	13.31	-167.44	0.10	0.51	-12.18	-24.60	9.63	-6690.24	7.72	-40.68	NA	NA	8.51
r-squared	0.02	0.16	0.03	0.00	0.01	0.42	0.43	0.44	0.65	0.00	0.30	NA	NA	0.00
Pearson	-0.15	-0.40	0.17	0.00	-0.09	0.65	0.66	-0.66	0.81	-0.01	0.54	NA	NA	-0.03
Significant ?	No	No	No	No	No	No	No	No	Yes	No	No	NA	NA	No

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-14 Dissolved Trace Metals in MW-13B: Significant Linear Regression Trend

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Jan-11	0.09	0.5	14.4	0.1	0.04	0.18	1	0.2	31.1	1.3	0.7	0.1	0.1	1.38
Apr-11	0.12	0.6	31	0.1	0.02	0.32	1.6	0.05	47.7	2.6	0.8	0.1	0.1	2
Jul-11	0.09	0.5	25	0.1	0.02	0.47	1.2	0.05	28	1.9	0.43	0.1	0.1	1.4
Jan-12	0.06	0.3	8.4	0.1	0.05	0.2	1.2	0.05	3.97	1	0.21	0.1	0.1	1.81
Apr-12	0.02	0.5	32.4	0.1	0.03	0.7	2.4	0.05	10.8	1.9	0.43	0.01	0.01	3.24
Slope	0.000	0.000	0.006	NA	0.000	0.001	0.002	0.000	-0.074	-0.001	-0.001	NA	NA	0.003
Intercept	7.02	12.22	-237.07	NA	-0.63	-27.08	-77.10	9.42	3041.45	25.87	39.27	NA	NA	-118.07
r-squared	0.74	0.25	0.01	NA	0.06	0.36	0.44	0.43	0.67	0.03	0.59	NA	NA	0.55
Pearson	-0.86	-0.50	0.12	NA	0.24	0.60	0.66	-0.65	-0.82	-0.18	-0.77	NA	NA	0.74
Significant ?	No	No	No	NA	No	No	No	No	No	No	No	NA	NA	No

Notes:

All values reported in ug/L (micrograms per liter) except mercury, which is reported as ng/L (nanograms per liter).

Non-detect results were included in the analysis at one-half the method detection limit.

Regression equation: Concentration (ug/L) = Intercept (ug/L) + Slope * Date (days)

p values not calculated for wells with fewer than three samples.

NA indicates that regression analysis was not performed due to prevalence of non-detects.

Table 5-15 Summary of Significant Linear Regression Trends for Dissolved Trace Metals

Well	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
MW-1A	NA	No	Up	NA	No	NA	Up	No	Up	Up	No	NA	NA	No
MW-2A	No	No	No	NA	NA	No	No	No	No	Up	No	NA	NA	No
MW-4A	No	No	No	NA	No	No	No	NA	No	No	No	NA	No	No
MW-5	No	No	No	NA	No	No	No	No	No	No	No	NA	No	Up
MW-6	NA	No	No	NA	NA	Up	Up	NA	No	No	Up	NA	NA	No
MW-7	No	No	No	NA	No	Up	No	No	No	No	No	NA	NA	No
MW-8A	No	No	No	NA	No	No	No	No	No	No	No	NA	NA	No
MW-9A	Up	No	Up	NA	No	No	No	No	No	Up	No	NA	NA	No
MW-10	No	No	No	NA	No	No	No	NA	No	No	No	NA	NA	No
MW-11	Up	No	No	NA	No	No	No	No	No	No	No	NA	NA	No
MW-12	No	No	No	No	No	No	No	No	Up	No	No	NA	NA	No
MW-13B	No	No	No	NA	No	No	No	No	No	No	No	NA	NA	No

Notes:

"No" indicates no significant trend

"Down" indicates significant decreasing trend

"Up" indicates significant increasing trend

"NA" indicates that there were not enough detections or samples collected to perform the analysis.

Table 5-16 Significant Upward Linear Regression Trend Figures

Date	Barium, MW-1A	Copper, MW-1A	Mercury, MW-1A	Nickel, MW-1A	Nickel, MW-2A	Zinc, MW-5	Chromium, MW-6	Copper, MW-6	Selenium, MW-6	Chromium, MW-7	Antimony, MW-9A	Barium, MW-9A	Nickel, MW-9A	Antimony, MW-11	Mercury, MW-12*
Jan-11	28	0.27	0.15	0.36	2.5	2.22	0.25	0.24	0.13	0.12	0.01	66.4	0.23	0.02	33.2
Apr-11	30.3	0.25	0.2	0.45	3.1	2	0.25	0.18	0.16	0.06	0.02	75.2	0.35	0.04	30.6
Jul-11	25	0.3	0.25	0.37	3.3	2.15	0.25	0.17	0.25	0.25	0.05	78.1	0.5	0.05	49.7
Oct-11					3.4	2.4	0.5	0.18	0.25	0.25	0.04	78.9	0.6	0.04	101
Jan-12	32.4	0.35	0.2	0.41	4.2	2.96	0.5	0.42	0.25	0.25	0.03	80.7	0.5	0.05	56
Apr-12	35.9	0.44	0.62	0.6	4.1	2.96	0.5	1.1	0.25	0.25	0.1	82.8	0.5	0.1	115
Slope	0.016	0.000	0.001	0.000	0.004	0.002	0.001	0.002	0.000	0.000	0.000	0.031	0.001	0.000	0.167
Intercept	-637.33	-14.81	-30.52	-14.50	-141.51	-84.41	-28.32	-63.58	-10.78	-15.17	-5.90	-1184.13	-23.63	-5.28	-6753.31
r-squared	0.56	0.86	0.56	0.51	0.91	0.77	0.78	0.55	0.71	0.58	0.62	0.84	0.58	0.70	0.65
Pearson	0.75	0.93	0.75	0.72	0.96	0.88	0.88	0.74	0.84	0.76	0.78	0.92	0.76	0.84	0.81
Action Level	1000	13	12	100	12	121	50	13	5	50	6	1000	100	6	12
Projected Exceedance (Calendar Year)	2173	2105	2054	2756	2018	2164	2204	2033	2060	2373	2123	2093	2473	2136	2010

All Values ug/L except mercury, which is reported in ng/L.

*Mercury exceeded the action level at MW-12 and MW-13B in April, 2009. A Groundwater Assessment Plan has been approved by Ecology to investigate the origin of the exceedance.

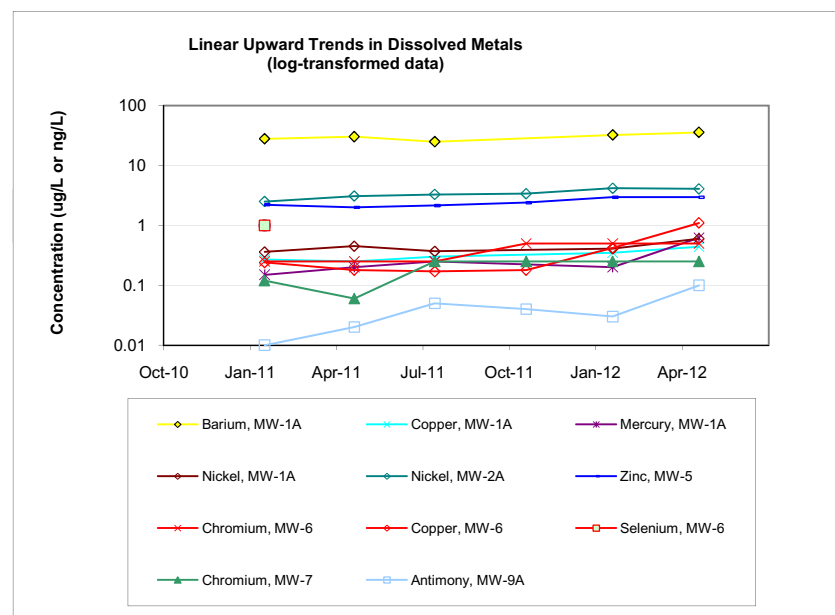
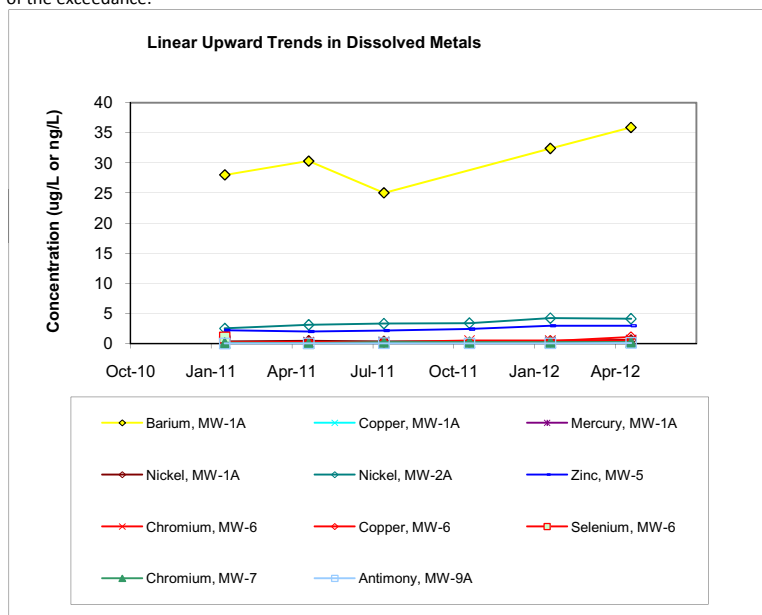


Table 5-17. Arsenic in MW-6: Original and Seasonally-Corrected Data

Original Data							Means	Seasonally-Corrected Data							
2006	2007	2008	2009	2010	2011	2012		2006	2007	2008	2009	2010	2011	2012	
January	6.64	10.5	11.3	9.1	12.6	9.8	12.9	10.41	7.87	11.73	12.53	10.33	13.83	11.03	14.13
April	9.52	10.9	5.88	0	12.6	9.8	12.1	8.69	12.47	13.85	8.83	2.95	15.55	12.75	15.05
July	19	15.1	11.6	11.2	13.7	13.6		14.03	16.60	12.70	9.20	8.80	11.30	11.20	
October	23.3	0.25	15.4	9.6	19.9	16.2		14.11	20.83	-2.22	12.93	7.13	17.43	13.73	
<i>Average</i>							<i>11.63</i>								<i>11.63</i>

Note: Seasonality correction applied per Ecology, 1996, Appendix E

$Z_{ij} = X_{ij} - M_i + M$, where
 Z_{ij} = seasonally corrected value (month i, year j)
 X_{ij} = uncorrected value (month i, year j)
 M_i = mean concentration for month i over period of record
 M = universal mean over period of record

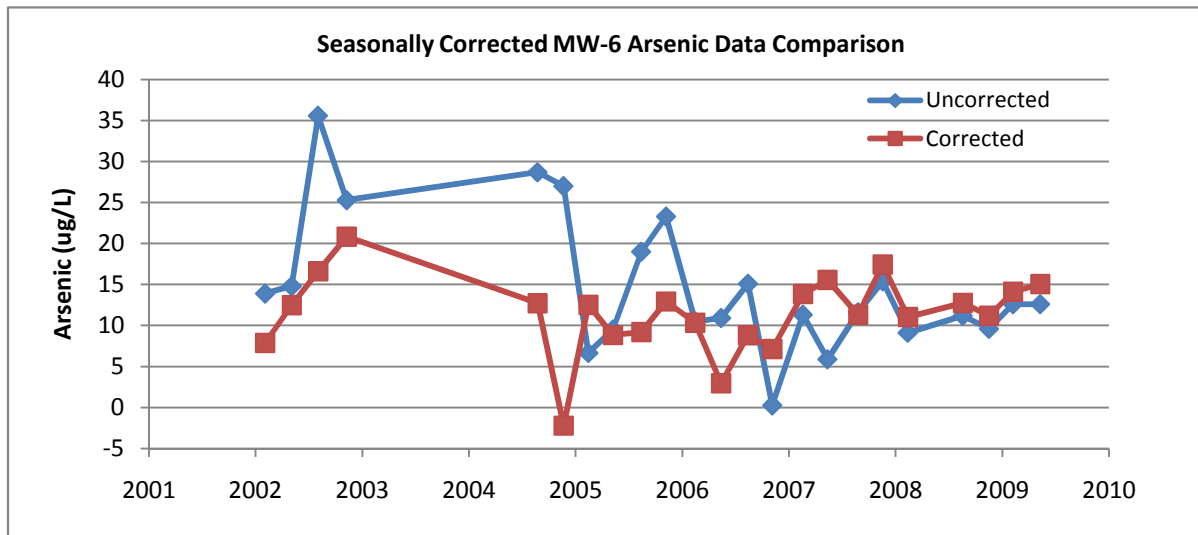


Table 5-18. Arsenic in MW-6: Combined Shewhart-CUSUM Chart for Seasonally Corrected Arsenic Data

Prior Mean* = 24.25 * Zi = Standardized As (in standard deviations)
 Prior StDev* = 8.75 * Si = Standardized CUSUM (in standard deviations)
 Chart SCL = 4.5 CUSUM and SCL adj are adjusted to ug/L levels
 Chart h = 5 CUSUM = prior mean + prior StDev*Si
 Chart k = 1 SCL adj = prior mean + prior StDev*4.5

Date	Val	Corrected	Zi	Si	CUSUM	CTL
Jul-05	28.7	2.69	-2.464	0.000	24.25	63.625
Oct-05	27	5.50	-2.143	0.000	24.25	63.625
Jan-06	6.64	-5.37	-3.385	0.000	24.25	63.625
Apr-06	9.52	-2.38	-3.044	0.000	24.25	63.625
Jul-06	19	23.13	-0.128	0.000	24.25	63.625
Oct-06	23.3	24.33	0.009	0.000	24.25	63.625
Jan-07	10.5	8.85	-1.760	0.000	24.25	63.625
Apr-07	10.9	14.52	-1.112	0.000	24.25	63.625
Jul-07	15.1	13.43	-1.236	0.000	24.25	63.625
Oct-07	0.25	20.63	-0.414	0.000	24.25	63.625
Jan-08	11.3	12.71	-1.319	0.000	24.25	63.625
Apr-08	5.88	15.90	-0.954	0.000	24.25	63.625
Jul-08	11.6	9.53	-1.682	0.000	24.25	63.625
Oct-08	15.4	-2.42	-3.048	0.000	24.25	63.625
Jan-09	9.1	13.51	-1.227	0.000	24.25	63.625
Jul-09	11.2	10.88	-1.528	0.000	24.25	63.625
Oct-09	9.6	6.03	-2.082	0.000	24.25	63.625
Jan-10	12.6	12.73	-1.317	0.000	24.25	63.625
Apr-10	12.6	11.31	-1.479	0.000	24.25	63.625
Jul-10	13..	5.00	-2.200	0.000	24.25	63.625
Oct-10	19.9	5.63	-2.128	0.000	24.25	63.625
Jan-11	9.8	14.81	-1.079	0.000	24.25	63.625
Apr-11	9.8	17.60	-0.760	0.000	24.25	63.625
Jul-11	13.6	9.28	-1.711	0.000	24.25	63.625
Oct-11	16.2	16.12	-0.929	0.000	24.25	63.625
Jan-12	12.9	11.65	-1.440	0.000	24.25	63.625
Apr-12	12.1	14.97	-1.060	0.000	24.25	63.625

* From Figure E-5 (Port of Seattle, 2005)

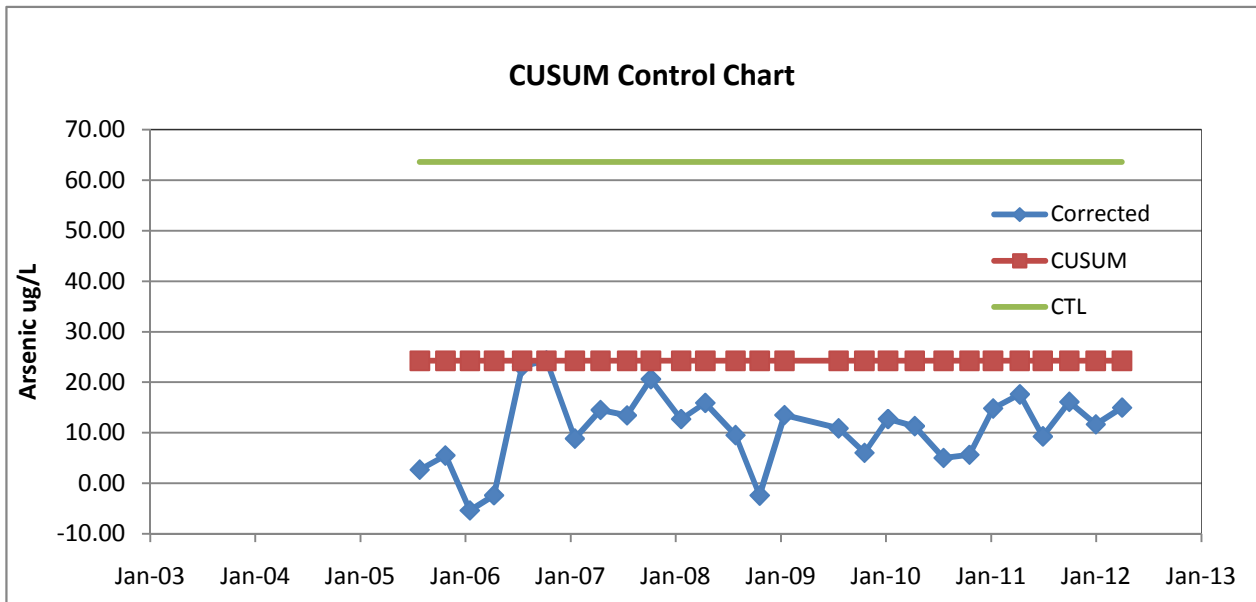


Table 5-19. Baseline Antimony Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02			0.06	0.15	0.1	0.14			0.05	0.05	0.37	
Dec-02			0.05	0.1	0.18	0.14			0.06	0.04	0.21	
Jan-03			0.12	0.13	0.07	0.11			0.28	0.06	0.14	
Feb-03			0.107	0.126	0.029	0.096			0.129	0.043	0.132	
Mar-03			0.103	0.108	0.043	0.089			0.124	0.045	0.096	
Apr-03			0.11	0.08	0.01	0.09			0.14	0.04	0.1	
May-03			0.09	0.09	0.02	0.1			0.09	0.03	0.11	
Jun-03			0.103	0.094	0.05	0.092			0.003	0.05	0.144	
Jul-03			0.062	0.103	0.017	0.059			0.034	0.041	0.173	
Aug-03			0.07	0.122	0.023	0.142			0.042	0.058	0.183	
Sep-03			0.073	0.108	0.022	0.214			0.037	0.042	0.249	
Oct-03				0.08	0.01	0.22			0.01	0.01	0.23	
Nov-03									0.043	0.049		
Dec-03					0.04					0.04		
Jan-04					0.026					0.036		
Feb-04												
Mar-04					0.018					0.038		
Apr-04					0.02					0.04		
Jul-04									0.03	0.04		
Oct-04	0.014											
Jan-05	0.01				0.025					0.045		
Apr-05	0.011				0.019			0.02		0.046		
Jul-05	0.01		0.06	0.16	0.03	0.06	0.09	0.03	0.1	0.05	0.2	
Aug-05	0.0025		0.07				0.043	0.0025				
Sep-05	0.02	0.05	0.15				0.09	0.03				
Oct-05	0.01	0.0125	0.109	0.11	0.0125	0.137	0.081	0.0125	0.05	0.005	0.111	
Nov-05	0.0025	0.0025	0.126				0.0025	0.0025				
Dec-05	0.018	0.131	0.121				0.081	0.015				
Jan-06	0.01	0.08	0.15	0.18	0.13	0.32	0.07	0.05	0.58	0.04	0.17	
Feb-06	0.022	0.076	0.12				0.081	0.024				
Mar-06	0.0025	0.0025	0.0025				0.087	0.0025				
Apr-06	0.03	0.1	0.1	0.16	0.04	0.2	0.0025	0.0025	0.18	0.07	0.14	
Jul-06	0.01	0.1	0.1	0.14	0.02	0.17	0.11	0.04	0.13	0.06	0.15	
Oct-06	0.01	0.03	0.08	0.14	0.01	0.43	0.05	0.12	0.17	0.05	0.17	
Jan-07	0.02	0.07	0.13	0.16	0.02	0.36	0.15	0.07	0.42	0.05	0.08	
Feb-07												0.07
Mar-07												0.06
Apr-07	0.01	0.079	0.11	0.19	0.01	0.33	0.17	0.07	0.19	0.05	0.09	0.04
May-07												0.06
Jun-07												0.07
Jul-07	0.024	0.08	0.402	0.142	0.013	0.294	0.17	0.093	0.15	0.06	0.1	
Oct-07	0.0045	0.0045	0.136	0.147	0.0045	0.195	0.218	0.139	0.12	0.02	0.121	
Dec-07												0.028
Jan-08	0.017	0.106	0.136	0.19	0.021	0.312	0.207	0.063	0.37	0.038	0.07	0.015
Apr-08	0.015	0.05	0.12	0.16	0.015	0.17	0.21	0.08	0.23	0.06	0.07	0.04
Jul-08	0.037	0.04	0.13	0.14	0.01	0.32	0.19	0.12	0.13	0.06	0.076	
Oct-08	0.0025	0.0025	0.2	0.166	0.0025	0.241	0.205	0.131	0.113	0.0025	0.107	
Jan-09	0.0025	0.064	0.174	0.176	0.0025	0.477	0.192	0.0025	0.69	0.052	0.118	0.0025
Apr-09	0.0025	0.0025	0.104	0.12	0.0025	0.371	0.158	0.0025	0.41	0.0025	0.108	0.0025
Jul-09	0.0025	0.054	0.11	0.134	0.0025	0.289	0.142	0.095	0.164	0.0025	0.082	0.074
Oct-09	0.0025	0.0025	0.926	0.314	0.0025	0.794	0.134	0.085	0.124	0.06	0.1	
Jan-10	0.01	1	0.19	0.15	0.01	0.6	0.14	0.04	0.8	0.05	0.08	0.09
Apr-10	0.01	0.05	0.1	0.16	0.01	0.2	0.1	0.01	0.2	0.03	0.15	0.05
Jul-10	0.01	0.05	0.12	0.09	0.01	0.09	0.11	0.07	0.12	0.07	0.05	0.04
Oct-10	0.01	0.03	0.14	0.09	0.01	0.4	0.11	0.06	0.15	0.05	0.11	
Jan-11	0.004	0.03	0.14	0.14	0.004	0.5	0.09	0.01	0.4	0.02	0.08	0.09
Apr-11	0.005	0.04	0.11	0.2	0.005	0.2	0.07	0.02	0.13	0.04	0.1	0.12
Jul-11	0.02	0.05	0.1	0.15	0.005	0.16	0.1	0.05	0.09	0.05	0.11	0.09
Oct-11	0.04	0.4	0.005	0.005	0.4	0.1	0.04	0.08	0.04	0.15	0.15	
Jan-12	0.005	1.3	0.12	0.14	0.005	0.6	0.09	0.03	0.4	0.05	0.09	0.06
Apr-12	0.005	0.02	0.09	0.1	0.005	0.2	0.06	0.005	0.12	0.005	0.06	0.02

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	0.01	0.12	0.14	0.14	0.02	0.26	0.11	0.05	0.19	0.04	0.13	0.05
Standard Dev	0.01	0.28	0.14	0.05	0.03	0.17	0.06	0.04	0.18	0.02	0.06	0.03	
Maximum	0.04	1.30	0.93	0.31	0.18	0.79	0.22	0.14	0.80	0.07	0.37	0.12	

Detection Statistics

Count	38	32	46	41	49	41	34	35	42	49	41	20
#Detects	14	25	44	40	23	41	32	26	39	42	41	17
%ND	63.2	21.9	4.3	2.4	53.1	0.0	5.9	25.7	7.1	14.3	0.0	15.0

Probability Distribution Analysis

Distribution	NP	NP	NP	LN	NP	LN	N	NP	NP	NP	LN	N
Aitchison's	No	No	No	Yes	No	Yes	Yes	No	No	No	Yes	Yes
Adjusted Mean	NA	NA	NA	-0.05	NA	0.00	0.11	NA	NA	NA	0.00	0.05
Adjusted StDev	NA	NA	NA	3.07	NA	17.48	0.06	NA	NA	NA	6.81	0.03
Ln Mean	-4.64	-3.31	-2.16	-2.09	-4.12	-1.54	-2.42	-3.67	-2.12	-3.33	-2.14	-3.22
Ln StDev	1.12	1.55	0.83	0.58	1.35	0.66	1.00	1.33	1.08	0.99	0.41	1.08

Upper Percentiles of Data Distributions

95th	0.03	0.52	0.36	0.19	0.09	0.60	0.21	0.12	0.57	0.06	0.23	0.09
99th	0.03	1.21	0.70	0.27	0.16	0.72	0.22	0.14	0.75	0.07	0.32	0.11

Upper Tolerance Limits with 95% Confidence

95% Coverage	0.04	1.30	0.93	0.42	0.18	0.87	0.24	0.14	0.80	0.07	0.28	0.14
Tolerance (K)	NA	NA	NA	2.11	NA	2.11	2.17	NA	NA	NA	2.11	2.38
99% Coverage	0.04	1.30	0.93	0.68	0.18	1.49	0.29	0.14	0.80	0.07	0.39	0.17
Tolerance (K)	NA	NA	NA	2.92	NA	2.92	3.00	NA	NA	NA	2.92	3.27

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = (1-#detects/count)*mean of detected values

standard deviation = sqrt{ [(count-#detects+1)/(count-1)]*(SD of detected values)^2 + (#detects/count)[(#detects-count)/(count-1)]*(mean of detected values)^2 }

Upper Tolerance Limits

for normally distributed data: UTL = Mean + Standard Deviation*K

for log-normally-distributed data: UTL = exp(LnMean + LnStandard Deviation*K)

for non-parametric data: UTL = maximum detected value

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-20. Baseline Arsenic Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02			0.3	0.4	3.4	3.4			0.7	0.9	2.3	
Dec-02			0.3	0.3	3.1	1.7			0.7	0.9	1.1	
Jan-03				0.3	13.9	2			1	0.8	0.3	
Feb-03			0.15	0.24	13.5	2.47			0.51	0.63	0.24	
Mar-03			0.19	0.26	16.7	2.41			0.56	0.62	0.24	
Apr-03			0.2	0.2	14.8	2.5			0.7	0.6	0.2	
May-03			0.3	0.3	19.7	2.5			0.5	0.7	0.5	
Jun-03			0.2	0.2	26.4	2.6			0.3	0.7	0.5	
Jul-03			0.23	0.24	35.6	3.88			0.16	0.89	0.9	
Aug-03			0.3	0.3	35.6	9.7			0.3	1.2	1	
Sep-03			0.2	0.3	41.4	11.2			0.2	0.8	1.6	
Oct-03			0.6	1	25.3	17.3			0.6	1.3	2.3	
Nov-03			0.1	0.1					0.2		0.4	
Dec-03			0.3								0.4	
Jan-04			0.17	0.26					0.48		0.26	
Feb-04			0.3								0.4	
Mar-04			0.14	0.31							0.23	
Apr-04			0.4						0.5			
Jul-04									0.2			
Oct-04			0.44	0.29					0.29			
Jan-05			0.2	0.3					0.3		0.4	
Apr-05			0.33	0.26					0.44		0.26	
Jul-05	14		1.66	0.61	28.7	2.93	4.83	3.51	0.83	1.09	0.025	
Aug-05	11.1		1.9				3.5	2.8				
Sep-05	11.5	2.61	4.79				3.86	3.07				
Oct-05	12.2	2.8	2.2	0.53	27	1.5	4	3.8	1	0.9	0.7	
Nov-05	12.1	2.8	1				3.5	3.2				
Dec-05	10.9	1.5	0.9				3.1	2.8				
Jan-06	11.1	2	0.27	0.12	6.64	0.74	2.77	2.62	0.32	0.33	0.17	
Feb-06	13.1	1.6	0.4				3.2	3.3				
Mar-06	11.4	1.7	0.3				3.2	2.7				
Apr-06	11.5	2.81	0.5	0.23	9.52	0.96		0.7	0.67	0.3		
Jul-06	10.9	1.7	1.1	0.3	19	1.6	3.2	2.6	0.6	0.8	0.05	
Oct-06	13.8	2.06	1.6	0.37	23.3	1.17	2.98	4.07	0.89	0.99	0.58	
Jan-07	11	1.59	0.27	0.28	10.5	0.72	3.57	3.12	0.73	0.62	0.28	
Feb-07												0.8
Mar-07												0.7
Apr-07	10.7	1.62	0.78	0.37	10.9	1.03	4.15	3.14	0.89	0.59	0.36	0.47
May-07												0.42
Jun-07												0.61
Jul-07	13.5	1.38	0.45	0.41	15.1	1.34	4.76	2.66	0.79	0.79	0.54	
Oct-07	12.5	0.04	0.04	0.04	0.04	0.04	3.72	0.04	0.41	0.8	0.04	
Dec-07												0.36
Jan-08	12.1	1.29	0.31	0.39	11.3	0.62	3.36	1.38	0.85	0.64	0.4	0.23
Apr-08	8.3	1.21	0.44	0.27	5.88	1.08	2.92	1.58	0.37	0.36	0.29	0.07
Jul-08	14.1	1.62	0.9	0.11	11.6	0.84	3.6	2.47	0.11	0.76	0.75	
Oct-08	13.1	1.6	1.5	0.32	15.4	1.3	3.8	3.3	0.29	0.9	0.45	
Jan-09	10.6	3.1	0.1	0.36	9.1	0.48	2.9	1.5	0.1	0.69	0.1	0.26
Apr-09	12.3	1.1	0.3	0.3	9.3	0.5	2.8	1.7	0.3	0.6	0.2	0.1
Jul-09	13.2	1.2	0.9	0.4	11.2	0.8	3.3	4.3	0.2	0.8	0.7	0.3
Oct-09	12.8	4.3	1.6	0.5	9.6	0.7	3.7	4.4	0.4	1	0.7	
Jan-10	11.9	3.8	0.2	0.3	12.6	0.6	2.7	2	0.3	0.5	0.5	0.4
Apr-10	12.7	2.1	0.2	0.23	12.6	0.7	2.6	2.1	0.2	0.6	0.6	0.3
Jul-10	12.7	2.1	0.8	0.29	13.7	2.6	2.8	4.5	0.3	1.3	0.05	0.5
Oct-10	12.3	2.4	0.9	0.31	19.9	0.9	2.7	3.6	0.3	0.8	0.033	
Jan-11	13	5	1.1	0.9	9.8	0.4	2.4	1.6	0.3	0.5	0.4	0.5
Apr-11	12.7	3.5	0.2	0.7	9.8	0.7	2.6	1.8	0.3	0.6	0.16	0.6
Jul-11	12.2	0.9	0.6	3.1	13.6	3	2.8	3	0.2	1.1	0.5	0.5
Oct-11	5.7	1	5.1	16.2	1	3	3.9	0.3	0.9	0.024		
Jan-12	12.4	4.7	0.3	3.5	12.9	0.4	2.3	1.4	0.3	0.5	0.16	0.3
Apr-12	12.4	2.5	0.2	2.3	12.1	0.7	2.4	1.4	0.2	0.5	0.024	0.5

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	12.12	2.32	0.65	0.61	15.42	2.28	3.24	2.71	0.45	0.77	0.48	0.42
Standard Dev	1.18	1.28	0.77	0.97	9.04	3.29	0.63	1.05	0.25	0.23	0.50	0.19	
Maximum	14.10	5.70	4.79	5.10	41.40	17.30	4.83	4.50	1.00	1.30	2.30	0.80	

Detection Statistics

Count	33	32	55	47	41	41	33	33	47	40	48	20
#Detects	33	31	52	46	40	40	33	32	45	40	40	19
%ND	0.0	3.1	5.5	2.1	2.4	2.4	0.0	3.0	4.3	0.0	16.7	5.0

Probability Distribution Analysis

Distribution	N	N	LN	NP	NP	NP	N	N	LN	N	NP	N
Aitchison's	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	No	Yes
Adjusted Mean	0.02	0.14	-0.04	NA	NA	NA	0.12	0.06	-0.04	0.05	NA	0.06
Adjusted StDev	0.01	0.30	38.80	NA	NA	NA	0.05	0.04	13.48	0.01	NA	0.03
Ln Mean	2.49	0.64	-0.86	-0.99	2.46	0.24	1.16	0.84	-0.96	-0.31	-1.22	-1.00
Ln StDev	0.10	0.84	0.92	0.88	1.06	1.05	0.19	0.81	0.58	0.31	1.12	0.61

Upper Percentiles of Data Distributions

95th	13.88	4.84	1.74	2.90	35.60	9.78	4.39	4.34	0.89	1.21	1.45	0.71
99th	14.07	5.48	3.42	4.38	39.14	14.92	4.81	4.47	1.00	1.30	2.30	0.78

Upper Tolerance Limits with 95% Confidence

95% Coverage	0.04	0.80	2.74	5.10	41.40	17.30	0.23	0.14	1.29	0.07	2.30	0.13
Tolerance (K)	2.18	2.19	2.04	NA	NA	NA	2.18	2.18	2.07	2.12	NA	2.38

99% Coverage	2.80	3.19	5.65	5.10	41.40	17.30	1.72	3.28	2.05	0.60	2.30	0.99
Tolerance (K)	3.01	3.02	2.83	NA	NA	NA	3.01	3.01	2.87	2.93	NA	3.27

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = (1-#detects/count)*mean of detected values

standard deviation = sqrt((count-#detects+1)/(count-1)) * (SD of detected values)^2 + (#detects/count)[(#detects-sqrt(1)/(count-1)) * (mean of detected values)^2]

Upper Tolerance Limits

for normally distributed data: UTL = Mean + Standard Deviation*K

for log-normally-distributed data: UTL = exp(LnMean + LnStandard Deviation*K)

for non-parametric data: UTL = maximum detected value

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-21. Baseline Barium Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02			15.1	38.3	37.7	26.8			13.1	11.5	34.6	
Dec-02			13.6	31.2	10.5	43.2			12.4	10.3	29.6	
Jan-03			22.7	30.9	31.9	28.9			33.5	11	14.8	
Feb-03			19.9	29.9	23.6	19.2			22.8	10.9	25.3	
Mar-03			23	29.3	23	18.4			21.4	10.5	9.64	
Apr-03			28.1	26.8	20.8	15.1			23.4	10.1	11.3	
May-03			31	25	22.4	16			16.7	12.3	13.5	
Jun-03			26.7	22.9	22	12.6			13.8	12.6	17.2	
Jul-03			20.6	25.2	22	8.38			11.2	12.9	19.6	
Aug-03			20.1	27.2	24.3	18.5			11.7	19	20.8	
Sep-03			18.4	28.4	25.6	25.1			10.8	12.3	23.6	
Oct-03			18.4	40.1	25.8	82.3			11.3	13.8	24.8	
Jul-05	0.35		45.4	19.6	0.35	0.35	11.4	31.4	15.4	0.35	0.35	
Aug-05	36.9		66.2				20	38.1				
Sep-05	26.6	18	67.1				11.7	29.2				
Oct-05	25.2	17.6	63.2	28.3	31.3	13.9	13.4	30.4	24.7	13.3	12.9	
Nov-05	29.9	28.1	50.5				11.4	30.9				
Dec-05	33.1	28.8	43.1				11.9	29				
Jan-06	27.8	22.9	27.6	13.6	14.4	9.85	13.8	26.8	47	9.7	9.61	
Feb-06	26.5	22.5	24.1				16.3	31.1				
Mar-06	24	29	22.4				18.2	34.6				
Apr-06	24.5	36.3	24	10.6	15.8	16.5	18.6	45	19.3	9.26	6.83	
Jul-06	24.7	29.7	52.2	18	18.6	12.7	32.5	68.9	19.3	11.1	11	
Oct-06	28.5	21.3	53.3	26.1	20.6	23.1	70.7	34	19.4	11.8	9.23	
Jan-07	18	25.2	21.1	14.2	16.1	13.9	30.9	97.5	34.3	8.43	5.93	
Feb-07												0.97
Mar-07												1.38
Apr-07	19.2	32	24	12.5	13.4	17	29.2	93.3	22.6	7.86	8.04	2.6
May-07												4.26
Jun-07												2.04
Jul-07	24.9	29.6	8.23	17.1	13.3	15.8	30.7	79.6	18.9	9.67	9.02	
Oct-07	21.8	25.9	37.8	21.8	19.5	15.6	34.1	72.1	15.5	10	7.79	
Dec-07												1.85
Jan-08	20.5	33.9	23	13.4	11.7	16.8	30.9	62.1	26.2	8.58	5.56	2.85
Apr-08	20.6	32.8	24	12.1	9.34	17.1	28.7	54.9	18.8	8.66	5.33	3.98
Jul-08	35	33.8	37.3	15.8	11.1	17.9	32.9	58.7	17.3	10.4	13.6	
Oct-08	28.9	31.2	36	20.1	13.8	19.3	33.2	58.4	13	9.06	10	
Jan-09	20.5	41.3	21.6	20.8	10.2	12.5	31.5	63.1	24.8	7.69	8.72	2.44
Apr-09	25.2	37.7	19.6	23.2	9.95	14.4	29.2	62.8	19.8	8.85	10.8	3.32
Jul-09	32.2	42.4	26	22.7	10.3	16.9	29.2	62.5	14.6	10	19.8	3.99
Oct-09	26.5	39.3	32.7	41.8	12.5	16.1	31.2	71.9	13.1	8.96	10.3	
Jan-10	23.6	34.2	15.2	24.2	9.4	9.4	26.8	60	18.6	7.4	8.8	5.3
Apr-10	29.1	32.5	13	34.2	10.5	12.3	23.3	61.4	12.7	8.5	10.2	12.5
Jul-10	32.3	41.8	19.3	31.5	11.6	22.2	25.9	63.6	11.2	9.7	22.3	15.5
Oct-10	26.1	33.5	21.2	29.4	13.9	15.8	26.3	66	11.1	8.7	10.8	
Jan-11	28	30.6	29.6	41	13.1	7.8	24.6	66.4	11.4	7.5	7.1	14.4
Apr-11	30.3	36.5	10.5	44.6	12.6	9.8	22.5	75.2	10.3	9.6	7.2	31
Jul-11	25	47	16.5	36.2	12.4	22.4	26.7	78.1	9.6	12	18.7	25
Oct-11		39	30.4	43.9	14.3	27.1	28.7	78.9	9	11.5	11.9	
Jan-12	32.4	23.4	35.6	29.6	11.5	7.1	25.5	80.7	13.5	9.5	7.4	8.4
Apr-12	35.9	46.3	9.8	46	10.4	10.4	25.2	82.8	10.7	9.5	11.3	32.4

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	26.18	31.69	28.46	26.69	16.54	18.21	25.80	58.22	17.61	10.12	13.13	9.17
Standard Dev	6.67	7.74	14.59	9.68	7.46	12.67	10.71	20.29	7.80	2.67	7.31	10.09	
Maximum	36.90	47.00	67.10	46.00	37.70	82.30	70.70	97.50	47.00	19.00	34.60	32.40	

Detection Statistics

Count	33	32	46	41	41	41	34	34	40	40	41	20
#Detects	32	32	46	41	40	40	34	34	40	39	40	20
%ND	3.0	0.0	0.0	0.0	2.4	2.4	0.0	0.0	0.0	2.5	2.4	0.0

Probability Distribution Analysis

Distribution	NP	N	LN	N	NP	NP	NP	NP	NP	NP	NP	LN
Aitchison's	No	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes
Adjusted Mean	NA	0.15	0.00	0.14	NA	NA	NA	NA	NA	NA	NA	0.00
Adjusted StDev	NA	0.31	10.74	0.04	NA	NA	NA	NA	NA	NA	NA	21.36
Ln Mean	3.15	3.43	3.23	3.23	2.66	2.69	3.17	4.00	2.79	2.24	2.38	1.72
Ln StDev	0.77	0.26	0.49	0.39	0.70	0.76	0.40	0.39	0.38	0.57	0.73	1.06

Upper Percentiles of Data Distributions

	95th	35.36	44.16	60.73	43.94	31.33	29.62	33.52	86.47	33.54	13.33	25.52	31.14
99th	36.58	46.78	66.70	45.45	35.44	67.05	58.62	96.11	42.05	16.97	32.65	32.15	

Upper Tolerance Limits with 95% Confidence

95% Coverage	36.90	0.82	69.92	0.23	37.70	82.30	70.70	97.50	47.00	19.00	34.60	70.21
Tolerance (K)	NA	2.19	2.08	2.11	NA	NA	NA	NA	NA	NA	NA	2.38
99% Coverage	36.90	1.07	103.50	0.26	37.70	82.30	70.70	97.50	47.00	19.00	34.60	182.01
Tolerance (K)	NA	3.02	2.88	2.92	NA	NA	NA	NA	NA	NA	NA	3.27

Notes:

Nondetect values were adjusted to .5*MDL
 No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.
 Probability Distribution Analysis:
 for 0-50% non-detects, the Shapiro-Wilks W-test was used
 for >50% non-detects, the data were assumed to be non-parametric
 Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric
 Aitchison's adjustment:
 mean = (1-#detects/count)*mean of detected values
 standard deviation = sqrt{[(count-#detects+1)/(count-1)]*(SD of detected values)^2 + (#detects/count)[(#detects-count)/(count-1)]*(mean of detected values)^2}
 Upper Tolerance Limits
 for normally distributed data: UTL = Mean + Standard Deviation*K
 for log-normally-distributed data: UTL = exp(LnMean + LnStandard Deviation*K)
 for non-parametric data: UTL = maximum detected value
 for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-22. Baseline Beryllium Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02			0.009	0.018	0.015	0.009			0.016	0.006	0.003	
Dec-02				0.012	0.044	0.007			0.01	0.003	0.003	
Jan-03			0.007	0.031	0.017	0.013			0.038	0.003	0.014	
Feb-03				0.021	0.004	0.01			0.027	0.004	0.014	
Mar-03				0.017	0.006	0.009			0.025	0.0025	0.008	
Apr-03			0.008	0.019	0.003	0.011			0.027	0.003	0.018	
May-03				0.01	0.02	0.01			0.02	0.01	0.01	
Jun-03			0.007	0.022	0.005	0.01			0.017	0.0025	0.007	
Jul-03			0.022	0.037	0.023	0.023			0.0025	0.0025	0.0025	
Aug-03				0.022	0.0025	0.0025			0.0025	0.023	0.024	
Sep-03			0.012	0.022	0.006	0.0025			0.006	0.0025	0.014	
Oct-03				0.01	0.01	0.16			0.01	0.01	0.01	
Nov-03			0.009		0.012	0.013			0.007			
Dec-03												
Jan-04				0.019	0.007	0.008					0.018	
Feb-04												
Mar-04									0.016		0.011	
Apr-04												
Jul-04				0.015	0.007	0.007		0.006	0.006			
Oct-04			0.01	0.012	0.015	0.012		0.017	0.016		0.01	
Jan-05			0.011	0.011		0.008			0.013		0.015	
Apr-05			0.012	0.013		0.01			0.015			
Jul-05	0.003		0.003	0.018	0.003	0.003	0.003	0.01	0.025	0.003	0.018	
Aug-05	0.002		0.002				0.002	0.002				
Sep-05	0.003	0.003	0.003				0.003	0.003				
Oct-05	0.003	0.01	0.01	0.003	0.01	0.005	0.01	0.01	0.04	0.004	0.008	
Nov-05	0.002	0.002	0.002				0.002	0.002				
Dec-05	0.002	0.002	0.005				0.002	0.002				
Jan-06	0.003	0.003	0.003	0.003	0.003	0.007	0.003	0.003	0.012	0.003	0.009	
Feb-06	0.002	0.002	0.003				0.003	0.002				
Mar-06	0.004	0.004	0.007				0.01	0.01				
Apr-06	0.003	0.003	0.003	0.003	0.003	0.007	0.002	0.002	0.011	0.003	0.015	
Jul-06	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.01	0.004	0.002	
Oct-06	0.01	0.01	0.01	0.01	0.002	0.002	0.01	0.01	0.01	0.01	0.01	
Jan-07	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.002	0.009	
Feb-07												0.004
Mar-07												0.008
Apr-07	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.008	0.003	0.013	0.004
May-07												0.004
Jun-07												0.0015
Jul-07	0.004	0.004	0.009	0.004	0.004	0.008	0.004	0.012	0.004	0.003	0.013	0.004
Oct-07	0.004	0.004	0.004	0.004	0.004	0.012	0.009	0.021	0.004	0.0015	0.017	0.008
Dec-07												0.008
Jan-08	0.004	0.004	0.004	0.003	0.004	0.008	0.004	0.004	0.003	0.004	0.011	0.01
Apr-08	0.003	0.003	0.003	0.003	0.003	0.009	0.003	0.003	0.003	0.003	0.011	0.01
Jul-08	0.01	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.01	0.016
Oct-08	0.004	0.004	0.004	0.004	0.004	0.008	0.004	0.01	0.004	0.004	0.016	0.009
Jan-09	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.01	0.004
Apr-09	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.01	0.004
Jul-09	0.003	0.003	0.003	0.009	0.003	0.008	0.009	0.011	0.003	0.003	0.019	0.003
Oct-09	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.015
Jan-10	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Apr-10	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Jul-10	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Oct-10	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135
Jan-11	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135	0.0135
Apr-11	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105
Jul-11	0.0105	0.03	0.0105	0.03	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105
Oct-11		0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105
Jan-12	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105
Apr-12	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	Standard Dev	Maximum
	0.01	0.01	0.01
	0.00	0.01	0.00
	0.02	0.03	0.02

Detection Statistics

Count	38	32	56	50	51	50	38	38	48	50	46	20
#Detects	0	1	13	18	11	24	2	7	22	2	25	4
%ND	100.0	96.9	76.8	64.0	78.4	52.0	94.7	81.6	54.2	96.0	45.7	80.0

Probability Distribution Analysis

Distribution	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Aitchison's	No	No	No	No	No	No	No	No	No	No	No	No
Adjusted Mean	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Adjusted StDev	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ln Mean	3.15	3.43	3.23	3.23	2.66	2.69	3.17	4.00	2.79	2.24	2.38	1.72
Ln StDev	1.94	0.78	2.20	1.51	1.79	1.38	1.78	1.39	1.23	2.24	0.87	0.65

Upper Percentiles of Data Distributions

95th	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02
99th	0.02	0.03	0.02	0.03	0.03	0.10	0.02	0.02	0.04	0.02	0.02	0.02

Upper Tolerance Limits with 95% Confidence

95% Coverage	0.02	0.03	0.02	0.04	0.04	0.16	0.02	0.02	0.04	0.02	0.02	0.02
Tolerance (K)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
99% Coverage	0.02	0.03	0.02	0.04	0.04	0.16	0.02	0.02	0.04	0.02	0.02	0.02
Tolerance (K)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = (1-#detects/count)*mean of detected values

standard deviation = sqrt([count-#detects+1]/(count-1))*[SD of detected values]^2 + (#detects/count)*[(#detects-count)/(count-1)]*(mean of detected values)^2

Upper Tolerance Limits

for normally distributed data: UTL = Mean + Standard Deviation*K

for log-normally distributed data: UTL = exp(LnMean + LnStandard Deviation*K)

for non-parametric data: UTL = maximum detected value

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-23. Baseline Cadmium Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02				0.11	0.025	0.025			0.025	0.025	0.025	
Dec-02				0.08	0.025	0.025			0.025	0.025	0.025	
Jan-03				0.14	0.05	0.025			0.09	0.025	0.025	
Feb-03			0.008	0.103	0.013	0.018			0.05	0.009	0.023	
Mar-03			0.015	0.092	0.021	0.039			0.05	0.039	0.026	
Apr-03				0.1	0.025	0.025			0.07	0.025	0.025	
May-03			0.027	0.056	0.036	0.027			0.055	0.032	0.035	
Jun-03			0.017	0.057	0.023	0.017			0.442	0.016	0.017	
Jul-03			0.019	0.064	0.015	0.012			0.014	0.01	0.011	
Aug-03			0.028	0.062	0.009	0.034			0.039	0.026	0.012	
Sep-03			0.028	0.091	0.024	0.035			0.054	0.007	0.014	
Oct-03			0.1	0.23	0.1	0.32			0.09	0.11	0.07	
Nov-03			0.008			0.014			0.013	0.014		
Jan-04					0.019	0.013				0.015		
Feb-04												
Mar-04					0.01						0.015	
Jul-04												
Oct-04					0.008		0.012	0.015		0.012	0.016	
Jan-05	0.01				0.01			0.01				
Apr-05	0.008		0.015			0.013	0.01				0.02	
Jul-05			0.025	0.01			0.01	0.01	0.01	0.013		
Aug-05	0.003		0.017				0.007	0.006				
Sep-05	0.003	0.003	0.003				0.003	0.003				
Oct-05	0.03	0.034	0.042	0.17	0.025	0.008	0.037	0.028	0.124	0.014	0.011	
Nov-05	0.001	0.001	0.001				0.001	0.001				
Dec-05	0.005	0.003	0.019				0.007	0.003				
Jan-06	0.006	0.003	0.028	0.03	0.01	0.01	0.01	0.01	0.114	0.003	0.039	
Feb-06	0.001	0.001	0.072				0.095	0.001				
Mar-06	0.046	0.002	0.023				0.023	0.005				
Apr-06	0.01	0.01	0.04	0.03	0.02	0.04	0.021	0.008	0.04	0.03	0.17	
Jul-06	0.01	0.01	0.01	0.06	0.01	0.01	0.01	0.01	0.03	0.01	0.05	
Oct-06	0.01	0.01	0.031	0.242	0.01	0.03	0.045	0.048	0.044	0.023	0.041	
Jan-07	0.01	0.01	0.01	0.04	0.01	0.01	0.03	0.01	0.03	0.01	0.02	
Feb-07												0.02
Mar-07												0.08
Apr-07	0.0035	0.0035	0.0035	0.058	0.019	0.035	0.0035	0.0035	0.037	0.039	0.018	0.04
May-07												0.093
Jun-07												0.277
Jul-07	0.0025	0.0025	0.028	0.037	0.011	0.075	0.024	0.007	0.028	0.0035	0.022	
Oct-07	0.0025	0.0025	0.025	0.0025	0.0025	0.0025	0.0025	0.0025	0.015	0.004	0.0025	
Dec-07												0.0025
Jan-08	0.0025	0.0025	0.0025	0.074	0.0025	0.0025	0.0025	0.0025	0.06	0.0025	0.056	0.067
Apr-08	0.0035	0.017	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035
Jul-08	0.0025	0.004	0.02	0.026	0.004	0.053	0.039	0.004	0.081	0.004	0.012	
Oct-08	0.0025	0.0025	0.07	0.058	0.0025	0.033	0.058	0.0025	0.021	0.0025	0.049	
Jan-09	0.0025	0.0025	0.0025	0.046	0.0025	0.0025	0.054	0.0025	0.024	0.0025	0.024	0.021
Apr-09	0.0025	0.0025	0.0025	0.044	0.0025	0.008	0.047	0.0025	0.007	0.0025	0.028	0.016
Jul-09	0.006	0.0025	0.016	0.037	0.0025	0.058	0.038	0.0025	0.025	0.012	0.038	0.028
Oct-09	0.0025	0.0025	0.154	0.249	0.0025	0.023	0.049	0.0025	0.0025	0.0025	0.0025	
Jan-10	0.02	0.06	0.02	0.1	0.005	0.005	0.03	0.005	0.03	0.02	0.005	0.005
Apr-10	0.005	0.005	0.005	0.12	0.005	0.005	0.04	0.005	0.005	0.005	0.03	0.03
Jul-10	0.005	0.005	0.005	0.06	0.005	0.005	0.05	0.03	0.005	0.005	0.03	0.005
Oct-10	0.011	0.03	0.06	0.1	0.011	0.04	0.07	0.03	0.03	0.011	0.05	
Jan-11	0.011	0.011	0.05	0.04	0.011	0.011	0.08	0.011	0.011	0.011	0.03	0.04
Apr-11	0.005	0.02	0.02	0.05	0.005	0.02	0.04	0.005	0.005	0.005	0.005	0.02
Jul-11	0.005	0.03	0.02	0.03	0.005	0.005	0.06	0.02	0.03	0.005	0.03	0.02
Oct-11		0.02	0.1	0.06	0.02	0.1	0.07	0.03	0.02	0.005	0.08	
Jan-12	0.005	0.2	0.02	0.04	0.005	0.02	0.06	0.005	0.005	0.005	0.02	0.005
Apr-12	0.005	0.02	0.02	0.03	0.005	0.005	0.1	0.02	0.02	0.005	0.03	0.03

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	0.01	0.02	0.03	0.08	0.01	0.03	0.03	0.01	0.05	0.02	0.03	0.04
Standard Dev	0.01	0.04	0.03	0.06	0.02	0.05	0.03	0.01	0.07	0.02	0.03	0.06	
Maximum	0.05	0.20	0.15	0.25	0.10	0.32	0.10	0.05	0.44	0.11	0.17	0.28	

Detection Statistics

Count	37	32	48	41	45	43	38	38	41	45	44	20
#Detects	9	10	32	38	18	25	27	13	31	18	34	15
%ND	75.7	68.8	33.3	7.3	60.0	41.9	28.9	65.8	24.4	60.0	22.7	25.0

Probability Distribution Analysis

Distribution	LN	NP	LN	NP	NP	LN	NP	LN	LN	NP	LN	LN
Aitchison's	Yes	No	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Yes
Adjusted Mean	-3.47	NA	-1.19	NA	NA	-1.49	NA	-2.76	-0.79	NA	-0.81	-0.81
Adjusted StDev	25.93	NA	19.76	NA	NA	25.48	NA	20.77	24.13	NA	13.87	9.08
Ln Mean	-4.85	-5.02	-3.80	-2.91	-4.54	-4.11	-3.67	-4.80	-3.66	-4.43	-3.74	-3.82
Ln StDev	1.67	1.25	1.60	0.93	1.14	1.04	1.47	1.49	1.08	1.33	1.03	1.20

Upper Percentiles of Data Distributions

95th	0.02	0.05	0.10	0.23	0.03	0.07	0.08	0.03	0.11	0.04	0.07	0.11
99th	0.04	0.16	0.13	0.25	0.08	0.23	0.10	0.04	0.31	0.08	0.13	0.24

Upper Tolerance Limits with 95% Confidence

95% Coverage	0.28	0.20	0.61	0.25	0.10	0.15	0.10	0.20	0.25	0.11	0.20	0.38
Tolerance (K)	2.14	NA	2.07	NA	NA	2.10	NA	2.13	2.11	NA	2.09	2.38
99% Coverage	1.10	0.20	2.18	0.25	0.10	0.34	0.10	0.67	0.61	0.11	0.47	1.13
Tolerance (K)	2.96	NA	2.87	NA	NA	2.90	NA	2.95	2.92	NA	2.90	3.27

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = $(1 - \# \text{detects} / \text{count}) * \text{mean of detected values}$

standard deviation = $\sqrt{\text{count} * (\# \text{detects} + 1) / (\text{count} - 1)} * (\text{SD of detected values})^2 + (\# \text{detects} / \text{count}) * [(\# \text{detects} - \text{count}) / (\text{count} - 1)] * (\text{mean of detected values})^2$

Upper Tolerance Limits

for normally distributed data: $UTL = \text{Mean} + \text{Standard Deviation} * K$

for log-normally distributed data: $UTL = \exp(\text{LnMean} + \text{LnStandard Deviation} * K)$

for non-parametric data: $UTL = \text{maximum detected value}$

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-24. Baseline Chromium Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02			0.35	1.37	0.84	0.65			1.07	3.85	2.24	
Dec-02			0.88	0.48	2.57	1.59			1.37	3.48	2.26	
Jan-03			0.2	0.34	0.41	0.75			1.03	2.8	0.19	
Feb-03			0.21	0.74	0.37	0.87			2.11	2.61	0.24	
Mar-03			0.19	0.44	0.37	0.81			1.01	2.23	0.22	
Apr-03			0.15	0.39	0.35	1.02			1.16	2.5	0.33	
May-03			0.14	0.28	0.21	0.68			0.83	2.4	0.51	
Jun-03			0.17	0.2	0.23	0.67			1.04	2.31	0.72	
Jul-03			0.26	0.25	0.43	1.02			0.71	3.19	0.93	
Aug-03			0.73	1.18	0.83	0.65			1.29	6.63	1.46	
Sep-03			0.78	0.2	0.59	0.48			0.97	3.66	1.55	
Oct-03			0.33	0.47	0.45	12			1.09	4.37	3.63	
Nov-03			0.19									
Mar-04			0.13	0.09								
Oct-04	0.12		0.19				0.19					
Jan-05	0.13						0.11					
Apr-05	0.08				0.2		0.1	0.16				
Jul-05	1		1	1.5	1	1	1.5	1.5	1.5	1	1	
Aug-05	1.5		1.5				1.5	1.5				
Sep-05	0.01	0.01	0.01				0.01	0.01				
Oct-05	0.01	0.05	0.05	0.01	0.05	0.01	0.05	0.05	1.72	3.37	2.99	
Nov-05	0.01	0.01	0.01				0.01	0.01				
Dec-05	0.74	1.37	1.7				1.11	0.63				
Jan-06	0.01	0.11	0.08	0.03	0.16	0.25	0.07	0.02	0.68	1.62	1.13	
Feb-06	0.34	0.4	0.01				0.01	0.35				
Mar-06	0.02	0.02	0.01				0.05	0.05				
Apr-06	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.9	1.89	0.68	
Jul-06	0.13	0.25	0.24	0.035	0.035	0.035	0.18	0.1	0.52	2.16	2.62	
Oct-06	0.015	0.015	0.015	0.015	0.015	0.51	0.015	0.015	0.53	3.32	1.21	
Jan-07	0.015	0.015	0.015	0.015	1.29	0.015	0.43	0.26	1.05	2.2	0.82	
Feb-07												0.38
Mar-07												0.035
Apr-07	0.015	0.015	0.015	0.015	0.015	0.015	1.58	0.015	1.06	2.03	0.015	0.035
May-07												0.34
Jun-07												0.015
Jul-07	0.035	0.035	0.035	0.035	0.035	0.035	1.35	1.12	0.035	2.14	0.035	
Oct-07	0.22	0.21	0.21	0.26	0.14	0.16	0.21	0.98	0.8	2.79	0.71	
Dec-07												0.58
Jan-08	0.38	0.25	0.41	0.11	0.17	0.35	0.32	0.51	0.72	1.93	0.45	0.41
Apr-08	0.5	0.32	0.36	0.31	0.17	0.83	0.54	1.06	1	2.26	0.34	0.7
Jul-08	0.47	0.33	0.25	0.015	0.015	0.015	0.21	0.76	0.28	2.59	1.34	
Oct-08	0.011	0.142	0.006	0.085	0.002	0.122	0.269	0.842	0.208	2.47	0.389	
Jan-09	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.35	1.55	0.276	0.42
Apr-09	0.015	0.05	0.12	0.14	0.015	0.09	0.1	0.1	0.22	1.6	0.17	0.34
Jul-09	0.01	0.01	0.01	0.01	0.01	0.01	0.2	0.64	0.01	2.11	0.01	0.65
Oct-09	0.01	0.01	0.01	0.01	0.01	0.3	0.23	0.57	0.25	2.33	0.35	
Jan-10	0.175	0.37	0.07	0.07	0.07	0.07	0.07	0.07	0.2	0.9	0.07	0.07
Apr-10	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	1.2	0.07	0.19
Jul-10	0.175	0.07	0.1	0.5	0.175	0.175	0.07	0.14	0.07	1.2	0.07	0.25
Oct-10	0.065	0.35	0.06	0.0265	0.065	0.0265	0.065	0.1	0.0265	1.4	0.22	
Jan-11	0.0265	0.08	0.31	0.11	0.0265	0.12	0.065	0.065	0.13	0.6	0.15	0.18
Apr-11	0.0225	0.1	0.16	0.19	0.0225	0.06	0.0225	0.0225	0.17	0.39	0.06	0.32
Jul-11	0.0225	0.06	0.1	0.13	0.0225	0.0225	0.0225	0.08	0.07	1	0.0225	0.47
Oct-11	0.12	0.055	0.12	0.055	0.0225	0.0225	0.12	0.06	1.7	0.2		
Jan-12	0.0225	0.88	0.12	0.17	0.055	0.0225	0.0225	0.055	0.05	1	0.29	0.2
Apr-12	0.0225	0.0225	0.06	0.11	0.055	0.0225	0.055	0.055	0.18	0.7	0.22	0.7

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	0.18	0.18	0.25	0.26	0.28	0.64	0.29	0.34	0.66	2.24	0.75	0.33
Standard Dev	0.32	0.28	0.36	0.36	0.47	1.88	0.47	0.44	0.54	1.18	0.89	0.22	
Maximum	1.50	1.37	1.70	1.50	2.57	12.00	1.58	1.50	2.11	6.63	3.63	0.70	

Detection Statistics

	Count	36	32	49	42	42	41	37	35	40	40	41	20
#Detects	11	17	31	27	18	23	17	19	34	39	33	16	
%ND	69.4	46.9	36.7	35.7	57.1	43.9	54.1	45.7	15.0	2.5	19.5	20.0	

Probability Distribution Analysis

Distribution	NP	LN	NP	LN	LN	LN	LN	LN	NP	NP	LN	N
Aitchison's	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Adjusted Mean	NA	-0.72	NA	-0.53	-0.55	-0.34	-0.70	-0.58	NA	NA	-0.12	0.05
Adjusted StDev	NA	24.92	NA	30.05	25.89	53.52	30.52	43.48	NA	NA	42.79	0.04
Ln Mean	-3.01	-2.73	-2.37	-2.30	-2.46	-2.03	-2.37	-2.15	-0.99	0.66	-1.09	-1.51
Ln StDev	1.65	1.57	1.59	1.56	1.72	1.87	1.64	1.71	1.34	0.57	1.45	1.09

Upper Percentiles of Data Distributions

	95th	0.81	0.62	0.95	1.18	1.00	1.05	1.50	1.23	1.51	3.88	2.64	0.70
99th	1.33	1.22	1.60	1.45	2.06	7.94	1.55	1.50	1.96	5.75	3.38	0.70	

Upper Tolerance Limits with 95% Confidence

	95% Coverage	1.50	1.99	1.70	2.67	3.16	6.84	3.10	4.69	2.11	6.63	7.19	0.14
Tolerance (K)	NA	2.19	NA	2.10	2.10	2.11	2.14	2.16	NA	NA	2.11	2.38	
	99% Coverage	1.50	7.38	1.70	9.44	12.71	31.29	11.85	19.31	2.11	6.63	23.35	0.17
Tolerance (K)	NA	3.02	NA	2.91	2.91	2.92	2.96	2.98	NA	NA	2.92	3.27	

Notes:

Nondetect values were adjusted to .5*MDL
 No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used
 for >50% non-detects, the data were assumed to be non-parametric
 Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = $(1 - \# \text{detects} / \text{count}) * \text{mean of detected values}$
 standard deviation = $\sqrt{\text{count} * (\# \text{detects} + 1) / (\text{count} - 1)} * (\text{SD of detected values})^2 + (\# \text{detects} / \text{count}) * [(\# \text{detects} - \text{count}) / (\text{count} - 1)] * (\text{mean of detected values})^2$

Upper Tolerance Limits

for normally distributed data: UTL = Mean + Standard Deviation*K
 for log-normally-distributed data: UTL = $\exp(\text{LnMean} + \text{LnStandard Deviation} * K)$
 for non-parametric data: UTL = maximum detected value
 for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-25. Baseline Copper Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02			1.06	0.98	1.12	0.62			0.56	0.52	0.45	
Dec-02			0.96	1.2	6.59	1.62			0.97	0.57	0.62	
Jan-03			1.51	2.25	2.11	2.25			7.43	1.08	1.56	
Feb-03			0.51	0.55	0.31	0.77			3.48	0.39	0.74	
Mar-03			0.65	0.6	0.52	0.88			3.08	0.61	0.93	
Apr-03			0.94	0.75	0.025	0.93			3.07	0.55	0.65	
May-03			1.65	1.36	0.44	1.07			3.44	1.02	0.98	
Jun-03			0.72	0.69	0.2	1.06			2.27	0.65	0.61	
Jul-03			0.66	0.59	0.21	0.64			0.55	0.48	0.53	
Aug-03			0.79	0.51	0.27	0.37			1.38	2.18	0.53	
Sep-03			0.59	0.55	0.1	0.35			0.38	0.31	0.48	
Oct-03			1.96	2.18	1.81	10.8			1.23	1.62	1	
Jul-04	0.03											
Oct-04	0.09											
Jul-05	4		4	2.5	4	4	2.5	2.5	2.5	4	4	
Aug-05	2.5		2.5				2.5	2.5				
Sep-05	0.01	0.37	1.95				0.48	0.01				
Oct-05	0.03	0.56	1.52	0.52	0.56	0.97	0.78	0.5	3.24	0.47	0.38	
Nov-05	0.22	0.59	1.06				0.34	0.18				
Dec-05	0.18	0.34	1.05				0.33	0.13				
Jan-06	0.01	0.11	0.61	0.55	0.07	1.3	0.16	0.01	3.11	0.01	0.48	
Feb-06	0.26	0.55	0.75				0.19	0.26				
Mar-06	0.46	0.72	1.09				1.45	0.73				
Apr-06	0.01	0.01	0.72	0.58	0.01	1.54	0.59	0.28	1.17	0.43	0.46	
Jul-06	0.21	0.41	1.1	0.69	0.21	1.36	0.84	0.53	1.24	0.51	0.21	
Oct-06	0.015	0.015	0.015	0.015	0.015	2.12	0.015	0.015	1.7	0.015	0.015	
Jan-07	0.2	0.31	1.06	0.9	0.29	1.97	0.76	0.49	3.17	0.52	0.55	
Feb-07												0.35
Mar-07												0.31
Apr-07	0.27	0.48	1.17	0.9	0.17	1.3	0.96	0.8	1.2	0.58	0.41	0.25
May-07												0.34
Jun-07												0.29
Jul-07	0.01	0.01	2.08	0.82	0.33	1.64	0.96	0.66	1.39	0.49	0.01	
Oct-07	0.08	0.18	0.88	0.81	0.53	0.85	0.9	0.32	1.61	0.29	0.5	
Dec-07												0.33
Jan-08	0.4	0.48	1.06	0.76	0.21	1.05	0.95	0.4	2.76	0.6	0.45	0.49
Apr-08	0.24	0.25	1.08	0.81	0.14	0.52	0.84	0.23	1.63	0.71	0.36	0.44
Jul-08	0.31	0.21	1.04	0.58	0.01	1.1	0.89	0.21	1.11	0.37	0.53	
Oct-08	0.12	0.18	0.64	0.61	0.06	1.14	1.1	0.35	1.16	0.26	0.54	
Jan-09	0.16	0.18	0.83	0.54	0.13	2.33	0.94	0.15	3.44	0.32	0.34	0.37
Apr-09	0.18	0.09	0.78	0.77	0.04	1.7	1.04	0.07	2.33	0.37	0.26	0.29
Jul-09	0.24	0.34	1.07	0.68	0.11	1.09	1.22	0.38	1.17	0.47	0.47	0.42
Oct-09	0.21	0.48	0.74	3.54	0.24	4.43	1.32	0.52	1.42	0.6	0.59	
Jan-10	0.06	3.5	1	0.8	0.15	2	0.9	0.06	3.3	0.45	0.39	0.8
Apr-10	0.2	0.6	0.8	0.6	0.06	0.7	0.7	0.06	1.4	0.06	0.48	0.5
Jul-10	0.06	0.27	0.9	0.7	0.06	0.41	1.1	0.24	1.6	0.39	0.5	0.7
Oct-10	0.115	0.3	1	0.6	0.115	1.4	1.2	0.34	1.5	0.44	0.8	
Jan-11	0.27	0.44	1.9	0.5	0.24	2.4	1.2	0.29	2.4	0.5	0.7	1
Apr-11	0.25	0.43	1.1	0.7	0.18	0.8	1	0.3	1.8	0.5	0.6	1.6
Jul-11	0.3	0.37	0.9	0.6	0.17	0.8	1.1	0.35	1.4	0.6	0.6	1.2
Oct-11		0.6	0.8	0.6	0.18	0.9	1.1	0.22	1.3	0.32	0.9	
Jan-12	0.35	5.2	1.3	0.9	0.42	3	1.4	0.29	2.7	0.9	1	1.2
Apr-12	0.44	0.6	0.9	0.7	1.1	1.1	1.2	0.33	1.9	0.7	0.8	2.4

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

Mean	0.36	0.60	1.12	0.89	0.59	1.63	0.97	0.43	2.06	0.65	0.66	0.70
Standard Dev	0.76	1.03	0.63	0.64	1.22	1.73	0.52	0.56	1.25	0.67	0.61	0.56
Maximum	4.00	5.20	4.00	3.54	6.59	10.80	2.50	2.50	7.43	4.00	4.00	2.40

Detection Statistics

Count	36	32	46	41	41	41	34	34	40	40	41	20
#Detects	26	29	43	39	33	40	31	27	39	36	38	20
%ND	27.8	9.4	6.5	4.9	19.5	2.4	8.8	20.6	2.5	10.0	7.3	0.0

Probability Distribution Analysis

Distribution	NP	NP	NP	NP	LN	LN	NP	NP	LN	NP	NP	LN
Aitchison's	No	No	No	No	Yes	Yes	No	No	Yes	No	No	Yes
Adjusted Mean	NA	NA	NA	NA	-0.25	0.00	NA	NA	0.01	NA	NA	0.00
Adjusted StDev	NA	NA	NA	NA	44.66	17.72	NA	NA	13.35	NA	NA	8.14
Ln Mean	-2.00	-1.23	-0.06	-0.34	-1.59	0.23	-0.26	-1.43	0.57	-0.81	-0.71	-0.56
Ln StDev	1.40	1.32	0.75	0.77	1.42	0.68	0.91	1.26	0.58	1.05	0.98	0.66

Upper Percentiles of Data Distributions

95th	1.07	1.97	2.05	2.26	2.20	4.02	1.82	1.39	3.44	1.65	1.03	1.68
99th	3.49	4.67	3.33	3.13	5.58	8.32	2.50	2.50	5.89	3.29	3.05	2.26

Upper Tolerance Limits with 95% Confidence

95% Coverage	4.00	5.20	4.00	3.54	4.11	5.33	2.50	2.50	6.02	4.00	4.00	2.72
Tolerance (K)	NA	NA	NA	NA	2.11	2.11	NA	NA	2.12	NA	NA	2.38
99% Coverage	4.00	5.20	4.00	3.54	13.05	9.27	2.50	2.50	9.65	4.00	4.00	4.89
Tolerance (K)	NA	NA	NA	NA	2.92	2.92	NA	NA	2.93	NA	NA	3.27

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = (1-#detects/count)*mean of detected values

standard deviation = sqrt{ [count-(#detects+1)]/(count-1)*[(SD of detected values)^2 + (#detects/count){(#detects-count)/((count-1)}*(mean of detected values)^2 }

Upper Tolerance Limits

for normally distributed data: UTL = Mean + Standard Deviation*K

for log-normally distributed data: UTL = exp(LnMean + LnStandard Deviation*K)

for non-parametric data: UTL = maximum detected value

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-26. Baseline Lead Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02			0.067	0.067	0.11	0.044			0.044	0.04	0.033	
Dec-02			0.052	0.039	0.345	0.042			0.035	0.052	0.024	
Jan-03			0.043	0.043	0.033	0.019			0.086	0.014	0.023	
Feb-03			0.06	0.21	0.02	0.04			0.09	0.04	0.03	
Mar-03			0.09	0.08	0.09	0.03			0.08	0.06	0.03	
Apr-03				0.013	0.016	0.029			0.03	0.02	0.02	
May-03			0.11	0.02	0.05	0.04			0.02	0.02	0.02	
Jun-03			0.218	0.05	0.05	0.0035			0.09	0.093	0.05	
Jul-03			0.018	0.015	0.011	0.011			0.018	0.028	0.012	
Aug-03			0.077	0.027	0.042	0.036			0.081	0.546	0.136	
Sep-03			0.029	0.02	0.011	0.015			0.022	0.014	0.061	
Oct-03			0.01	0.18	0.08	2.51			0.06	0.09	0.1	
Nov-03			0.016									
Dec-03										0.02		
Jan-04			0.018									
Feb-04					0.02							
Mar-04			0.013	0.014	0.016						0.011	
Apr-04				0.01								
Oct-04												
Jan-05	0.015		0.019									
Apr-05								0.018	0.015			
Jul-05	0.005		0.005	0.005	0.005	0.005	0.01	0.01	0.02	0.005	0.005	
Aug-05	0.001		0.003				0.003	0.005				
Sep-05	0.005	0.02	0.005				0.02	0.01				
Oct-05	0.005	0.068	0.07	0.005	0.074	0.006	0.066	0.11	0.272	0.019	0.043	
Nov-05	0.03	0.048	0.001				0.001	0.001				
Dec-05	0.004	0.007	0.001				0.003	0.002				
Jan-06	0.005	0.005	0.005	0.005	0.01	0.02	0.005	0.005	0.005	0.005	0.005	
Feb-06	0.001	0.001	0.005				0.005	0.001				
Mar-06	0.006	0.004	0.005				0.001	0.001				
Apr-06	0.005	0.005	0.005	0.005	0.005	0.005	0.065	0.135	0.005	0.005	0.03	
Jul-06	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	
Oct-06	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	
Jan-07	0.004	0.02	0.004	0.004	0.004	0.02	0.029	0.056	0.023	0.009	0.048	
Feb-07												0.004
Mar-07												0.011
Apr-07	0.0015	0.0015	0.0015	0.01	0.004	0.007	0.0015	0.0015	0.007	0.008	0.015	0.004
May-07												0.009
Jun-07												0.0015
Jul-07	0.188	0.011	0.018	0.0045	0.012	0.012	0.0045	0.0045	0.01	0.0015	0.012	
Oct-07	0.0045	0.0045	0.01	0.019	0.0045	0.014	0.0045	0.0045	0.01	0.007	0.063	
Dec-07												0.117
Jan-08	0.077	0.01	0.0045	0.0015	0.0045	0.032	0.015	0.0045	0.0015	0.082	0.0015	0.043
Apr-08	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Jul-08	0.031	0.022	0.0015	0.0015	0.0015	0.028	0.0015	0.0015	0.0015	0.0015	0.032	
Oct-08	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	
Jan-09	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.046
Apr-09	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Jul-09	0.0025	0.0025	0.0025	0.0025	0.0025	0.019	0.0025	0.0025	0.0025	0.0025	0.009	0.025
Oct-09	0.0025	0.0025	0.0025	0.0025	0.0025	0.023	0.009	0.008	0.0025	0.02	0.007	
Jan-10	0.015	0.14	0.015	0.04	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Apr-10	0.03	0.03	0.03	0.03	0.03	0.22	0.03	0.03	0.03	0.03	0.03	0.03
Jul-10	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Oct-10	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	
Jan-11	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
Apr-11	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023
Jul-11	0.023	0.023	0.023	0.08	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023
Oct-11	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	
Jan-12	0.023	0.2	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023
Apr-12	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	0.02	0.03	0.03	0.03	0.09	0.02	0.02	0.03	0.04	0.03	0.02
Standard Dev	0.03	0.04	0.04	0.04	0.06	0.39	0.02	0.03	0.05	0.08	0.03	0.03
Maximum	0.19	0.20	0.22	0.21	0.35	2.51	0.07	0.14	0.27	0.55	0.14	0.12

Detection Statistics

	Count	34	32	51	43	43	41	34	35	41	42	42	20
#Detects	7	11	20	18	18	22	9	9	19	19	23	6	6
%ND	79.4	65.6	60.8	58.1	58.1	46.3	73.5	74.3	53.7	54.8	45.2	70.0	

Probability Distribution Analysis

Distribution	NP	LN	LN	LN	LN	NP	NP	NP	LN	LN	NP	LN
Aitchison's	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No	Yes
Adjusted Mean	NA	-2.42	-2.17	-1.97	-2.04	NA	NA	NA	-1.81	-1.91	NA	-2.48
Adjusted StDev	NA	45.29	57.96	33.66	48.30	NA	NA	NA	34.09	43.51	NA	15.45
Ln Mean	-4.87	-4.61	-4.33	-4.35	-4.31	-4.08	-4.88	-4.90	-4.23	-4.16	-4.09	-4.23
Ln StDev	1.37	1.44	1.64	1.38	1.36	1.37	1.32	1.43	1.39	1.51	1.15	1.26

Upper Percentiles of Data Distributions

	95th	0.05	0.10	0.08	0.08	0.09	0.05	0.05	0.07	0.09	0.09	0.06	0.05
99th	0.15	0.18	0.17	0.20	0.25	1.62	0.07	0.13	0.20	0.36	0.12	0.10	

Upper Tolerance Limits with 95% Confidence

	95% Coverage	0.19	0.23	0.38	0.23	0.23	2.51	0.07	0.14	0.27	0.37	0.14	0.29
Tolerance (K)	NA	2.19	2.05	2.10	2.10	NA	NA	NA	2.11	2.10	NA	2.38	
99% Coverage	0.19	0.77	1.41	0.71	0.69	2.51	0.07	0.14	0.85	1.27	0.14	0.91	
Tolerance (K)	NA	3.02	2.85	2.90	2.90	NA	NA	NA	2.92	2.91	NA	3.27	

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = $(1 - \# \text{detects} / \text{count}) * \text{mean of detected values}$

standard deviation = $\sqrt{\text{count} * (\# \text{detects} + 1) / (\text{count} - 1)} * (\text{SD of detected values})^2 + (\# \text{detects} / \text{count}) * [(\# \text{detects} - \text{count}) / (\text{count} - 1)] * (\text{mean of detected values})^2$

Upper Tolerance Limits

for normally distributed data: $UTL = \text{Mean} + \text{Standard Deviation} * K$

for log-normally-distributed data: $UTL = \exp(\text{LnMean} + \text{LnStandard Deviation} * K)$

for non-parametric data: $UTL = \text{maximum detected value}$

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-27. Baseline Mercury Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02			0.4	0.4	1.3	0.4			0.4	0.2	0.8	
Dec-02				0.24	11.6	0.43			0.26	0.3	0.1	
Feb-03			0.38	0.53	1.25	0.75			6.63	0.53	0.94	
Apr-03			0.5	0.4	0.7	0.8			6.8	0.5	0.7	
Sep-03			0.4	0.8	0.6	0.8			0.7	0.6	0.7	
Oct-03			0.5	0.6	4.9	1.5			0.6	0.9	0.5	
Dec-03			0.5	0.6		0.9				0.7		
Jan-04			0.8	0.6						0.7		
Feb-04			0.7	0.6		0.8				0.8	0.8	
Mar-04			0.9									
Apr-04				0.7						0.8		
Jul-04	0.6			0.8		0.9		0.6		0.4		
Oct-04				0.8								
Apr-05	0.6		0.8	0.5	0.7		0.5	0.5		0.7	0.8	
Jul-05	0.4		1	0.7	0.5	1	0.9	0.6	4.6	0.9	1.1	
Aug-05	0.7		2				26	0.2				
Sep-05	0.5	0.6	1.7				0.5	0.5				
Oct-05	0.4	0.7	1.4	2.5	0.4	0.9	0.4	0.4	6.1	0.2	0.8	
Nov-05	0.5	0.4	2.2				0.7	0.8				
Dec-05	0.7	1.4	2.1				0.6	0.5				
Jan-06	0.6	0.4	2.2	0.05	0.05	1.7	0.05	0.05	4.8	0.8	1.4	
Feb-06	0.6	0.8	2.4				0.5	0.3				
Mar-06	0.3	0.4	1.5				0.6	0.4				
Apr-06	0.4	0.2	1.2	0.6	0.2	1.4	0.7	0.2	7.4	0.5	0.8	
Jul-06	1.5	1.7	2.5	1.7	1.6	2.7	1.1	1.8	5.6	1.9	2	
Oct-06	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	12.2	0.03	0.03	
Jan-07	0.1	0.2	1.2	0.4	0.6	1.4	3.2	0.03	4	0.03	0.03	
Feb-07												1.6
Mar-07												1.2
Apr-07	0.2	0.2	1.5	0.5	0.2	1	7.3	0.2	3.8	0.6	0.5	0.025
May-07												0.9
Jun-07												0.9
Jul-07	0.025	0.025	4.8	0.4	0.4	0.8	2.6	0.4	5.4	0.025	0.025	
Oct-07	0.025	0.025	1.2	0.025	0.025	0.025	9.7	0.025	4	0.025	0.025	
Dec-07												1.9
Jan-08	0.025	0.025	1.3	0.4	0.025	1	11.9	0.025	4.4	0.025	1	1.3
Apr-08	0.025	0.025	1.6	1.2	0.025	1	10.6	0.8	2.5	0.025	1.2	1.3
Jul-08	0.025	0.025	0.025	0.025	0.025	1.19	14.4	1.32	3.46	0.025	0.025	
Oct-08	0.31	0.29	0.69	0.04	0.14	1.44	6.42	0.04	0.04	0.04	0.04	
Jan-09	0.04	0.04	1.57	0.04	0.04	2.19	20.9	0.04	3.75	0.04	1.06	1.44
Apr-09	0.1	0.08	0.91	1.29	0.1	0.74	6.32	0.025	1	0.025	0.025	0.025
Jul-09	0.27	0.39	0.98	1.41	0.15	0.54	2.9	0.78	1.46	0.49	2.64	0.025
Oct-09	0.16	0.17	0.24	3.24	0.18	1.33	11.4	0.64	0.16	0.7	1.8	
Jan-10	0.075	5.31	1.53	0.075	0.075	1.08	15.4	0.075	3.14	0.52	4.77	6.62
Apr-10	0.095	0.25	0.92	1.2	0.075	0.91	9.37	0.075	1.92	0.52	18.6	21.1
Jul-10	0.18	0.31	0.79	1.26	0.18	1.06	3.94	0.68	1.3	0.73	28.1	9.36
Oct-10	0.19	0.17	1	1.23	0.15	1.51	12	0.41	2.08	0.52	35.3	
Jan-11	0.15	0.31	2.86	4.44	0.33	1.27	8.81	0.24	2.61	0.65	33.2	31.1
Apr-11	0.075	0.79	1.82	2.68	0.22	0.73	4.56	0.97	1.9	0.63	30.6	47.7
Jul-11	0.25	0.26	1.13	5.23	0.075	0.83	6.47	0.075	1.19	0.93	49.7	28
Oct-11		0.97	1.12	6.63	0.65	3.13	5.64		1.99	1.86	101	
Jan-12	0.075	6.32	1.12	2.78	0.075	0.74	6.64	0.075	1.65	0.59	56	3.97
Apr-12	0.62	1.22	1.94	2.8	1.39	1.09	5.32	0.2	2.06	0.76	115	10.8

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	Standard Dev	Maximum
MW-1A	0.31	0.31	1.50
MW-2A	0.75	1.40	6.32
MW-4A	1.28	0.87	4.80
MW-5	1.23	1.48	6.63
MW-6	0.83	2.07	11.60
MW-7	1.08	0.62	3.13
MW-8A	6.24	6.25	26.00
MW-9A	0.40	0.40	1.80
MW-10	3.23	2.61	12.20
MW-11	0.53	0.43	1.90
MW-12	13.67	27.66	115.00
MW-13B	8.91	13.42	47.70

Detection Statistics

	Count	#Detects	%ND
MW-1A	37	25	32.4
MW-2A	38	31	18.4
MW-4A	52	49	5.8
MW-5	47	40	14.9
MW-6	41	30	26.8
MW-7	43	41	4.7
MW-8A	36	34	5.6
MW-9A	37	24	35.1
MW-10	34	33	2.9
MW-11	40	30	25.0
MW-12	37	29	21.6
MW-13B	20	17	15.0

Probability Distribution Analysis

Distribution	NP	LN	NP	NP	LN	NP	NP	NP	NP	NP	NP	NP
Aitchison's	No	Yes	No	No	Yes	No	No	No	No	No	No	No
Adjusted Mean	NA	-0.11	NA	NA	-0.17	NA	NA	NA	NA	NA	NA	NA
Adjusted StDev	NA	35.45	NA	NA	43.98	NA	NA	NA	NA	NA	NA	NA
Ln Mean	-1.72	-1.13	-0.02	-0.24	-1.32	0.02	1.07	-1.61	0.72	-1.24	0.26	0.72
Ln StDev	1.19	1.48	0.91	1.60	1.46	0.98	1.65	1.29	1.20	1.42	2.54	2.27

Upper Percentiles of Data Distributions

	95th	99th
MW-1A	0.70	1.23
MW-2A	3.32	6.01
MW-4A	2.49	3.97
MW-5	4.44	6.07
MW-6	2.59	9.32
MW-7	2.29	2.98
MW-8A	17.05	24.27
MW-9A	1.08	1.64
MW-10	7.01	10.62
MW-11	0.98	1.88
MW-12	67.25	110.10
MW-13B	32.76	44.71

Upper Tolerance Limits with 95% Confidence

	95% Coverage	Tolerance (K)
MW-1A	1.50	NA
MW-2A	7.55	2.13
MW-4A	4.80	NA
MW-5	6.63	NA
MW-6	5.85	2.11
MW-7	3.13	NA
MW-8A	26.00	NA
MW-9A	1.80	NA
MW-10	12.20	NA
MW-11	1.90	NA
MW-12	115.00	NA
MW-13B	47.70	NA
MW-1A	1.50	25.31
MW-2A	2.95	NA
MW-4A	4.80	NA
MW-5	6.63	NA
MW-6	19.20	2.92
MW-7	3.13	NA
MW-8A	26.00	NA
MW-9A	1.80	NA
MW-10	12.20	NA
MW-11	1.90	NA
MW-12	115.00	NA
MW-13B	47.70	NA

Notes:

Nondetect values were adjusted to .5*MDL
 No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.
 Probability Distribution Analysis:
 for 0-50% non-detects, the Shapiro-Wilks W-test was used
 for >50% non-detects, the data were assumed to be non-parametric
 Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric
 Aitchison's adjustment:
 mean = (1-#detects/count)*mean of detected values
 standard deviation = sqrt([(count-#detects+1)/(count-1)]*(SD of detected values)^2 + (#detects/count)[(#detects-count)/(count-1)]*(mean of detected values)^2)
 Upper Tolerance Limits
 for normally distributed data: UTL = Mean + Standard Deviation *K
 for log-normally-distributed data: UTL = exp(LnMean + LnStandard Deviation*K)
 for non-parametric data: UTL = maximum detected value
 for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-28. Baseline Nickel Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02			1.76	24.2	1.63	2.27			3.36	5.77	0.76	
Dec-02			1.88	16.7	2.7	3.71			3.32	5.45	1.01	
Jan-03			0.88	34.6	3.71	3.17			16.1	4.66	0.64	
Feb-03			0.79	32.6	1.77	2.81			8.33	4.4	0.74	
Mar-03			0.47	27.9	1.59	2.58			6.82	3.98	0.27	
Apr-03			0.95	27.7	1.39	2.46			7.24	4.43	0.71	
May-03			1.5	21.1	2.37	2.78			6.87	5.05	0.02	
Jun-03			1.45	9.59	1.35	2.52			5.71	4.9	0.61	
Jul-03			1.97	27.9	1.69	2.09			3.5	6.36	0.62	
Aug-03			1.55	26.4	1.5	1.5			3.45	10.4	0.67	
Sep-03			1.15	23.1	1.48	1.01			2.78	6.02	0.36	
Oct-03			0.8	35.3	1.7	20.9			2.9	6.7	0.1	
Apr-05												
Jul-05	1		1	10	1	1	10	10	10	4.3	1	
Aug-05	10		10				10	10				
Sep-05	4.48	5.09	13.5				10.4	4.3				
Oct-05	0.4	2.94	4.34	25.4	3.26	2.1	8.17	1.6	9.51	6.67	1.58	
Nov-05	1.64	2.88	5.15				6.52	1.29				
Dec-05	3.62	5.54	9.6				8.38	2.76				
Jan-06	1.07	2.75	2.3	1.67	1.11	2.14	8.5	0.69	3.96	4.17	0.015	
Feb-06	2.05	3.56	3.3				11.5	1.84				
Mar-06	2.12	5.41	4.01				14.8	2.54				
Apr-06	0.1	3.1	0.1	0.1	0.1	5.6	13.1	2.81	3.5	4.1	0.1	
Jul-06	1.26	3.21	3.85	8.18	1.54	4.76	19.2	2.59	3.27	5.07	0.9	
Oct-06	0.4	1.3	1.8	15.5	0.7	2.4	0.3	26.1	3.8	5.9	0.8	
Jan-07	0.3	1.9	0.5	0.8	0.8	2.5	25.9	0.5	3	4	0.9	
Feb-07												0.6
Mar-07												1.33
Apr-07	0.5	2.8	0.9	0.9	0.5	6.3	24.3	0.8	2.6	3.4	0.9	1.66
May-07												2.05
Jun-07												2.03
Jul-07	0.5	2.3	0.8	7.9	0.4	5.6	25	1.3	3	5.57	1	
Oct-07	0.47	1.8	2.87	8.87	0.69	6.22	26.8	2.31	3.33	5.01	0.83	
Dec-07												0.02
Jan-08	0.93	3.11	1.12	2.04	0.65	5.11	29	1.66	3.91	4.09	0.95	1.27
Apr-08	0.67	2.64	1.46	0.9	0.47	6.12	25.7	2.14	2.83	4.18	0.78	1.33
Jul-08	3.71	2.27	2.31	6.43	0.34	9.08	30.4	2.29	2.59	5.66	3.51	
Oct-08	0.66	1.97	2.34	7.17	0.45	9.23	31.3	2.51	3.35	5.04	1.38	
Jan-09	0.55	2.6	0.66	2.28	0.41	2.09	30	0.95	1.77	3.61	1.11	0.89
Apr-09	0.61	2.38	0.85	2.91	0.38	2.66	32.6	1.08	2.05	4.39	1.9	0.72
Jul-09	0.82	2.98	1.53	10.5	0.36	9.21	31.8	2.15	2.73	5.53	5.42	1.33
Oct-09	0.3	2.32	2.23	27.5	0.23	1.8	31	0.85	2.76	4.79	1.42	
Jan-10	0.43	3.2	0.34	3.6	0.7	1.2	28.4	0.23	1.1	4	1.4	1
Apr-10	0.32	2.9	0.34	3.9	0.6	2.2	29	0.41	2.1	4.4	2.2	1.7
Jul-10	0.39	3.3	1.3	24	0.24	7.8	32	0.9	3.2	7.3	8	2.1
Oct-10	0.3	2.6	1.5	20.5	0.46	3	28	0.7	2.9	5.2	1.9	
Jan-11	0.36	2.5	0.6	5.5	0.31	1.8	31.5	0.23	1.3	3.5	1.7	1.3
Apr-11	0.45	3.1	0.36	5.7	0.32	2.5	26.8	0.35	2.3	4.1	2.4	2.6
Jul-11	0.37	3.3	1	16.2	0.7	7	30.5	0.5	3.5	7.5	8.1	1.9
Oct-11		3.4	2.5	14.6	0.9	14.1	32	0.6	3.3	6.7	3	
Jan-12	0.41	4.2	0.6	5.6	0.8	1.3	31.1	0.5	1.6	4	1.6	1
Apr-12	0.6	4.1	0.41	4.3	0.29	2.4	30.9	0.5	2.3	3.9	3.2	1.9

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

Mean	1.27	3.05	2.19	13.75	1.04	4.38	22.50	2.65	4.05	5.11	1.61	1.41
Standard Dev	1.90	0.97	2.66	10.96	0.84	3.92	9.90	4.72	2.86	1.36	1.83	0.63
Maximum	10.00	5.54	13.50	35.30	3.71	20.90	32.60	26.10	16.10	10.40	8.10	2.60

Detection Statistics

Count	34	32	46	41	41	41	34	34	40	40	41	20
#Detects	30	32	43	39	39	40	32	32	39	40	36	19
%ND	11.8	0.0	6.5	4.9	4.9	2.4	5.9	5.9	2.5	0.0	12.2	5.0

Probability Distribution Analysis

Distribution	NP	LN	NP	NP	LN	NP	NP	NP	NP	NP	NP	NP
Aitchison's	No	Yes	No	No	Yes	No	No	No	No	No	No	No
Adjusted Mean	NA	0.00	NA	NA	-0.01	NA	NA	NA	NA	NA	NA	NA
Adjusted StDev	NA	2.97	NA	NA	23.65	NA	NA	NA	NA	NA	NA	NA
Ln Mean	-0.31	1.07	0.32	2.08	-0.29	1.19	2.91	0.30	1.23	1.60	-0.08	0.11
Ln StDev	0.95	0.31	0.96	1.28	0.82	0.71	0.89	1.06	0.55	0.24	1.29	1.02

Upper Percentiles of Data Distributions

95th	4.02	5.23	8.49	32.70	2.73	9.47	32.00	10.00	9.53	7.31	5.55	2.15
99th	8.23	5.50	11.93	35.03	3.53	18.25	32.40	20.79	13.72	9.27	8.06	2.51

Upper Tolerance Limits with 95% Confidence

95% Coverage	10.00	5.72	13.50	35.30	4.20	20.90	32.60	26.10	16.10	10.40	8.10	2.60
Tolerance (K)	NA	2.19	NA	NA	2.11	NA	NA	NA	NA	NA	NA	NA
99% Coverage	10.00	7.41	13.50	35.30	8.14	20.90	32.60	26.10	16.10	10.40	8.10	2.60
Tolerance (K)	NA	3.02	NA	NA	2.92	NA	NA	NA	NA	NA	NA	NA

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = (1-#detects/count)*mean of detected values

standard deviation = sqrt{(count-#detects+1)/(count-1)}*(SD of detected values)*2 + (#detects/count)[(#detects-count)/((count-1))* (mean of detected values)*2 }

Upper Tolerance Limits

for normally distributed data: UTL = Mean + Standard Deviation*K

for log-normally distributed data: UTL = exp(LnMean + LnStandard Deviation*K)

for non-parametric data: UTL = maximum detected value

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-29. Baseline Selenium Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02				0.4	0.4	0.4			0.4	0.4	0.4	
Dec-02			0.9	1.1	0.4	0.8			0.4	0.4	0.9	
Jan-03				0.4	0.1	0.4			0.4	0.4	0.4	
Feb-03				0.4	0.1	0.1			0.7	0.1	0.1	
Mar-03				0.5	0.1	0.3			0.8	0.1	0.1	
Apr-03				0.4	0.4	0.4			1.2	0.4	0.4	
May-03				1.1	0.2	0.1			1.3	0.3	0.1	
Jun-03				0.4	0.5	0.3			0.8	0.3	0.2	
Jul-03				0.4	0.5	0.1			0.3	0.05	0.3	
Aug-03				0.4	0.5	0.1			0.3	0.1	0.3	
Sep-03				0.3	0.4	0.1			0.3	0.1	0.5	
Oct-03				0.6	1.1	0.7			1	1	1.1	
Nov-03					0.5	0.1			0.2		0.1	
Dec-03									0.4			
Jan-04				0.3	0.5	0.2			0.6	0.1	0.2	
Feb-04				0.8	0.4	0.5				0.6	0.5	
Mar-04				0.2	0.5	0.2			0.7	0.2	0.1	
Apr-04					0.5	0.6			0.9	0.9	0.9	
Jul-04				0.3	0.3	0.3			0.4	0.4		
Oct-04	0.3			0.3	0.4	0.5			0.2			
Jan-05				0.2					0.4		0.4	
Apr-05				0.4	0.2	0.3			0.7			
Jul-05	0.05			0.05	1.4	0.05			0.8	0.5	2.5	0.05
Aug-05	0.3			2.7					0.6	0.3		
Sep-05	0.2	0.4		1					0.4	0.3		
Oct-05	0.05	0.5		1.7	0.2	0.5			0.5	0.5	2	0.2
Nov-05	0.1	0.3		1.9					0.4	0.1		
Dec-05	0.4	0.8		1.6					0.8	0.3		
Jan-06	0.35	0.35		0.35	0.05	0.05			0.05	0.05	0.35	0.35
Feb-06	0.3	0.8		0.2					0.05	0.4		
Mar-06	0.2	0.9		0.7					0.5	0.5		
Apr-06	0.05	0.3		0.1	0.2	0.2			1.4	0.5	0.4	0.05
Jul-06	0.1	0.4		0.4	0.3	0.2			1.2	0.4	1	0.1
Oct-06	0.3	0.2		0.4	0.3	0.2			0.4	0.3	0.5	0.4
Jan-07	0.1	0.1		0.2	0.1	0.2			0.3	0.1	0.4	0.1
Feb-07												0.3
Mar-07												0.1
Apr-07	0.5	2.1		1.9	0.7	0.3			1.4	4.9	2.9	1.8
May-07												0.3
Jun-07												0.6
Jul-07	0.3	0.3		0.3	0.3	0.3			0.3	0.3	0.05	0.3
Oct-07	0.2	0.2		0.2	0.2	0.2			0.2	0.2	0.7	0.1
Dec-07												0.2
Jan-08	0.2	0.5		0.2	0.05	0.2			1.7	0.8	0.2	0.2
Apr-08	0.1	1		0.4	0.3	0.1			1	2	1	0.4
Jul-08	0.25	0.1		0.1	0.2	0.1			0.1	0.2	0.3	0.2
Oct-08	0.15	0.15		0.15	0.15	0.15			0.15	0.15	0.15	0.15
Jan-09	0.2	0.2		0.2	0.8	0.2			0.5	1.1	0.2	0.2
Apr-09	0.2	0.5		0.2	0.7	0.2			0.4	0.8	0.2	0.2
Jul-09	0.15	0.4		0.15	0.5	0.15			0.4	0.9	0.6	0.3
Oct-09	0.15	1.1		0.15	1	0.15			2	1.2	0.8	0.3
Jan-10	0.165	0.4		0.165	0.165	0.165			0.37	0.165	0.8	0.165
Apr-10	0.38	0.6		0.165	0.165	0.165			0.48	0.165	0.8	0.38
Jul-10	0.37	0.165		0.27	0.165	0.13			0.165	0.165	0.6	0.22
Oct-10	0.25	0.06		0.32	0.06	0.21			0.49	0.06	0.42	0.6
Jan-11	0.24	0.9		0.34	1.7	0.13			0.23	0.06	0.9	0.34
Apr-11	0.31	1.1		0.065	0.065	0.16			0.42	0.59	1	0.36
Jul-11	0.19	0.065		0.22	0.065	0.065			1	0.065	0.19	0.48
Oct-11		0.8		0.35	0.065	0.065			0.065	1	0.45	0.065
Jan-12	0.25	0.41		0.28	0.8	0.065			0.3	0.065	0.9	0.32
Apr-12	0.23	0.9		0.065	0.065	0.42			0.065	0.9	0.3	0.14

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	Standard Dev	Maximum
	0.22	0.11	0.50
	0.53	0.43	2.70
	0.50	0.57	1.70
	0.45	0.37	1.70
	0.21	0.14	0.70
	0.40	0.34	1.80
	0.66	0.91	4.90
	0.57	0.52	2.90
	0.59	0.48	2.50
	0.23	0.20	1.00
	0.34	0.35	1.80
	0.26	0.21	0.80

Detection Statistics

	Count	#Detects	%ND
	38	15	60.5
	32	32	0.0
	46	43	6.5
	41	39	4.9
	41	39	4.9
	41	40	2.4
	34	32	5.9
	34	32	5.9
	40	39	2.5
	40	40	0.0
	41	36	12.2
	20	19	5.0

Probability Distribution Analysis

Distribution	LN	LN	LN	NP	LN	LN	NP	LN	NP	LN	NP	N
Aitchison's	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	No	Yes
Adjusted Mean	-0.75	0.00	0.01	NA	-0.03	0.00	NA	-0.04	NA	0.00	NA	0.06
Adjusted StDev	2.29	29.57	14.87	NA	43.80	12.88	NA	12.30	NA	9.10	NA	0.03
Ln Mean	-1.47	-0.95	-0.95	-1.11	-1.64	-1.14	-1.04	-0.80	-0.75	-1.58	-1.38	-1.55
Ln StDev	0.76	0.87	0.93	0.95	0.78	0.82	1.22	0.85	0.64	0.88	0.95	0.76

Upper Percentiles of Data Distributions

	95th	99th
	0.39	0.47
	1.10	1.79
	1.84	2.33
	1.10	1.56
	0.48	0.66
	1.00	1.62
	2.00	3.89
	1.07	2.34
	1.60	2.26
	0.56	0.96
	0.98	1.49
	0.71	0.78

Upper Tolerance Limits with 95% Confidence

	95% Coverage	Tolerance (K)
	1.16	2.13
	2.59	2.19
	2.65	2.08
	1.70	NA
	1.00	2.11
	1.82	2.11
	4.90	NA
	2.83	2.17
	2.50	NA
	1.34	2.12
	1.80	NA
	0.13	2.38
	2.15	3.55
	2.95	3.02
	5.57	2.88
	1.70	NA
	1.88	2.92
	3.55	2.92
	4.90	NA
	5.72	3.00
	2.50	NA
	2.74	2.93
	1.80	NA
	0.16	3.27

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = (1-#detects/count)* mean of detected values

standard deviation = sqrt[(count-#detects+1)/(count-1)]*(SD of detected values)^2 + (#detects/count)[(#detects-count)/(count-1)]*(mean of detected values)^2

Upper Tolerance Limits

for normally distributed data: UTL = Mean + Standard Deviation*K

for log-normally-distributed data: UTL = exp(LnMean + LnStandard Deviation*K)

for non-parametric data: UTL = maximum detected value

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-30. Baseline Silver Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02				0.005	0.005	0.005			0.005	0.005	0.005	
Dec-02				0.005	0.01	0.005			0.01	0.005	0.005	
Jan-03				0.0035	0.0035	0.0035			0.0035	0.0035	0.0035	
Feb-03			0.006	0.004	0.004	0.004			0.005	0.004	0.0015	
Mar-03			0.004	0.008	0.0015	0.005			0.0015	0.004	0.0015	
Apr-03				0.01	0.02	0.005			0.02	0.01	0.01	
May-03				0.002	0.004	0.002			0.002	0.002	0.002	
Jun-03				0.002	0.002	0.009			0.262	0.002	0.002	
Jul-03			0.018	0.021	0.042	0.024			0.002	0.009	0.01	
Aug-03				0.002	0.002	0.002			0.002	0.007	0.002	
Sep-03			0.008	0.002	0.002	0.002			0.002	0.002	0.002	
Oct-03				0.005	0.005	0.04			0.005	0.005	0.005	
Nov-03											0.006	
Dec-03												
Jan-04									0.008			
Feb-04												
Mar-04									0.004			
Apr-04											0.01	
Jul-04							0.015					
Oct-04					0.003			0.003	0.002		0.002	
Jan-05					0.002		0.002	0.002	0.004			
Apr-05												
Jul-05	4		4	2	4	4	2	4.5	2	4	4	
Aug-05	0.001		0.001				0.001	0.001				
Sep-05	0.0025	0.0025	0.0025				0.0025	0.0025				
Oct-05	0.0025	0.005	0.005	0.0025	0.005	0.001			0.02	0.002	0.001	
Nov-05	0.001	0.001	0.001				0.001	0.001				
Dec-05	0.001	0.001	0.001				0.001	0.001				
Jan-06	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	
Feb-06	0.001	0.001	0.0025				0.0025	0.001				
Mar-06	0.002	0.002	0.001				0.005	0.005				
Apr-06	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.001	0.001	0.0025	0.0025	0.0025	
Jul-06	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.004	0.0015	0.0035	
Oct-06	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	
Jan-07	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	
Feb-07												0.0015
Mar-07												0.0015
Apr-07	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0015
May-07												0.002
Jun-07												0.0015
Jul-07	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.005	0.002	0.0045	0.002	
Oct-07	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.0015	0.0015	0.002	
Dec-07												0.002
Jan-08	0.002	0.002	0.002	0.0045	0.002	0.002	0.002	0.002	0.0045	0.002	0.0045	0.0045
Apr-08	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045
Jul-08	0.0045	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0045	
Oct-08	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	
Jan-09	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Apr-09	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Jul-09	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Oct-09	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	
Jan-10	0.002	0.02	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Apr-10	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Jul-10	0.002	0.002	0.002	0.01	0.002	0.002	0.002	0.002	0.002	0.01	0.002	0.002
Oct-10	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	
Jan-11	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045
Apr-11	0.004	0.004	0.004	0.01	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Jul-11	0.004	0.01	0.01	0.01	0.004	0.004	0.01	0.004	0.004	0.004	0.004	0.004
Oct-11	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	
Jan-12	0.004	0.01	0.004	0.01	0.004	0.004	0.01	0.004	0.004	0.004	0.004	0.004
Apr-12	0.004	0.004	0.004	0.004	0.004	0.004	0.02	0.01	0.01	0.01	0.004	0.01

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	0.12	0.00	0.11	0.05	0.10	0.10	0.06	0.13	0.06	0.10	0.10	0.00
Standard Dev	0.70	0.00	0.65	0.32	0.62	0.63	0.33	0.75	0.30	0.63	0.61	0.00	
Maximum	4.00	0.02	4.00	2.00	4.00	4.00	2.00	4.50	2.00	4.00	4.00	0.01	

Detection Statistics

	Count	38	32	56	51	51	50	38	38	49	50	51	20
#Detects	0	3	5	8	6	5	5	5	5	10	7	5	1
%ND	100.0	90.6	91.1	84.3	88.2	90.0	86.8	86.8	79.6	86.0	90.2	95.0	

Probability Distribution Analysis

Distribution	N	LN	LN	LN	LN	LN	LN	LN	LN	LN	LN	LN	LN
Aitchison's	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted Mean	0.00	-3.96	-4.39	-3.92	-4.30	-4.05	-4.09	-3.55	-3.77	-4.24	-4.54	-4.37	
Adjusted StDev	0.00	3.43	15.82	7.39	68.61	47.52	27.51	381.04	86.30	5.86	22.55	-1.06	
Ln Mean	-4.99	-5.85	-3.84	-4.39	-4.68	-4.54	-5.36	-5.45	-4.87	-4.41	-4.82	-5.90	
Ln StDev	2.35	0.67	2.89	2.43	2.34	2.45	1.80	1.86	2.07	2.49	2.24	0.52	

Upper Percentiles of Data Distributions

	95th	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.01	0.01	0.01
99th	2.72	0.02	2.53	1.23	2.38	2.46	1.31	2.93	1.25	2.44	2.32	0.01	

Upper Tolerance Limits with 95% Confidence

	95% Coverage	0.00	0.01	7.53	1.80	1.14	1.65	0.22	0.23	0.54	2.03	0.79	0.01
Tolerance (K)	2.13	2.19	2.03	2.05	2.05	2.06	2.13	2.13	2.06	2.06	2.05	2.38	
	99% Coverage	0.00	0.02	73.19	12.39	7.35	11.56	0.96	1.04	2.82	14.69	4.69	0.02
Tolerance (K)	2.95	3.02	2.82	2.85	2.85	2.85	2.95	2.95	2.86	2.85	2.85	3.27	

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = (1-#detects/count)* mean of detected values

standard deviation = sqrt[(count-#detects+1)/(count-1)]*(SD of detected values)^2 + (#detects/count)[(#detects-count)/(count-1)]*(mean of detected values)^2]

Upper Tolerance Limits

for normally distributed data: UTL = Mean + Standard Deviation*K

for log-normally-distributed data: UTL = exp(LnMean + LnStandard Deviation*K)

for non-parametric data: UTL = maximum detected value

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-31. Baseline Thallium Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02			0.009	0.032	0.014	0.018			0.002	0.002	0.011	
Dec-02			0.007	0.016	0.024	0.017			0.002	0.002	0.013	
Jan-03			0.014	0.027	0.018	0.017			0.015	0.007	0.011	
Feb-03			0.009	0.025	0.007	0.01			0.015	0.002	0.008	
Mar-03			0.007	0.026	0.007	0.01			0.018	0.001	0.004	
Apr-03			0.01	0.026	0.002	0.009			0.017	0.002	0.006	
May-03				0.018	0.005	0.01			0.01	0.0025	0.0025	
Jun-03			0.009	0.017	0.004	0.009			0.021	0.0015	0.005	
Jul-03			0.009	0.021	0.003	0.004			0.0015	0.0015	0.007	
Aug-03			0.01	0.027	0.006	0.013			0.004	0.011	0.012	
Sep-03			0.015	0.021	0.003	0.011			0.0015	0.0015	0.009	
Oct-03			0.007	0.028	0.011	0.046			0.0025	0.0025	0.01	
Nov-03			0.008	0.012	0.01	0.01			0.003		0.01	
Jan-04				0.005					0.011			
Feb-04				0.01	0.007	0.005						
Mar-04			0.003	0.009					0.012			
Jul-04			0.007			0.007	0.005	0.006	0.005		0.02	
Oct-04			0.009			0.006			0.004		0.004	
Jan-05				0.006					0.009		0.015	
Apr-05			0.006	0.011		0.006	0.004		0.015		0.005	
Jul-05	0.003		0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	
Aug-05	0.001		0.001				0.001	0.001				
Sep-05	0.003	0.003	0.003				0.003	0.003				
Oct-05	0.003	0.005	0.005	0.016	0.005	0.001	0.005	0.005	0.02	0.002	0.004	
Nov-05	0.001	0.001	0.001				0.001	0.001				
Dec-05	0.001	0.001	0.001				0.001	0.001				
Jan-06	0.003	0.003	0.003	0.014	0.003	0.003	0.003	0.003	0.003	0.003	0.003	
Feb-06	0.001	0.001	0.003				0.003	0.001				
Mar-06	0.001	0.001	0.001				0.001	0.001				
Apr-06	0.003	0.003	0.008	0.003	0.003	0.007	0.008	0.001	0.014	0.003	0.003	
Jul-06	0.0025	0.0025	0.01	0.024	0.0025	0.006	0.007	0.0025	0.009	0.0025	0.0025	
Oct-06	0.004	0.004	0.022	0.035	0.004	0.01	0.004	0.014	0.015	0.004	0.012	
Jan-07	0.004	0.004	0.004	0.011	0.004	0.004	0.015	0.004	0.015	0.004	0.004	
Feb-07												0.0025
Mar-07												0.0025
Apr-07	0.0015	0.004	0.01	0.009	0.0015	0.004	0.014	0.006	0.009	0.006	0.008	0.0025
May-07												0.004
Jun-07												0.0015
Jul-07	0.0015	0.003	0.007	0.01	0.0015	0.009	0.011	0.003	0.007	0.0015	0.007	
Oct-07	0.0015	0.0015	0.02	0.0015	0.0015	0.0015	0.004	0.0015	0.005	0.0015	0.0015	
Dec-07												0.0015
Jan-08	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Apr-08	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Jul-08	0.014	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.016	
Oct-08	0.001	0.001	0.048	0.011	0.001	0.001	0.014	0.001	0.008	0.001	0.008	
Jan-09	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Apr-09	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Jul-09	0.0025	0.0025	0.008	0.013	0.0025	0.014	0.007	0.0025	0.0025	0.0025	0.0025	0.0025
Oct-09	0.0025	0.0025	0.14	0.034	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	
Jan-10	0.005	0.02	0.005	0.03	0.005	0.005	0.02	0.005	0.005	0.005	0.005	0.02
Apr-10	0.005	0.005	0.005	0.02	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jul-10	0.005	0.005	0.005	0.01	0.005	0.01	0.01	0.005	0.005	0.005	0.01	0.005
Oct-10	0.0015	0.0015	0.02	0.03	0.0015	0.0015	0.01	0.0015	0.0015	0.0015	0.01	
Jan-11	0.0015	0.0015	0.0015	0.03	0.0015	0.0015	0.01	0.0015	0.0015	0.0015	0.0015	0.0015
Apr-11	0.002	0.002	0.002	0.04	0.002	0.002	0.01	0.002	0.01	0.002	0.01	0.002
Jul-11	0.002	0.01	0.01	0.03	0.002	0.002	0.01	0.002	0.002	0.002	0.01	0.002
Oct-11		0.002	0.08	0.04	0.002	0.02	0.01	0.002	0.01	0.002	0.01	
Jan-12	0.002	0.01	0.01	0.02	0.002	0.002	0.01	0.002	0.002	0.002	0.002	0.002
Apr-12	0.002	0.002	0.002	0.04	0.002	0.002	0.03	0.002	0.01	0.002	0.01	0.01

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	Standard Dev	Maximum
Mean	0.00	0.00	0.01
Standard Dev	0.00	0.00	0.02
Maximum	0.01	0.02	0.14

Detection Statistics

Count	38	32	54	47	49	48	38	38	47	48	49	20
#Detects	1	5	29	39	12	25	19	4	25	4	28	3
%ND	97.4	84.4	46.3	17.0	75.5	47.9	50.0	89.5	46.8	91.7	42.9	85.0

Probability Distribution Analysis

Distribution	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Aitchison's	No	No	No	No	No	No	No	No	No	No	No	No
Adjusted Mean	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Adjusted StDev	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ln Mean	-5.36	-6.03	-4.79	-4.39	-5.06	-5.15	-5.11	-5.65	-5.31	-5.08	-4.95	-6.00
Ln StDev	2.20	0.76	1.74	1.07	2.05	1.45	1.55	1.80	0.93	2.35	1.50	0.75

Upper Percentiles of Data Distributions

	95th	99th
0.01	0.01	0.01
0.02	0.01	0.01
0.04	0.01	0.01
0.04	0.02	0.02
0.01	0.02	0.03
0.02	0.03	0.03
0.02	0.01	0.01
0.01	0.02	0.02
0.01	0.01	0.01
0.01	0.02	0.02
0.01	0.01	0.01

Upper Tolerance Limits with 95% Confidence

	95% Coverage	Tolerance (K)
0.01	0.01	0.02
0.02	0.01	0.04
0.04	0.02	0.04
0.02	0.05	0.03
0.03	0.01	0.02
0.01	0.02	0.01
0.02	0.01	0.02
0.01	0.02	0.01
0.02	0.01	0.02
0.01	0.02	0.01
0.02	0.01	0.02

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = (1-#detects/count)*mean of detected values

standard deviation = sqrt[(count-#detects+1)/(count-1)]*(SD of detected values)^2 + (#detects/count)[(#detects-count)/(count-1)]*(mean of detected values)^2

Upper Tolerance Limits

for normally distributed data: UTL = Mean + Standard Deviation*K

for log-normally-distributed data: UTL = exp(LnMean + LnStandard Deviation*K)

for non-parametric data: UTL = maximum detected value

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-32. Baseline Zinc Data

Date	MW-1A	MW-2A	MW-4A	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B
Nov-02			1.41	2.44	1.66	1.33			1.26	0.96	1.48	
Dec-02			1.4	3.33	1.92	3.04			3.41	1.34	1.94	
Jan-03			1.4	5.7	1.3	3.5			3.7	2.1	4.1	
Feb-03			0.9	1.7	0.8	1.4			1.7	1	2	
Mar-03			0.9	2.2	0.8	1.5			1.3	1.3	3	
Apr-03			1.12	1.54	0.035	2.02			1.25	0.035	1.19	
May-03			2.01	2	1.35	1.57			1.95	0.045	3.75	
Jun-03			1.1	1	0.4	1.2			1.2	1.1	0.8	
Jul-03			2.1	1.3	0.6	0.9			1	0.6	0.5	
Aug-03			4.9	2.2	0.7	0.5			2.4	3.7	0.8	
Sep-03			0.6	1.3	0.4	0.7			0.9	0.7	1.2	
Oct-03			1.36	3.82	1.34	24.6			1.52	1.88	1.47	
Nov-03			0.5									
Dec-03			0.94		0.79							
Jul-04	0.5											
Oct-04	0.48		0.49									
Jan-05							0.4					
Jul-05	1		1	3	1	1	3	3	3	1	2.4	
Aug-05	3		3				3	3				
Sep-05	0.025	0.025	0.025				0.025	0.025				
Oct-05	0.025	1.69	1.96	1.29	1.81	0.66	2.08	3.64	6.69	0.81	0.73	
Nov-05	0.025	0.025	0.025				0.025	0.025				
Dec-05	0.025	0.025	0.025				0.025	0.025				
Jan-06	0.025	1.89	2.94	0.025	2.32	3.68	2.49	2.5	5.9	4.31	0.025	
Feb-06	0.025	3.72	0.025				0.025	0.025				
Mar-06	0.82	0.68	0.025				1.67	1.21				
Apr-06	0.025	0.025	0.025	2.01	2.03	4.29	1.04	1.63	2.47	0.025	1.95	
Jul-06	2.3	1.2	3.8	1.9	3.5	1.5	1.8	1.9	6.7	3.8	6	
Oct-06	0.1	4.3	0.1	0.1	1.7	0.1	0.1	0.1	0.1	0.1	0.1	
Jan-07	6.2	20.6	7.6	14.5	7.4	6.2	13	14.2	15.8	9.6	16.3	
Feb-07												1.3
Mar-07												0.9
Apr-07	0.05	0.05	0.05	0.025	2.15	0.025	0.05	0.05	2.76	0.025	2.34	1.5
May-07												4.5
Jun-07												1.26
Jul-07	0.05	6.4	7.1	0.05	0.05	0.05	0.05	0.05	0.05	0.025	0.05	
Oct-07	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.03	0.03	0.05	
Dec-07												0.05
Jan-08	0.05	0.05	0.05	0.025	0.05	3.2	0.05	0.05	0.025	0.05	0.025	0.025
Apr-08	0.8	2.57	0.8	0.95	1.29	1.01	0.99	0.025	0.025	0.025	1.11	1.77
Jul-08	1.45	1.62	1.12	2.03	0.89	1.67	1.59	0.56	1.92	1.62	2.47	
Oct-08	1	0.9	1.2	2.9	0.8	0.8	2	1	2.6	0.7	2.7	
Jan-09	1.8	0.9	0.8	2.4	0.9	1	1.1	0.9	1.3	0.9	2	5
Apr-09	2.3	0.7	0.6	1.7	1.4	0.6	4.5	3.4	0.3	1.1	1.1	2.4
Jul-09	0.3	0.4	0.4	1.2	0.5	0.8	0.8	0.5	1	0.5	1.1	2.5
Oct-09	0.2	0.3	0.3	1.9	0.3	0.5	0.9	0.9	0.5	1.5	0.6	
Jan-10	0.6	12	0.6	2	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Apr-10	0.6	0.6	0.6	2.6	0.6	0.6	2.1	0.6	0.6	1.4	0.6	0.6
Jul-10	0.6	0.6	0.6	1.2	0.6	0.6	0.6	0.6	5	0.6	0.6	0.6
Oct-10	0.405	0.405	1	1.9	0.405	1.2	1.5	1.5	7	1.1	1.6	
Jan-11	0.405	0.85	1.05	2.22	0.405	1.57	1.67	0.405	0.9	0.93	1.23	1.38
Apr-11	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Jul-11	0.72	1	0.25	2.15	0.56	1.18	1.04	0.59	1.38	0.87	1.24	1.4
Oct-11	1.02	1.02	0.9	2.4	1	2.05	1.52	1.16	1.29	0.73	3.24	
Jan-12	1.13	24	1.08	2.96	1.16	2.06	2.52	1.65	2.63	1.89	1.84	1.81
Apr-12	1.13	1.73	0.25	2.96	0.92	1.17	0.83	0.25	1.3	0.25	0.79	3.24

Sample Statistics for Untransformed Site-Wide Pooled Data Sets

	Mean	0.81	2.83	1.24	2.13	1.14	2.02	1.53	1.36	2.34	1.24	1.88	1.64
Standard Dev	1.20	5.65	1.62	2.32	1.24	3.88	2.27	2.50	2.89	1.70	2.65	1.39	
Maximum	6.20	24.00	7.60	14.50	7.40	24.60	13.00	14.20	15.80	9.60	16.30	5.00	

Detection Statistics

	Count	36	32	49	41	42	41	35	34	40	40	41	20
#Detects	15	21	31	33	30	32	21	16	31	26	32	14	
%ND	58.3	34.4	36.7	19.5	28.6	22.0	40.0	52.9	22.5	35.0	22.0	30.0	

Probability Distribution Analysis

Distribution	NP	NP	NP	NP	LN	NP	NP	NP	NP	NP	NP	NP	NP
Aitchison's	No	No	No	No	Yes	No	No	No	No	No	No	No	No
Adjusted Mean	NA	NA	NA	NA	0.03	NA	NA	NA	NA	NA	NA	NA	NA
Adjusted StDev	NA	NA	NA	NA	19.04	NA	NA	NA	NA	NA	NA	NA	NA
Ln Mean	-1.22	-0.43	-0.64	0.13	-0.36	-0.02	-0.56	-0.86	0.10	-0.65	-0.04	-0.03	
Ln StDev	1.68	1.94	1.59	1.53	1.12	1.28	1.75	1.79	1.54	1.63	1.39	1.35	

Upper Percentiles of Data Distributions

95th	2.51	15.87	4.46	3.91	2.32	4.39	3.45	3.48	6.72	3.83	4.19	4.55
99th	5.11	22.95	7.36	11.07	5.84	17.42	10.11	10.72	12.37	7.54	12.28	4.91

Upper Tolerance Limits with 95% Confidence

95% Coverage	6.20	24.00	7.60	14.50	7.45	24.60	13.00	14.20	15.80	9.60	16.30	5.00
Tolerance (K)	NA	NA	NA	NA	2.10	NA	NA	NA	NA	NA	NA	NA

99% Coverage	6.20	24.00	7.60	14.50	18.49	24.60	13.00	14.20	15.80	9.60	16.30	5.00
Tolerance (K)	NA	NA	NA	NA	2.91	NA	NA	NA	NA	NA	NA	NA

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = $(1 - \# \text{detects} / \text{count}) * \text{mean of detected values}$

standard deviation = $\sqrt{\text{count} * (\# \text{detects} + 1) / (\text{count} - 1)} * (\text{SD of detected values})^2 + (\# \text{detects} / \text{count}) * [(\# \text{detects} - \text{count}) / (\text{count} - 1)] * (\text{mean of detected values})^2$

Upper Tolerance Limits

for normally distributed data: UTL = Mean + Standard Deviation*K

for log-normally-distributed data: UTL = $\exp(\text{LnMean} + \text{LnStandard Deviation} * K)$

for non-parametric data: UTL = maximum detected value

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-33. Site-Wide Baseline Dissolved Metals Data Summary and Statistical Analysis

Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
Sample Statistics for Untransformed Site-Wide Pooled Data Sets														
Mean	0.11	3.28	23.46	0.01	0.03	0.54	0.91	0.03	2.91	5.26	0.42	0.08	0.01	1.66
Standard Dev	0.14	5.53	16.12	0.01	0.04	0.96	1.05	0.12	9.19	7.71	0.46	0.53	0.01	2.71
Maximum	1.30	41.40	97.50	0.16	0.44	12.00	10.80	2.51	115.00	35.30	4.90	4.50	0.14	24.60
Detection Statistics														
Count	468	470	443	517	472	455	446	458	462	444	523	524	508	451
#Detects	403	455	438	237	319	337	408	288	388	421	326	155	268	344
# Non-Detects	65	15	5	280	153	118	38	170	74	23	197	369	240	107
%ND	13.9	3.2	1.1	54.2	32.4	25.9	8.5	37.1	16.0	5.2	37.7	70.4	47.2	23.7
Probability Distribution Analysis														
Distribution	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Aitchison's	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Adjusted Mean	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Adjusted StDev	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ln Mean	-0.44	-2.94	0.10	2.91	-5.08	-4.31	-1.90	-0.66	-4.50	0.86	-1.28	-5.62	-5.56	-0.40
Ln StDev	1.78	1.38	1.51	0.79	0.69	1.19	1.85	1.28	1.35	1.31	0.90	1.21	0.96	1.63
Upper Percentiles of Data Distributions														
95th	0.36	13.50	62.16	0.02	0.10	2.26	3.00	0.09	11.31	27.53	1.10	0.01	0.02	5.00
99th	0.73	26.62	80.29	0.03	0.24	3.65	4.26	0.22	44.85	32.00	2.02	4.00	0.04	15.23
Upper Tolerance Limits with 95% Confidence														
95% Coverage	1.30	41.40	97.50	0.16	0.44	12.00	10.80	2.51	115.00	35.30	4.90	4.50	0.14	24.60
Tolerance (K)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
99% Coverage	1.30	41.40	97.50	0.16	0.44	12.00	10.80	2.51	115.00	35.30	4.90	4.50	0.14	24.60
Tolerance (K)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Nondetect values were adjusted to .5*MDL

No values included in analyses when a well was not sampled during an event or where the MDL was not provided with historical data.

Probability Distribution Analysis:

for 0-50% non-detects, the Shapiro-Wilks W-test was used

for >50% non-detects, the data were assumed to be non-parametric

Probability Distribution Abbreviations: N = Normal; LN = Lognormal; NP = Non-Parametric

Aitchison's adjustment:

mean = (1-#detects/count)*mean of detected values

standard deviation = $\sqrt{\frac{count - \#detects + 1}{count - 1} * (SD \text{ of detected values})^2 + \frac{\#detects}{count} * \left(\frac{\#detects - count}{count - 1} \right) * (\text{mean of detected values})^2}$

Upper Tolerance Limits

for normally distributed data: UTL = Mean + Standard Deviation*K

for log-normally-distributed data: UTL = $\exp(\text{LnMean} + \text{LnStandard Deviation} * K)$

for non-parametric data: UTL = maximum detected value

for Aitchison's adjusted value, the adjusted mean and standard deviation were used in the above equations

Table 5-34. Comparative Analysis of Total and Dissolved Metals in Well MW-1A

Constituent	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc	
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T
7/27/2005	0.01	0.01	14	13.7	0.35	0.35	0.003	0.003	0.003	0.003	1.5	1.5	2.5	2.5	0.001	0.001	0.7	0.6	10	10	0.3	0.3	0.001	0.001	0.001	0.001	1	1
8/23/2005	0.0025	0.0025	11.1	11.8	36.9	32.7	0.002	0.002	0.003	0.009	1.5	1.5	2.5	2.5	0.001	0.021	0.7	0.6	10	10	0.3	0.3	0.001	0.001	0.001	0.001	3	3
9/20/2005	0.02	0.01	11.5	11.4	26.6	27	0.003	0.003	0.003	0.003	0.01	0.01	0.01	0.01	0.005	0.01	0.5	0.5	4.48	4.71	0.2	0.3	0.0025	0.0025	0.003	0.003	0.025	0.025
10/24/2005	0.01	0.01	12.2	12.4	25.2	26.2	0.003	0.003	0.03	0.06	0.01	0.01	0.03	0.04	0.005	0.005	0.4	0.3	0.4	0.6	0.05	0.05	0.0025	0.0025	0.003	0.003	0.025	0.025
11/15/2005	0.0025	0.015	12.1	12.6	29.9	30.1	0.002	0.002	0.001	0.001	0.01	0.01	0.22	0.38	0.03	0.016	0.5	2.1	1.64	1.63	0.1	0.1	0.001	0.001	0.001	0.001	0.025	1.49
12/14/2005	0.018	0.021	10.9	11.6	33.1	35.6	0.002	0.002	0.005	0.013	0.74	0.61	0.18	0.3	0.004	0.029	0.7	0.7	3.62	3.94	0.4	0.3	0.001	0.004	0.001	0.001	0.025	0.62
1/17/2006	0.01	0.01	11.1	11.5	27.8	29.9	0.003	0.003	0.006	0.023	0.01	0.04	0.01	0.08	0.005	0.005	0.6	0.8	1.07	1.11	0.35	0.8	0.0025	0.0025	0.003	0.003	0.025	3.47
2/14/2006	0.022		13.1		26.5		0.002		0.001		0.34		0.26		0.001		0.6	0.4	2.05		0.3		0.001		0.001		0.025	
3/14/2006	0.0025		11.4		24		0.004		0.046		0.02	0.01	0.46		0.006		0.3	0.3	2.12		0.2		0.002		0.001		0.82	
4/11/2006	0.03	0.01	11.5	11.2	24.5	25	0.003	0.003	0.01	0.02	0.01	0.01	0.01	0.01	0.005	0.01	0.4	0.4	0.1	0.4	0.05	0.05	0.0025	0.005	0.003	0.003	0.025	0.025
7/17/2006	0.01	0.01	10.9	11.4	24.7	25.6	0.004	0.004	0.01	0.01	0.13	0.16	0.21	0.28	0.004	0.012	1.5	1.9	1.26	1.37	0.1	0.1	0.0015	0.0015	0.0025	0.0025	2.3	3.8
10/10/2006	0.01	0.01	13.8	13.4	28.5	27.9	0.01	0.002	0.01	0.01	0.015	0.65	0.015	0.015	0.004	0.011	0.03	0.03	0.4	0.5	0.3	0.1	0.0035	0.0035	0.004	0.004	0.1	1.1
1/17/2007	0.02	0.02	11	11.6	18	21.1	0.002	0.002	0.01	0.07	0.015	0.015	0.2	0.4	0.004	0.047	0.1	0.2	0.3	0.5	0.1	0.1	0.0035	0.0035	0.004	0.004	6.2	10.9
4/16/2007	0.01	0.01	10.7	11	19.2	22	0.003	0.003	0.0035	0.0035	0.015	0.015	0.27	0.39	0.0015	0.022	0.2	0.6	0.5	0.6	0.5	0.5	0.0045	0.0045	0.0015	0.005	0.05	2.1
7/17/2007	0.024	0.013	13.5	13.9	24.9	26.2	0.004	0.004	0.0025	0.013	0.035	0.035	0.01	0.01	0.188	0.023	0.025	0.025	0.5	0.7	0.3	0.3	0.002	0.005	0.0015	0.004	0.05	0.05
10/8/2007	0.0045	0.0045	12.5	12.6	21.8	22.2	0.004	0.004	0.0025	0.0025	0.22	0.27	0.08	0.13	0.0045	0.015	0.025	0.025	0.47	0.52	0.2	0.2	0.002	0.002	0.0015	0.0015	0.05	0.05
1/21/2008	0.017	0.015	12.1	12.1	20.5	21.2	0.004	0.004	0.0025	0.0025	0.38	0.44	0.4	0.43	0.077	0.06	0.025	0.025	0.93	1.03	0.2	0.2	0.002	0.002	0.0015	0.0015	0.05	0.05
4/14/2008	0.015	0.015	8.3	7.8	20.6	21.4	0.003	0.003	0.0035	0.0035	0.5	0.44	0.24	0.51	0.0015	0.043	0.025	0.7	0.67	1.01	0.1	0.1	0.0045	0.0045	0.0015	0.0015	0.8	2.29
7/28/2008	0.037	0.005	14.1	13.9	35	36.2	0.01	0.01	0.0025	0.0025	0.47	0.35	0.31	0.34	0.031	0.035	0.025	0.025	3.71	3.73	0.25	0.25	0.0045	0.0045	0.014	0.011	1.45	1.25
10/20/2008	0.0025	0.0025	13.1	13	28.9	29.3	0.004	0.004	0.0025	0.0025	0.011	0.002	0.12	0.16	0.0015	0.0015	0.31	0.04	0.66	0.77	0.15	0.15	0.0025	0.0025	0.001	0.001	1	5.1
1/14/2009	0.0025	0.0025	10.6	10.5	20.5	21.1	0.004	0.004	0.0025	0.0025	0.002	0.002	0.16	0.18	0.0015	0.0015	0.04	0.04	0.55	0.53	0.2	0.2	0.0025	0.0025	0.001	0.001	1.8	2.9
4/6/2009	0.0025		12.3		25.2		0.004		0.0025		0.015		0.18		0.0015		0.1		0.61		0.2		0.0025		0.001		2.3	
7/21/2009	0.0025	0.0025	13.2	13	32.2	32.4	0.003	0.003	0.006	0.008	0.01	0.01	0.24	0.3	0.0025	0.009	0.27	0.09	0.82	0.84	0.15	0.15	0.002	0.002	0.0025	0.0025	0.3	0.5
10/19/2009	0.0025	0.0025	12.8	12.8	26.5	26.8	0.003	0.003	0.0025	0.0025	0.01	0.01	0.21	0.23	0.0025	0.013	0.16	0.16	0.3	0.37	0.15	0.6	0.002	0.002	0.0025	0.05	0.2	0.3
1/9/2010	0.01	0.03	11.9	11.7	23.6	23.6	0.015	0.011	0.02	0.03	0.175	0.04	0.06	0.13	0.015	0.03	0.075	0.075	0.43	0.34	0.165	0.21	0.002	0.004	0.005	0.0015	0.6	0.89
4/12/2010	0.01	0.02	12.7	13	29.1	30.3	0.015	0.0135	0.005	0.004	0.07	0.016	0.2	0.27	0.03	0.041	0.095	0.095	0.32	0.5	0.38	0.39	0.002	0.004	0.005	0.0015	0.6	0.19
7/23/2010	0.01	0.004	12.7	13.5	32.3	34	0.015	0.0135	0.005	0.011	0.175	0.065	0.06	0.29	0.03	0.041	0.18	0.18	0.39	0.5	0.37	0.33	0.009	0.0045	0.005	0.0015	0.6	2.9
10/18/2010	0.01	0.01	12.3	11.7	26.1	25.2	0.0135	0.0135	0.011	0.011	0.065	0.065	0.115	0.25	0.041	0.041	0.19	0.15	0.3	0.38	0.25	0.27	0.0045	0.0045	0.0015	0.0015	0.405	0.405
1/18/2011	0.004	0.004	13	13.6	28	29.3	0.0135	0.0135	0.011	0.011	0.0265	0.0265	0.27	0.35	0.041	0.041	0.15	0.26	0.36	0.39	0.24	0.3	0.0045	0.0045	0.0015	0.0015	0.405	0.405
4/25/2011	0.005	0.005	12.7	12.9	30.3	31.4	0.0105	0.0105	0.005	0.02	0.0225	0.0225	0.25	0.29	0.023	0.023	0.075	0.075	0.45	0.48	0.31	0.34	0.004	0.004	0.002	0.002	0.25	0.25
7/19/2011	0.02	0.02	12.2	12.9	25	27.3	0.0105	0.0105	0.005	0.005	0.0225	0.0225	0.3	0.28	0.023	0.023	0.25	0.16	0.37	0.45	0.19	0.16	0.004	0.004	0.002	0.002	0.72	0.85
1/23/2012	0.005	0.02	12.4	12.8	32.4	34.2	0.0105	0.0105	0.005	0.005	0.0225	0.0225	0.35	0.4	0.023	0.05	0.075	0.18	0.41	0.5	0.25	0.25	0.004	0.004	0.002	0.002	1.13	1.54
4/23/2012	0.005	0.005	12.4	12.5	35.9	38.1	0.0105	0.0105	0.005	0.005	0.0225	0.0225	0.44	0.31	0.023	0.023	0.62	0.45	0.6	0.48	0.23	0.15	0.004	0.01	0.002	0.002	1.13	1.06

Paired T Test														
p-level	0.693355	0.046255	0.001979	0.103567	0.01607	0.802964	0.000196	0.694858	0.286557	5.85E-05	0.310537	0.139249	0.415573	0.002262
Significant?	No	Yes	Yes	No	Yes	No	Yes	No	No	Yes	No	No	No	Yes

Wilcoxon Signed Rank Test														
W Value	26.5	288.5	357	0	77	31.5	303	146.5	90	370	54	22	10.5	178
p-level	0.95906	0.052551	0.000473	1	0.003252	0.345005	0.000164	0.040055	0.538294	0.000149	0.576104	0.203272	1	0.0009
Significant?	No	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No	No	No	Yes

Correlation Analysis														
Pearson R	0.296539	0.948865	0.98114	0.908265	0.734774	0.931579	0.995216	0.313439	0.720228	0.998407	0.65533	0.999997	0.129296	0.846718
p-level	0.05578	6.66E-16	0	2.07E-12	2.83E-06	1.42E-14	0	0.045837	1.68E-06	0	4.24E-05	0	0.247949	1.85E-09
Significant?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Spearman Test														
Spearman Rho	0.609036	0.938789	0.977854	0.878416	0.848048	0.798859	0.867338	0.500198	0.721322	0.895784	0.791149	0.700151	0.581504	0.617614
p-level	0.000177	8.71E-15	7.3E-21	8.85E-11	3.17E-09	3.58E-08	2.79E-10	0.00244	1.6E-06	1.14E-11	9.74E-08	8.27E-06	0.000376	0.000138
Significant?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes:
 NA = Not applicable, data too homogeneous
 α = 0.05
 All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-35. Comparative Analysis of Total and Dissolved Metals in Well MW-2A

Constituent	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc		
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	
9/20/2005	0.05	0.05	2.61	2.65	18	18.2	0.003	0.003	0.003	0.003	0.01	0.01	0.37	0.37	0.02	0.01	0.6	0.5	5.09	5.05	0.4	0.3	0.0025	0.0025	0.003	0.003	0.025	0.025	
10/24/2005	0.0125	0.005	2.8	2.5	17.6	14.2	0.01	0.008	0.034	0.01	0.05	0.02	0.56	0.26	0.068	0.037	0.7	0.8	2.94	1.68	0.5	0.2	0.005	0.002	0.005	0.002	1.69	0.05	
11/15/2005	0.0025	0.0025	2.8	3	28.1	28.2	0.002	0.002	0.001	0.001	0.01	0.01	0.59	0.22	0.048	0.001	0.4	0.5	2.88	2.86	0.3	0.3	0.001	0.001	0.001	0.001	0.001	0.025	0.025
12/14/2005	0.131	0.119	1.5	1.5	28.8	29.6	0.002	0.005	0.003	0.003	1.37	0.79	0.34	0.33	0.007	0.006	1.4	0.5	5.54	5.67	0.8	0.8	0.001	0.001	0.001	0.001	0.025	0.025	
1/17/2006	0.08	0.09	2	2.03	22.9	23.8	0.003	0.003	0.003	0.003	0.11	0.04	0.11	0.12	0.005	0.005	0.4	0.6	2.75	2.65	0.35	1	0.0025	0.0025	0.003	0.003	1.89	3.05	
2/14/2006	0.076		1.6		22.5		0.002		0.001		0.4		0.55		0.001		0.8	0.6	3.56		0.8		0.001		0.001		3.72		
3/14/2006	0.0025		1.7		29		0.004		0.002		0.02	0.01	0.72		0.004		0.4	0.5	5.41		0.9		0.002		0.001		0.68		
4/11/2006	0.1	0.08	2.81	2.69	36.3	34.4	0.003	0.003	0.01	0.02	0.01	0.01	0.01	0.24	0.005	0.005	0.2	0.4	3.1	2.8	0.3	0.2	0.0025	0.0025	0.003	0.003	0.025	3.47	
7/17/2006	0.1	0.11	1.7	1.6	29.7	29.9	0.004	0.004	0.01	0.01	0.25	0.95	0.41	0.41	0.004	0.004	1.7	1.8	3.21	3.51	0.4	0.4	0.0015	0.0015	0.0025	0.0025	1.2	2.9	
10/10/2006	0.03	0.03	2.06	2.05	21.3	21.5	0.01	0.002	0.01	0.01	0.015	0.015	0.015	0.015	0.004	0.012	0.03	0.03	1.3	1.3	0.2	0.1	0.0035	0.0035	0.004	0.004	4.3	2.1	
1/17/2007	0.07	0.01	1.59	1.62	25.2	25.8	0.002	0.002	0.01	0.01	0.015	0.015	0.31	0.32	0.02	0.022	0.2	0.3	1.9	2.1	0.1	0.1	0.0035	0.0035	0.004	0.004	20.6	5	
4/16/2007	0.079	0.073	1.62	1.64	32	33.6	0.003	0.003	0.0035	0.0035	0.015	0.015	0.48	0.48	0.0015	0.0015	0.2	0.3	2.8	2.7	2.1	2.2	0.0045	0.0045	0.004	0.012	0.05	3.3	
7/17/2007	0.08	0.066	1.38	1.41	29.6	29	0.004	0.004	0.0025	0.0025	0.035	0.035	0.01	0.01	0.011	0.0045	0.025	0.025	2.3	2.2	0.3	0.3	0.002	0.002	0.003	0.003	6.4	0.05	
10/8/2007	0.0045	0.0045	0.04	1.65	25.9	25.5	0.004	0.01	0.0025	0.0025	0.21	0.42	0.18	0.18	0.0045	0.0045	0.025	0.025	1.8	1.87	0.2	0.2	0.002	0.002	0.0015	0.0015	0.05	0.05	
1/21/2008	0.106	0.088	1.29	1.29	33.9	34.2	0.004	0.004	0.0025	0.0025	0.25	0.24	0.48	0.44	0.01	0.01	0.025	1.7	3.11	3.1	0.5	0.4	0.002	0.002	0.0015	0.0015	0.05	0.05	
4/14/2008	0.05	0.05	1.21	1.22	32.8	32.6	0.003	0.003	0.017	0.015	0.32	0.46	0.25	0.22	0.0015	0.0015	0.025	0.8	2.64	2.5	1	0.9	0.0045	0.0045	0.0015	0.0015	2.57	0.64	
7/28/2008	0.04	0.05	1.62	1.57	33.8	33.9	0.0015	0.0015	0.004	0.004	0.33	1.74	0.21	0.23	0.022	0.0015	0.025	0.025	2.27	2.85	0.1	0.1	0.0015	0.0015	0.0015	0.0015	1.62	0.6	
10/20/2008	0.0025	0.0025	1.6	1.8	31.2	31.6	0.004	0.004	0.0025	0.0025	0.142	0.21	0.18	0.21	0.0015	0.0015	0.29	0.04	1.97	2.21	0.15	0.15	0.0025	0.0025	0.001	0.001	0.9	1.2	
1/14/2009	0.064	0.058	3.1	3	41.3	40.8	0.004	0.004	0.0025	0.0025	0.002	0.002	0.18	0.22	0.0015	0.0015	0.04	0.04	2.6	2.71	0.2	0.6	0.0025	0.0025	0.001	0.001	0.9	0.5	
4/6/2009	0.0025		1.1		37.7		0.004		0.0025		0.05		0.09		0.0015		0.08		2.38		0.5		0.0025		0.001		0.7		
7/21/2009	0.054	0.055	1.2	1.3	42.4	41.7	0.003	0.008	0.0025	0.0025	0.01	0.01	0.34	0.31	0.0025	0.0025	0.39	0.37	2.98	2.98	0.4	0.6	0.002	0.002	0.0025	0.0025	0.4	0.4	
10/19/2009	0.0025	0.053	4.3	4.5	39.3	40.3	0.003	0.003	0.0025	0.0025	0.01	0.22	0.48	0.36	0.0025	0.0025	0.17	0.35	2.32	2.31	1.1	1.3	0.002	0.002	0.0025	0.0025	0.3	0.2	
1/9/2010	1	1	3.8	3.9	24.2	24.9	0.015	0.011	0.06	0.06	0.37	0.5	3.5	3.9	0.14	0.3	5.31	5.6	3.2	3.6	0.4	0.42	0.02	0.02	0.02	0.02	12	13	
4/12/2010	0.05	0.06	2.1	2.3	32.5	34.3	0.015	0.0135	0.005	0.07	0.07	0.016	0.6	0.37	0.03	0.041	0.25	0.075	2.9	3	0.6	0.9	0.002	0.01	0.005	0.0015	0.6	0.19	
7/23/2010	0.05	0.004	2.1	2.3	41.8	41.4	0.015	0.0135	0.005	0.011	0.07	0.0265	0.27	0.28	0.03	0.041	0.31	0.18	3.3	3.2	0.165	0.06	0.002	0.01	0.005	0.0015	0.6	0.405	
10/18/2010	0.03	0.04	2.4	2.6	33.5	33.3	0.0135	0.0135	0.03	0.03	0.35	0.0265	0.3	0.33	0.041	0.041	0.17	0.15	2.6	2.6	0.06	0.9	0.0045	0.0045	0.0015	0.0015	0.405	0.405	
1/18/2011	0.03	0.03	5	5	30.6	30	0.0135	0.0135	0.011	0.011	0.08	0.08	0.44	0.41	0.041	0.041	0.31	0.28	2.5	2.4	0.9	0.7	0.0045	0.0045	0.0015	0.0015	0.85	0.405	
4/25/2011	0.04	0.05	3.5	3.7	36.5	36.5	0.0105	0.0105	0.02	0.02	0.1	0.08	0.43	0.44	0.023	0.023	0.79	0.4	3.1	3.1	1.1	1.1	0.004	0.004	0.002	0.002	0.25	0.25	
7/19/2011	0.05	0.05	0.9	1.7	47	47	0.03	0.0105	0.03	0.03	0.06	0.09	0.37	0.36	0.023	0.023	0.26	0.23	3.3	3.3	0.065	0.98	0.01	0.004	0.01	0.002	1	0.93	
10/24/2011	0.04	0.04	5.7	5.7	39	40.3	0.0105	0.0105	0.02	0.03	0.12	0.055	0.6	0.26	0.023	0.023	0.97	0.25	3.4	3	0.8	0.7	0.004	0.01	0.002	0.01	1.02	0.74	
1/23/2012	1.3	1.3	4.7	5	23.4	23.5	0.0105	0.0105	0.2	0.2	0.88	0.9	5.2	5.4	0.2	0.3	6.32	8	4.2	4.3	0.41	0.43	0.01	0.02	0.01	0.01	24	24	
4/23/2012	0.02	0.03	2.5	2.4	46.3	49.1	0.0105	0.0105	0.02	0.03	0.0225	0.0225	0.6	3.3	0.023	0.07	1.22	0.57	4.1	4.1	0.9	0.7	0.004	0.004	0.002	0.002	1.73	2.29	

Paired T Test														
p-level	0.509495	0.055554	0.493942	0.341172	0.303702	0.336593	0.449436	0.283396	0.506221	0.787524	0.164213	0.195758	0.896783	0.29396
Significant?	No	No	No	No	No	No	No	No	No	No	No	No	No	No

Wilcoxon Signed Rank Test														
W Value	55.5	246.5	233	9	16	109	132	47	186	144	125.5	17.5	9.5	85
p-level	0.533279	0.024508	0.295808	0.833935	0.293177	0.586906	0.86695	0.556147	0.799337	0.867026	0.454958	0.170587	0.916051	0.466622
Significant?	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No

Correlation Analysis														
Pearson R	0.997824	0.965234	0.991119	0.640591	0.941735	0.603198	0.908376	0.943648	0.954641	0.944885	0.794508	0.753733	0.780479	0.825176
p-level	0	0	0	9.08E-05	1.34E-14	0.000209	4.96E-12	8.66E-15	0	6.44E-15	1.33E-07	1.18E-06	2.96E-07	1.82E-08
Significant?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Spearman Test														
Spearman Rho	0.835225	0.935297	0.990516	0.780341	0.923442	0.831748	0.762947	0.744658	0.618783	0.894763	0.586203	0.719715	0.705251	0.570739
p-level	8.73E-09	5.33E-14	4.08E-25	2.99E-07	4.81E-13	6.18E-09	7.47E-07	1.81E-06	0.000103	2.97E-11	0.000416	5.4E-06	9.67E-06	0.000612
Significant?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes:
 NA = Not applicable, data too homogeneous
 α = 0.05
 All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-36. Comparative Analysis of Total and Dissolved Metals in Well MW-4A

Constituent	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc		
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	
7/27/2005	0.06	0.07	1.66	1.96	45.4	44.9	0.003	0.003	0.025	0.027	1	1	4	4	0.005	0.005	1	0.05	1	1	0.05	0.05	4	4	0.003	0.01	1	1	
8/23/2005	0.07	0.069	1.9	1.9	66.2	64.6	0.002	0.002	0.017	0.017	1.5	1.5	2.5	2.5	0.003	0.005	2	3.2	10	10	2.7	2.4	0.001	0.001	0.001	0.001	3	3	
9/20/2005	0.15	0.11	4.79	4.56	67.1	59.6	0.003	0.003	0.003	0.003	0.01	0.01	1.95	1.82	0.005	0.04	1.7	2.3	13.5	13.3	1	1	0.0025	0.011	0.003	0.003	0.025	0.025	
10/24/2005	0.109	0.116	2.2	2	63.2	60.4	0.01	0.009	0.042	0.022	0.05	0.02	1.52	1.04	0.07	0.017	1.4	1.9	4.34	3.35	1.7	1.3	0.005	0.002	0.005	0.002	1.96	0.91	
11/15/2005	0.126	0.122	1	1	50.5	51.1	0.002	0.002	0.001	0.01	0.01	0.01	1.06	1.75	0.001	0.04	2.2	2.4	5.15	5.34	1.9	1.8	0.001	0.001	0.001	0.001	0.007	0.025	2.06
12/14/2005	0.121	0.124	0.9	0.9	43.1	44.2	0.005	0.007	0.019	0.019	1.7	2.04	1.05	1.1	0.001	0.003	2.1	2.9	9.6	9.9	1.6	1.6	0.001	0.001	0.001	0.001	0.025	0.025	
1/17/2006	0.15	0.11	0.27	0.31	27.6	28	0.003	0.003	0.028	0.041	0.08	0.11	0.61	0.58	0.005	0.005	2.2	2.8	2.3	2.44	0.35	0.8	0.0025	0.0025	0.003	0.003	2.94	2.84	
2/14/2006	0.12		0.4		24.1		0.003		0.072		0.01		0.75		0.005		2.4	2.6	3.3		0.2		0.0025		0.003		0.025		
3/14/2006	0.0025		0.3		22.4		0.007		0.023		0.01	0.01	1.09		0.005		1.5	2.1	4.01		0.7		0.001		0.001		0.025		
4/11/2006	0.1	0.01	0.5	0.57	24	24.1	0.003	0.003	0.04	0.03	0.01	0.01	0.72	0.76	0.005	0.005	1.2	2	0.1	0.1	0.1	0.2	0.0025	0.0025	0.008	0.008	0.025	0.025	
7/17/2006	0.1	0.01	1.1	1.2	52.2	50.4	0.004	0.004	0.01	0.01	0.24	0.24	1.1	1.2	0.004	0.004	2.5	3.4	3.85	3.98	0.4	0.4	0.0015	0.0015	0.01	0.011	3.8	2.5	
10/10/2006	0.08	0.1	1.6	1.65	53.3	51.5	0.01	0.002	0.031	0.04	0.015	0.015	0.015	0.015	0.004	0.004	0.03	0.03	1.8	1.7	0.4	0.2	0.0035	0.0035	0.022	0.004	0.1	2.3	
1/17/2007	0.13	0.13	0.27	0.31	21.1	21.3	0.002	0.002	0.01	0.01	0.015	0.015	1.06	1.05	0.004	0.02	1.2	1.3	0.5	0.5	0.2	0.1	0.0035	0.0035	0.004	0.009	7.6	7.3	
4/16/2007	0.11	0.088	0.78	0.79	24	24.2	0.003	0.003	0.0035	0.0035	0.015	0.015	1.17	1.21	0.0015	0.013	1.5	1.7	0.9	0.9	1.9	1.9	0.0045	0.0045	0.01	0.012	0.05	0.05	
7/17/2007	0.402	0.364	0.45	0.45	8.23	8.42	0.009	0.014	0.028	0.03	0.035	0.035	2.08	2.05	0.018	0.039	4.8	5.3	0.8	0.8	0.3	0.3	0.002	0.004	0.007	0.008	7.1	0.05	
10/8/2007	0.136	0.0045	0.04	1.72	37.8	35.4	0.004	0.004	0.0025	0.0025	0.21	0.24	0.88	0.88	0.01	0.027	1.2	2	2.87	2.82	0.2	0.2	0.002	0.002	0.02	0.021	0.05	0.05	
1/21/2008	0.136	0.0045	0.31	0.34	23	23.6	0.004	0.004	0.0025	0.0025	0.41	0.42	1.06	1.11	0.0045	0.014	1.3	9.9	1.12	1.21	0.2	0.2	0.002	0.002	0.0015	0.009	0.05	0.05	
4/14/2008	0.12	0.12	0.44	0.36	24	23.8	0.003	0.003	0.0035	0.0035	0.36	0.69	1.08	1	0.0015	0.0015	1.6	1.5	1.46	1.41	0.4	0.4	0.0045	0.0045	0.0015	0.0015	0.8	1.95	
7/28/2008	0.13	0.12	0.9	1.03	37.3	36.6	0.0015	0.0015	0.02	0.033	0.25	0.27	1.04	1.09	0.0015	0.029	0.025	1.54	2.31	2.32	0.1	0.2	0.0015	0.0015	0.0015	0.0015	1.12	1.22	
10/20/2008	0.2	0.152	1.5	1.6	36	29.7	0.004	0.004	0.07	0.048	0.006	0.002	0.64	0.65	0.0015	0.0015	0.69	1.04	2.34	2.15	0.15	0.15	0.0025	0.0025	0.048	0.043	1.2	0.8	
1/14/2009	0.174	0.149	0.1	0.24	21.6	21.9	0.004	0.004	0.0025	0.0025	0.002	0.224	0.83	0.81	0.0015	0.0015	1.57	1.67	0.66	0.7	0.2	0.2	0.0025	0.0025	0.001	0.001	0.8	1	
4/6/2009	0.104		0.3		19.6		0.004		0.0025		0.12		0.78		0.0015		0.91		0.65		0.2		0.0025		0.001		0.6		
7/21/2009	0.11	0.104	0.9	0.9	26	25.1	0.003	0.003	0.016	0.015	0.01	0.01	1.07	1.03	0.0025	0.012	0.98	1.61	1.53	1.58	0.15	0.15	0.002	0.002	0.008	0.008	0.4	0.5	
10/19/2009	0.926	0.795	1.6	1.7	32.7	29.6	0.003	0.003	0.154	0.144	0.01	0.01	0.74	0.82	0.0025	0.027	0.24	1.23	2.23	2.2	0.15	0.15	0.002	0.002	0.14	0.156	0.3	0.6	
1/9/2010	0.19	0.2	0.2	0.2	15.2	15.7	0.015	0.011	0.02	0.03	0.07	0.14	1	1.1	0.015	0.0125	1.53	1.51	0.34	0.44	0.165	0.14	0.002	0.004	0.005	0.01	0.6	2.8	
4/12/2010	0.1	0.13	0.2	0.2	13	13.2	0.015	0.0135	0.005	0.01	0.07	0.15	0.8	0.8	0.03	0.041	0.92	1.01	0.34	0.38	0.165	0.11	0.002	0.004	0.005	0.0015	0.6	1.8	
7/23/2010	0.12	0.12	0.8	0.8	19.3	18.8	0.015	0.0135	0.005	0.011	0.1	0.1	0.0265	0.9	0.9	0.03	0.041	0.79	1.19	1.3	1.3	0.27	0.3	0.002	0.01	0.005	0.0015	0.6	0.405
10/18/2010	0.14	0.14	0.9	0.9	21.2	21.4	0.0135	0.0135	0.06	0.07	0.06	0.1	1	1	0.041	0.041	1	1.54	1.5	1.5	0.32	0.32	0.0045	0.0045	0.02	0.02	1	1.1	
1/18/2011	0.14	0.14	1.1	1.1	29.6	28.7	0.0135	0.0135	0.05	0.06	0.31	0.35	1.9	2.2	0.041	0.041	2.86	11.6	0.6	0.6	0.34	0.28	0.0045	0.01	0.0015	0.0015	1.05	0.99	
4/25/2011	0.11	0.11	0.2	0.3	10.5	10.7	0.0105	0.0105	0.02	0.02	0.16	0.21	1.1	1.1	0.023	0.023	1.82	1.54	0.36	0.32	0.065	0.25	0.004	0.004	0.002	0.002	0.25	0.25	
7/19/2011	0.1	0.1	0.6	0.7	16.5	17.5	0.0105	0.0105	0.02	0.02	0.1	0.13	0.9	1	0.023	0.023	1.13	1.26	1	1.1	0.22	0.26	0.01	0.01	0.01	0.01	0.25	0.79	
10/24/2011	0.4	0.3	1	1	30.4	29.8	0.0105	0.0105	0.1	0.1	0.055	0.06	0.8	1	0.023	0.023	1.12	1	2.5	2.5	0.35	0.49	0.004	0.004	0.08	0.06	0.9	2.8	
1/23/2012	0.12	0.12	0.3	0.3	35.6	34.1	0.0105	0.0105	0.02	0.03	0.12	0.1	1.3	1.2	0.023	0.023	1.12	1.56	0.6	0.6	0.28	0.31	0.004	0.01	0.01	0.01	1.08	0.8	
4/23/2012	0.09	0.06	0.2	0.2	9.8	9.8	0.0105	0.0105	0.02	0.005	0.06	0.2	0.9	1	0.023	0.023	1.94	2.29	0.41	0.37	0.065	0.14	0.004	0.004	0.002	0.002	0.25	0.25	

Paired T Test														
p-level	0.002409	0.163102	0.017027	0.409204	0.667324	0.018107	0.158241	0.047306	0.018315	0.664851	0.909936	0.035805	0.966808	0.88329
Significant?	Yes	No	Yes	No	No	Yes	No	Yes	Yes	No	No	Yes	No	No

Wilcoxon Signed Rank Test														
W Value	27	133	133.5	4.5	78	161	208	105	478.5	114	78	32	46	141
p-level	0.002182	0.0406	0.042547	1	0.622504	0.008366	0.100222	0.011457	6.28E-05	0.750869	0.962217	0.057471	0.609983	0.384772
Significant?	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	No	No	No	No	No

Correlation Analysis														
Pearson R	0.961138	0.940957	0.994765	0.904806	0.951828	0.982297	0.953035	0.425133	0.518548	0.997861	0.980571	0.999994	0.979262	0.588227
p-level	0	1.78E-15	0	1.43E-12	1.11E-16	0	0	0.00856	0.000996	0	0	0	0	0.00025
Significant?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Spearman Test														
Spearman Rho	0.712625	0.84866	0.995563	0.873713	0.904148	0.873418	0.9137	0.550421	0.799498	0.993344	0.868089	0.711299	0.79592	0.586556
p-level	3.44E-06	8.14E-10	1.26E-31	6.99E-11	1.57E-12	3.46E-11	3.65E-13	0.000668	1.2E-08	4.46E-29	1.27E-10	3.64E-06	4.33E-08	0.000262
Significant?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes:
 NA = Not applicable, data too homogeneous
 α = 0.05
 All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-37. Comparative Analysis of Total and Dissolved Metals in Well MW-5

Constituent	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc		
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	
7/27/2005	0.16	0.15	0.61	0.64	19.6	20.4	0.018	0.026	0.01	0.01	1.5	1.5	2.5	2.5	0.005	0.04	0.7	0.02	10	21	1.4	1.6	2	2	0.003	0.003	3	3	
10/24/2005	0.11	0.1	0.53	0.5	28.3	27.2	0.003	0.003	0.17	0.2	0.01	0.01	0.52	0.5	0.005	0.005	2.5	0.5	25.4	26.4	0.2	0.1	0.0025	0.0025	0.016	0.017	1.29	1.4	
1/17/2006	0.18	0.16	0.12	0.12	13.6	13.7	0.003	0.003	0.03	0.06	0.03	0.33	0.55	0.62	0.005	0.005	0.05	1.2	1.67	1.72	0.05	0.05	0.0025	0.0025	0.014	0.003	0.025	2.6	
4/11/2006	0.16	0.01	0.23	0.25	10.6	11.3	0.003	0.003	0.03	0.03	0.01	0.01	0.58	0.6	0.005	0.01	0.6	0.8	0.1	0.1	0.2	0.1	0.0025	0.0025	0.003	0.003	2.01	0.025	
7/17/2006	0.14	0.14	0.3	0.3	18	18.2	0.004	0.004	0.06	0.08	0.035	0.035	0.69	0.71	0.004	0.01	1.7	2.3	8.18	8.13	0.3	0.3	0.0015	0.0015	0.024	0.025	1.9	7.2	
10/10/2006	0.14	0.13	0.37	0.37	26.1	27.8	0.01	0.002	0.242	0.184	0.015	0.015	0.015	1.04	0.004	0.019	0.03	0.03	15.5	18.8	0.3	0.2	0.0035	0.0035	0.035	0.031	0.1	3.9	
1/17/2007	0.16	0.15	0.28	0.29	14.2	14.2	0.002	0.004	0.04	0.05	0.015	0.015	0.9	0.92	0.004	0.01	0.4	0.5	0.8	1.9	0.1	0.1	0.0035	0.0035	0.011	0.013	14.5	5.5	
4/16/2007	0.19	0.17	0.37	0.56	12.5	15.2	0.003	0.015	0.058	0.07	0.015	0.91	0.9	1.63	0.01	0.383	0.5	1.7	0.9	1.6	0.7	0.7	0.0045	0.0045	0.009	0.015	0.025	3.88	
7/17/2007	0.142	0.138	0.41	0.41	17.1	17.8	0.004	0.015	0.037	0.042	0.035	0.035	0.82	0.82	0.0045	0.054	0.4	0.5	7.9	8.1	0.3	0.3	0.002	0.002	0.01	0.01	0.05	0.05	
10/8/2007	0.147	0.136	0.04	0.04	21.8	22.6	0.004	0.004	0.0025	0.0025	0.26	0.29	0.81	0.82	0.019	0.026	0.025	0.025	8.87	10.6	0.2	0.2	0.002	0.002	0.0015	0.008	0.05	0.05	
1/21/2008	0.19	0.18	0.39	0.49	13.4	15.3	0.003	0.01	0.074	0.098	0.11	0.38	0.76	1.25	0.0015	0.25	0.4	1.4	2.04	2.48	0.05	0.1	0.0045	0.0045	0.0015	0.004	0.025	0.025	
4/14/2008	0.16	0.16	0.27	0.37	12.1	12.7	0.003	0.003	0.0035	0.0035	0.31	0.89	0.81	0.99	0.0015	0.078	1.2	2	0.9	1.26	0.3	0.4	0.0045	0.0045	0.0015	0.0015	0.95	1.84	
7/28/2008	0.14	0.15	0.11	0.18	15.8	15.9	0.0015	0.022	0.026	0.032	0.015	0.38	0.58	0.66	0.0015	0.045	0.025	0.025	6.43	5.29	0.2	0.2	0.0015	0.0015	0.0015	0.0015	2.03	1.18	
10/20/2008	0.166	0.131	0.32	0.32	20.1	20.2	0.004	0.004	0.058	0.053	0.085	0.208	0.61	0.72	0.0015	0.022	0.04	0.04	7.17	7.37	0.15	0.15	0.0025	0.0025	0.011	0.01	2.9	1.8	
1/14/2009	0.176	0.185	0.36	0.45	20.8	22.3	0.004	0.01	0.046	0.061	0.002	0.368	0.54	0.87	0.0015	0.143	0.04	2.1	2.28	3.13	0.8	0.7	0.0025	0.0025	0.001	0.001	2.4	2.3	
4/6/2009	0.12	0.3	0.3	0.3	23.2	22.7	0.004	0.004	0.044	0.044	0.14	0.14	0.77	0.77	0.0015	0.0015	1.29	1.29	2.91	2.91	0.7	0.7	0.0025	0.0025	0.001	0.001	1.7	1.7	
7/21/2009	0.134	0.151	0.4	0.5	22.7	22.7	0.009	0.015	0.037	0.062	0.01	0.21	0.68	0.76	0.0025	0.029	1.41	2.07	10.5	12.3	0.5	0.7	0.002	0.002	0.013	0.018	1.2	1.2	
10/19/2009	0.314	0.291	0.5	0.5	41.8	42.8	0.003	0.003	0.249	0.269	0.01	0.24	3.54	4.11	0.0025	0.046	3.24	10.1	27.5	25.4	1	0.15	0.002	0.033	0.034	0.042	1.9	2.3	
1/9/2010	0.15	0.2	0.3	0.44	24.2	25.3	0.015	0.011	0.1	0.17	0.07	0.016	0.8	0.6	0.04	0.12	0.075	1.84	3.6	4	0.165	0.05	0.002	0.004	0.03	0.03	2	2.2	
4/12/2010	0.16	0.16	0.23	0.033	34.2	34.9	0.015	0.0135	0.12	0.13	0.07	0.016	0.6	0.6	0.03	0.041	1.2	2.01	3.9	4.3	0.165	0.06	0.002	0.004	0.02	0.02	2.6	1.9	
7/23/2010	0.09	0.09	0.29	0.27	31.5	30.5	0.015	0.03	0.06	0.05	0.5	0.0265	0.7	0.46	0.03	0.041	1.26	2.11	24	23.7	0.165	0.06	0.01	0.01	0.01	0.02	1.2	0.93	
10/18/2010	0.09	0.1	0.31	0.33	29.4	31.4	0.0135	0.0135	0.1	0.12	0.0265	0.08	0.6	1	0.041	0.041	1.23	3.5	20.5	20.8	0.06	0.06	0.0045	0.01	0.03	0.03	1.9	1.8	
1/18/2011	0.14	0.15	0.9	0.6	41	41.2	0.0135	0.0135	0.04	0.04	0.11	0.12	0.5	0.6	0.041	0.041	4.44	8.24	5.5	5.4	1.7	0.43	0.0045	0.0045	0.03	0.03	2.22	2.73	
4/25/2011	0.2	0.2	0.7	1.2	44.6	42.9	0.0105	0.0105	0.05	0.06	0.19	0.11	0.7	0.7	0.023	0.023	2.68	7.23	5.7	5.7	0.065	1.9	0.01	0.004	0.04	0.03	0.25	1.27	
7/19/2011	0.15	0.14	3.1	2.9	36.2	37	0.03	0.03	0.03	0.03	0.07	0.13	0.15	0.6	1	0.08	0.07	5.23	17.2	16.2	16.3	0.065	0.065	0.01	0.02	0.03	0.03	2.15	6
10/24/2011	0.005	0.11	5.1	5.3	43.9	41.6	0.0105	0.0105	0.06	0.07	0.12	0.28	0.6	1.5	0.023	0.2	6.63	10.5	14.6	14	0.065	0.24	0.004	0.01	0.04	0.03	2.4	2.6	
1/23/2012	0.14	0.17	3.5	3.7	29.6	28.4	0.0105	0.0105	0.04	0.08	0.17	0.18	0.9	1.3	0.023	0.023	2.78	16.9	5.6	5.4	0.8	0.7	0.01	0.03	0.02	0.03	2.96	2.76	
4/23/2012	0.1	0.12	2.3	2.6	46	47.3	0.0105	0.0105	0.03	0.08	0.11	0.15	0.7	1	0.023	0.05	2.8	7.12	4.3	4.5	0.065	0.065	0.004	0.004	0.04	0.04	2.96	2.59	

Paired T Test	
summ	No
Significant?	No

Wilcoxon Signed Rank Test	
W Value	105
P-Level	0.49318
Significant?	No

Correlation Analysis	
Pearson p	0.67677
n	5.3E-05
Significant?	Yes

Spearman Test	
Spearman Rho	0.72413
p-level	9.8E-06
Significant?	Yes

Notes:
 NA = Not applicable, data too homogeneous
 α = 0.05
 All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-38. Comparative Analysis of Total and Dissolved Metals in Well MW-6

Constituent	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc		
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	
7/27/2005	0.03	0.01	28.7	35.2	0.35	0.35	0.003	0.003		0.012	1	1	4	4	0.005	0.79	0.5	0.05	1	1	0.05	0.05	4	4	0.003	0.003	1	1	
10/24/2005	0.0125	0.025	27	29.3	31.3	32	0.01	0.02	0.025	0.038	0.05	0.1	0.56	0.76	0.074	0.163	0.4	0.6	3.26	4.01	0.5	1	0.005	0.01	0.005	0.01	1.81	4.18	
1/17/2006	0.13	0.11	6.64	10	14.4	18.2	0.003	0.003	0.01	0.01	0.16	0.11	0.07	0.11	0.01	0.02	0.05	0.05	1.11	1.12	0.05	0.05	0.0025	0.0025	0.003	0.003	2.32	6.02	
4/11/2006	0.04	0.01	9.52	11	15.8	15.8	0.003	0.003	0.02	0.02	0.01	0.01	0.01	0.01	0.005	0.01	0.2	0.4	0.1	0.1	0.2	0.1	0.0025	0.0025	0.003	0.003	2.03	1.23	
7/17/2006	0.02	0.01	19	20.9	18.6	19.7	0.004	0.004	0.01	0.01	0.035	0.035	0.21	0.24	0.004	0.016	1.6	1.5	1.54	1.57	0.2	0.1	0.0015	0.0015	0.0025	0.0025	3.5	9.2	
10/10/2006	0.01	0.02	23.3	26.9	20.6	21.6	0.002	0.002	0.01	0.05	0.015	0.015	0.015	0.015	0.004	0.004	0.03	0.03	0.7	0.8	0.2	0.3	0.0035	0.0035	0.004	0.004	1.7	4.6	
1/17/2007	0.02	0.03	10.5	28.5	16.1	22.4	0.002	0.006	0.01	0.01	1.29	0.015	0.29	0.57	0.004	0.043	0.6	1.5	0.8	0.7	0.2	0.4	0.0035	0.0035	0.004	0.004	7.4	7.4	
4/16/2007	0.01	0.01	10.9	19.3	13.4	17.2	0.003	0.007	0.019	0.02	0.015	0.015	0.17	0.27	0.004	0.019	0.2	1	0.5	0.4	0.3	0.3	0.0045	0.0045	0.0015	0.008	2.15	3.51	
7/17/2007	0.013	0.012	15.1	18.8	13.3	15.3	0.004	0.004	0.011	0.017	0.035	0.035	0.33	0.01	0.012	0.024	0.4	1.2	0.4	0.3	0.3	0.3	0.002	0.002	0.0015	0.0015	0.05	0.05	
10/8/2007	0.0045	0.0045	0.04	9.48	19.5	23.8	0.004	0.009	0.0025	0.0025	0.14	0.25	0.53	0.62	0.0045	0.044	0.025	0.025	0.69	0.76	0.2	0.2	0.002	0.002	0.0015	0.0015	0.05	0.05	
1/21/2008	0.021	0.011	11.3	25	11.7	16.3	0.004	0.004	0.0025	0.0025	0.17	0.21	0.21	0.33	0.0045	0.031	0.025	0.025	0.65	0.68	0.2	0.2	0.002	0.002	0.0015	0.0015	0.05	0.05	
4/14/2008	0.015	0.015	5.88	14.7	9.34	15.2	0.003	0.003	0.0035	0.0035	0.17	0.24	0.14	0.15	0.0015	0.003	0.025	0.025	0.47	0.48	0.1	0.1	0.0045	0.0045	0.0015	0.0015	1.29	0.92	
7/28/2008	0.01	0.01	11.6	19.1	11.1	15	0.0015	0.0015	0.004	0.024	0.015	0.015	0.01	0.13	0.0015	0.026	0.025	0.025	0.34	0.39	0.1	0.1	0.0015	0.0015	0.0015	0.0015	0.89	1.66	
10/20/2008	0.0025	0.0025	15.4	21.6	13.8	17.1	0.004	0.004	0.0025	0.0025	0.002	0.002	0.06	0.24	0.0015	0.033	0.14	0.38	0.45	0.51	0.15	0.15	0.0025	0.0025	0.001	0.001	0.8	4.2	
1/14/2009	0.0025	0.0025	9.1	16.7	10.2	13.4	0.004	0.004	0.0025	0.021	0.002	0.002	0.13	0.19	0.0015	0.034	0.04	1.21	0.41	0.45	0.2	0.2	0.0025	0.0025	0.001	0.001	0.9	3.3	
4/6/2009	0.0025		9.3	9.95			0.004		0.0025		0.015		0.04		0.0015		0.1		0.38				0.0025		0.001		1.4		
7/21/2009	0.0025	0.0025	11.2	19.6	10.3	14.5	0.003	0.007	0.0025	0.014	0.01	0.01	0.11	0.14	0.0025	0.02	0.15	0.29	0.36	0.4	0.15	0.15	0.002	0.002	0.0025	0.0025	0.5	0.5	
10/19/2009	0.0025	0.0025	9.6	12.1	12.5	14.3	0.003	0.003	0.0025	0.0025	0.01	0.01	0.24	0.23	0.0025	0.023	0.18	0.27	0.23	0.21	0.15	0.15	0.002	0.002	0.0025	0.0025	0.3	0.2	
1/9/2010	0.01	0.02	12.6	13.4	9.4	9.7	0.015	0.011	0.005	0.004	0.07	0.016	0.15	0.19	0.015	0.0125	0.075	0.35	0.7	0.7	0.165	0.05	0.002	0.004	0.005	0.0015	0.6	0.19	
4/12/2010	0.01	0.01	12.6	15.5	10.5	12.4	0.015	0.0135	0.005	0.01	0.07	0.016	0.06	0.15	0.03	0.041	0.075	0.075	0.6	0.25	0.165	0.05	0.002	0.004	0.005	0.0015	0.6	0.19	
7/23/2010	0.01	0.004	13.7	17	11.6	14.2	0.015	0.0135	0.005	0.011	0.175	0.0265	0.06	0.115	0.03	0.041	0.18	0.18	0.24	0.7	0.13	0.06	0.002	0.0045	0.005	0.0015	0.6	0.405	
10/18/2010	0.01	0.01	19.9	21.6	13.9	15.2	0.0135	0.0135	0.011	0.03	0.065	0.065	0.115	0.115	0.041	0.041	0.15	0.15	0.46	0.43	0.21	0.22	0.0045	0.0045	0.0015	0.0015	0.405	0.405	
1/18/2011	0.004	0.004	9.8	11.8	13.1	14.4	0.0135	0.0135	0.011	0.011	0.0265	0.0265	0.24	0.115	0.041	0.041	0.33	0.35	0.31	0.31	0.13	0.13	0.0045	0.0045	0.0015	0.0015	0.405	0.405	
4/25/2011	0.005	0.005	9.8	10.9	12.6	13.4	0.0105	0.0105	0.005	0.005	0.0225	0.0225	0.18	0.18	0.023	0.023	0.22	0.075	0.32	0.34	0.16	0.17	0.004	0.004	0.002	0.002	0.25	0.25	
7/19/2011	0.005	0.005	13.6	14.9	12.4	13.2	0.0105	0.0105	0.005	0.005	0.0225	0.0225	0.17	0.18	0.023	0.023	0.075	0.075	0.7	0.7	0.065	0.065	0.004	0.004	0.002	0.002	0.56	1.05	
10/24/2011	0.005	0.02	16.2	23.8	14.3	25.2	0.0105	0.0105	0.02	0.03	0.055	0.0225	0.18	0.24	0.023	0.023	0.65	0.27	0.9	0.9	0.065	0.16	0.004	0.004	0.002	0.002	1	1.4	
1/23/2012	0.005	0.03	12.9	15.8	11.5	14.9	0.0105	0.0105	0.005	0.02	0.055	0.055	0.42	0.29	0.023	0.023	0.075	0.075	0.8	0.39	0.065	0.065	0.004	0.004	0.002	0.002	1.16	2.39	
4/23/2012	0.005	0.005	12.1	18.7	10.4	16.5	0.0105	0.0105	0.005	0.005	0.055	0.055	1.1	0.21	0.023	0.023	1.39	0.45	0.29	0.36	0.065	0.13	0.004	0.004	0.002	0.002	0.92	0.51	
Paired T Test																													
summ	No		No		No		No		No		No		No		No		No		No		No		No		No		No		No
Significant?	No		No		No		NA		No		No		No		No		No		No		No		No		No		No		No
Wilcoxon Signed Rank Test																													
W Value	36		378		325		15		77		20.5		175		171		92		139		41.5		10		9		137		
P-Level	0.843325		5.93E-06		1.31E-05		0.054474		0.00324		0.507072		0.119004		0.000212		0.224307		0.423763		0.874995		0.097513		0.78353		0.026329		
Significant?	No		Yes		Yes		No		Yes		No		No		Yes		No		No		No		No		No		No		Yes
Correlation Analysis																													
Pearson	0.895302		0.787038		0.900673		0.819641		0.57759		0.556759		0.961368		0.035913		0.525105		0.970734		0.850309		0.999999		0.344634		0.789939		
n	1.45E-10		5.59E-07		7.75E-11		8.47E-08		0.001001		0.001279		8.88E-16		0.429425		0.002459		0		9.83E-09		0		0.039168		4.79E-07		
Significant?	Yes		Yes		Yes		Yes		Yes		Yes		Yes		No		Yes		Yes		Yes		Yes		Yes		Yes		
Spearman Test																													
Spearman Rho	0.672185		0.718278		0.783206		0.888105		0.658892		0.673446		0.654496		0.399883		0.679121		0.79541		0.724887		0.816717		0.546482		0.864228		
p-level	6.15E-05		1.23E-05		6.83E-07		3.2E-10		0.000126		5.9E-05		0.000106		0.019383		4.91E-05		3.56E-07		9.49E-06		1.02E-07		0.001593		3.14E-09		
Significant?	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		

Notes:

NA = Not applicable, data too homogeneous

α = 0.05

All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-39. Comparative Analysis of Total and Dissolved Metals in Well MW-7

Constituent	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc		
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	
7/27/2005	0.06	0.07	2.93	2.86	0.35	0.35	0.003	0.003	0.026	1	1	4	4	0.005	0.02	1	0.05	1	1	0.05	0.05	4	4	0.003	0.003	1	1		
10/24/2005	0.137	0.124	1.5	1.4	13.9	15.5	0.005	0.016	0.008	0.017	0.01	0.02	0.97	1.19	0.006	0.017	0.9	0.9	2.1	2.97	0.5	0.2	0.001	0.002	0.001	0.002	0.66	1.03	
1/17/2006	0.32	0.32	0.74	0.79	9.85	12	0.007	0.008	0.01	0.01	0.25	0.26	1.3	1.51	0.02	0.02	1.7	2.4	2.14	2.51	0.05	0.05	0.0025	0.0025	0.003	0.003	3.68	7.58	
4/11/2006	0.2	0.24	0.96	1.02	16.5	15.4	0.007	0.007	0.04	0.06	0.01	0.01	1.54	1.68	0.005	0.01	1.4	1.7	5.6	7.4	0.2	0.2	0.0025	0.0025	0.007	0.011	4.29	3.73	
7/17/2006	0.17	0.18	1.6	1.5	12.7	13.2	0.004	0.004	0.01	0.02	0.035	0.035	1.36	1.42	0.004	0.004	2.7	3.1	4.76	4.87	0.5	0.5	0.0015	0.0015	0.006	0.007	1.5	5.9	
10/10/2006	0.43	0.45	1.17	1.19	23.1	24.7	0.002	0.002	0.03	0.04	0.51	0.68	2.12	2.24	0.004	0.004	0.03	0.03	2.4	2.8	0.4	0.3	0.0035	0.0035	0.01	0.004	0.1	1.8	
1/17/2007	0.36	0.36	0.72	0.77	13.9	14.7	0.002	0.002	0.01	0.01	0.015	0.53	1.97	1.98	0.02	0.041	1.4	1.6	2.5	4	0.1	0.2	0.0035	0.0035	0.004	0.004	6.2	8.8	
4/16/2007	0.33	0.42	1.03	1.19	17	19.8	0.003	0.007	0.035	0.036	0.015	0.015	1.3	1.66	0.007	0.035	1	1.9	6.3	7.9	1.4	1.4	0.0045	0.0045	0.004	0.007	0.025	3.31	
7/17/2007	0.294	0.299	1.34	1.35	15.8	15.9	0.008	0.008	0.075	0.089	0.035	0.035	1.64	1.53	0.012	0.013	0.8	1.5	5.6	5.4	0.3	0.3	0.002	0.002	0.009	0.008	0.05	0.05	
10/8/2007	0.195	0.211	0.04	0.04	15.6	15.6	0.012	0.013	0.0025	0.0025	0.16	0.23	0.85	0.95	0.014	0.039	0.025	0.025	6.22	6.19	0.2	0.2	0.002	0.002	0.0015	0.0015	0.05	0.05	
1/21/2008	0.312	0.336	0.62	0.92	16.8	17.7	0.008	0.01	0.0025	0.0025	0.35	0.22	1.05	1.09	0.032	0.041	1	1.2	5.11	5.3	0.5	0.5	0.002	0.002	0.0015	0.0015	3.2	0.05	
4/14/2008	0.17	0.2	1.08	0.97	17.1	16.8	0.009	0.01	0.0035	0.0035	0.83	0.31	0.52	0.6	0.0015	0.063	1	1.9	6.12	5.63	1	0.6	0.0045	0.0045	0.0015	0.0015	1.01	1.03	
7/28/2008	0.32	0.32	0.84	1.01	17.9	17.6	0.0015	0.0015	0.053	0.06	0.015	0.015	1.1	1.22	0.028	0.043	1.19	1.35	9.08	9.07	0.1	0.1	0.0015	0.0015	0.0015	0.0015	1.67	1.01	
10/20/2008	0.241	0.289	1.3	1.6	19.3	20.6	0.008	0.004	0.033	0.047	0.122	0.002	1.14	1.27	0.0015	0.043	1.44	2.12	9.23	9.6	0.15	0.15	0.0025	0.0025	0.001	0.001	0.8	2.1	
1/14/2009	0.477	0.487	0.48	0.94	12.5	12.7	0.004	0.004	0.0025	0.03	0.002	0.002	2.33	2.76	0.0015	0.139	2.19	2.72	2.09	2.24	0.5	0.5	0.0025	0.0025	0.001	0.001	1	1.3	
4/6/2009	0.371		0.5		14.4		0.004		0.008		0.09		1.7		0.0015		0.74		2.66		0.4		0.0025		0.001		0.6		
7/21/2009	0.289	0.308	0.8	0.9	16.9	16.8	0.008	0.01	0.058	0.035	0.01	0.01	1.09	1.03	0.019	0.039	0.54	1.04	9.21	9.1	0.4	0.3	0.002	0.002	0.014	0.0025	0.8	0.5	
10/19/2009	0.794	0.811	0.7	1	16.1	16.3	0.003	0.003	0.023	0.068	0.3	0.39	4.43	5.3	0.023	0.112	1.33	2.21	1.8	1.61	0.15	0.15	0.002	0.002	0.0025	0.0025	0.5	1.1	
1/9/2010	0.6	0.6	0.6	0.6	9.4	9.5	0.015	0.011	0.005	0.01	0.07	0.016	2	2.6	0.015	0.07	1.08	1.5	1.2	1.3	0.37	0.37	0.002	0.004	0.005	0.01	0.6	0.78	
4/12/2010	0.2	0.2	0.7	0.7	12.3	12	0.015	0.0135	0.005	0.02	0.07	0.016	0.7	0.8	0.22	0.041	0.91	1.48	2.2	2.1	0.48	0.45	0.002	0.004	0.005	0.0015	0.6	0.19	
7/23/2010	0.09	0.12	2.6	3	22.2	21.2	0.015	0.0135	0.005	0.03	0.175	0.0265	0.41	0.6	0.03	0.041	1.06	1.69	7.8	7.3	0.165	0.9	0.002	0.0045	0.01	0.01	0.6	7	
10/18/2010	0.4	0.4	0.9	1	15.8	16.9	0.0135	0.0135	0.04	0.04	0.0265	0.08	1.4	2.9	0.041	0.041	1.51	2.35	3	3.2	0.49	0.6	0.0045	0.0045	0.0015	0.0015	1.2	1.3	
1/18/2011	0.5	0.5	0.4	0.5	7.8	8.3	0.0135	0.0135	0.011	0.011	0.12	0.1	2.4	3.4	0.041	0.041	1.27	1.95	1.8	2.2	0.23	0.29	0.0045	0.0045	0.0015	0.0015	1.57	1.01	
4/25/2011	0.2	0.2	0.7	0.7	9.8	9.7	0.0105	0.0105	0.02	0.03	0.06	0.09	0.8	0.9	0.023	0.023	0.73	1.66	2.5	2.5	0.42	0.45	0.004	0.004	0.002	0.002	0.25	0.25	
7/19/2011	0.16	0.17	3	3.1	22.4	22.5	0.0105	0.0105	0.005	0.02	0.0225	0.0225	0.8	0.24	0.023	0.023	0.83	1.39	7	6.3	1	0.065	0.004	0.01	0.002	0.002	1.18	0.25	
10/24/2011	0.4	0.4	1	1.5	27.1	27.4	0.0105	0.0105	0.1	0.09	0.0225	0.07	0.9	1.6	0.023	0.09	3.13	2.46	14.1	14.4	0.065	1.3	0.004	0.004	0.02	0.01	2.05	2	
1/23/2012	0.6	0.6	0.4	0.6	7.1	7.8	0.0105	0.0105	0.02	0.04	0.0225	0.07	3	3	0.023	0.1	0.74	1.73	1.3	1.2	0.3	0.28	0.004	0.004	0.002	0.002	2.06	2.24	
4/23/2012	0.2	0.2	0.7	0.7	10.4	10.6	0.0105	0.0105	0.005	0.005	0.0225	0.0225	1.1	1.2	0.023	0.023	1.09	1.77	2.4	2.4	0.42	0.34	0.004	0.004	0.002	0.002	1.17	1.1	
Paired T Test																													
summ	No		No		No		No		No		No		No		No		No		No		No		No		No		No		No
Significant?	No		No		No		NA		No		No		No		No		No		No		No		No		No		No		No
Wilcoxon Signed Rank Test																													
W Value	116.5		212		249		22.5		130		77.5		291		153		265		204		48		15		21		182.5		
P-Level	0.001422		0.005746		0.020622		0.174749		0.012074		0.981109		0.000573		0.003513		0.001068		0.126293		0.801684		0.057907		0.540291		0.180762		
Significant?	Yes		Yes		Yes		No		Yes		No		Yes		Yes		Yes		No		No		No		No		No		
Correlation Analysis																													
Pearson	0.992944		0.97357		0.987777		0.881193		0.867239		0.796244		0.942054		0.015438		0.793194		0.983006		0.416407		0.999999		0.708076		0.605966		
n	0		0		0		6.52E-10		4.94E-09		3.4E-07		1.15E-13		0.469539		4.02E-07		0		0.015365		0		1.8E-05		0.000404		
Significant?	Yes		Yes		Yes		Yes		Yes		Yes		Yes		No		Yes		Yes		Yes		Yes		Yes		Yes		
Spearman Test																													
Spearman Rho	0.985285		0.917496		0.974343		0.884886		0.813819		0.612474		0.942883		0.255517		0.789724		0.967318		0.512899		0.808197		0.847944		0.382344		
p-level	5.29E-21		8.36E-12		5.2E-18		4.48E-10		2.14E-07		0.000342		9.69E-14		0.099159		4.85E-07		1.03E-16		0.003112		1.71E-07		1.18E-08		0.024521		
Significant?	Yes		Yes		Yes		Yes		Yes		Yes		Yes		No		Yes		Yes		Yes		Yes		Yes		Yes		

Notes:
 NA = Not applicable, data too homogeneous
 α = 0.05
 All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-40. Comparative Analysis of Total and Dissolved Metals in Well MW-8A

Constituent	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc	
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T
7/27/2005	0.09	0.08	4.83	4.59	11.4	12.1	0.003	0.003	0.01	0.01	1.5	1.5	2.5	2.5	0.01	0.005	0.9	0.02	10	10	0.8	0.7	2	2	0.003	0.003	3	3
8/23/2005	0.043	0.047	3.5	3.5	20	20	0.002	0.002	0.007	0.009	1.5	1.5	2.5	6.9	0.003	0.008	26	0.8	10	10	0.6	0.6	0.001	0.001	0.001	0.001	3	3
9/20/2005	0.09	0.1	3.86	3.94	11.7	12	0.003	0.003	0.003	0.003	0.01	0.01	0.48	0.53	0.02	0.04	0.5	0.7	10.4	10.6	0.4	0.5	0.0025	0.0025	0.003	0.003	0.025	0.025
10/24/2005	0.081	0.082	4	3.6	13.4	11.4	0.01	0.004	0.037	0.009	0.05	0.02	0.78	0.44	0.066	0.014	0.4	1.8	8.17	6.67	0.5	0.2	0.005	0.002	0.005	0.002	2.08	0.84
11/15/2005	0.0025	0.088	3.5	3.6	11.4	10.7	0.002	0.002	0.001	0.001	0.01	0.01	0.34	0.35	0.001	0.01	0.7	0.7	6.52	6.55	0.4	0.4	0.001	0.001	0.001	0.001	0.004	0.025
12/14/2005	0.081	0.08	3.1	3.3	11.9	12.2	0.002	0.002	0.007	0.007	1.11	1.51	0.33	0.36	0.003	0.012	0.6	0.7	8.38	8.42	0.8	0.9	0.001	0.001	0.001	0.001	0.025	0.025
1/17/2006	0.07	0.08	2.77	3.09	13.8	15	0.003	0.003	0.01	0.01	0.07	0.06	0.16	0.19	0.005	0.01	0.05	0.05	8.5	8.81	0.05	0.05	0.0025	0.0025	0.003	0.003	2.49	3.88
2/14/2006	0.081		3.2		16.3		0.003		0.095		0.01		0.19		0.005		0.5	0.6	11.5		0.05		0.0025		0.003		0.025	
3/14/2006	0.087		3.2		18.2		0.01		0.023		0.05	0.01	1.45		0.001		0.6	0.8	14.8		0.5		0.005		0.001		1.67	
4/11/2006	0.0025	0.0025			18.6	19	0.002	0.002	0.021	0.022	0.01	0.01	0.59	0.6	0.065	0.001	0.7	0.6	13.1	13.4	1.4	1.3	0.001	0.001	0.008	0.009	1.04	2.72
7/17/2006	0.11	0.09	3.2	3.4	32.5	32.3	0.004	0.004	0.01	0.01	0.18	0.13	0.84	0.8	0.004	0.01	1.1	2.7	19.2	19.1	1.2	1.3	0.0015	0.0015	0.007	0.008	1.8	5.3
10/10/2006	0.05	0.04	2.98	3.35	70.7	72.7	0.01	0.002	0.045	0.078	0.015	0.015	0.015	1.61	0.004	0.024	0.03	0.3	0.3	0.3	0.3	0.0035	0.0035	0.004	0.004	0.1	3.5	
1/17/2007	0.15	0.17	3.57	9.23	30.9	32.4	0.002	0.006	0.03	0.04	0.43	0.37	0.76	0.97	0.029	0.062	3.2	4.3	25.9	26	0.3	0.1	0.0035	0.0035	0.015	0.015	13	9.2
4/16/2007	0.17	0.162	4.15	6.89	29.2	29.9	0.003	0.003	0.0035	0.0035	1.58	1.33	0.96	1.01	0.0015	0.028	7.3	7.8	24.3	24.8	4.9	5	0.0045	0.0045	0.014	0.013	0.05	0.05
7/17/2007	0.17	0.202	4.76	7.41	30.7	32.2	0.004	0.013	0.024	0.032	1.35	2	0.96	1.06	0.0045	0.041	2.6	7.2	25	25.7	0.3	0.3	0.002	0.004	0.011	0.013	0.05	0.05
10/8/2007	0.218	0.222	3.72	6.01	34.1	34.5	0.009	0.008	0.0025	0.0025	0.21	0.43	0.9	0.97	0.0045	0.047	9.7	11.6	26.8	27.5	0.2	0.2	0.002	0.002	0.004	0.006	0.05	0.05
1/21/2008	0.207	0.228	3.36	6.36	30.9	33.2	0.004	0.004	0.0025	0.0025	0.32	0.53	0.95	1.27	0.015	0.075	11.9	12.4	29	29.3	1.7	1.7	0.002	0.002	0.0015	0.0015	0.05	0.05
4/14/2008	0.21	0.21	2.92	7.05	28.7	29.7	0.003	0.003	0.0035	0.0035	0.54	0.77	0.84	1.02	0.0015	0.09	10.6	14.4	25.7	25.7	2	1.9	0.0045	0.0045	0.0015	0.0015	0.99	1.35
7/28/2008	0.19	0.2	3.6	4.27	32.9	32.8	0.0015	0.0015	0.039	0.037	0.21	0.015	0.89	0.87	0.0015	0.021	14.4	15.7	30.4	30.1	0.2	0.3	0.0015	0.0015	0.0015	0.0015	1.59	1.4
10/20/2008	0.205	0.208	3.8	5.5	33.2	33.7	0.004	0.004	0.058	0.048	0.269	0.428	1.1	1.16	0.0015	0.03	6.42	11.3	31.3	31.9	0.15	0.15	0.0025	0.0025	0.014	0.01	2	1.8
1/14/2009	0.192	0.199	2.9	4.7	31.5	32.5	0.004	0.004	0.054	0.062	0.002	0.214	0.94	1.04	0.0015	0.046	20.9	21.5	30	30.8	1.1	1.1	0.0025	0.0025	0.001	0.001	1.1	1.9
4/6/2009	0.158		2.8		29.2		0.004		0.047		0.1		1.04		0.0015		6.32		32.6		0.8		0.0025		0.001		4.5	
7/21/2009	0.142	0.156	3.3	3.7	29.2	30	0.009	0.006	0.038	0.04	0.2	0.24	1.22	1.23	0.0025	0.015	2.9	10.9	31.8	32.3	0.9	0.9	0.002	0.002	0.007	0.007	0.8	71.3
10/19/2009	0.134	0.151	3.7	4.1	31.2	31	0.003	0.003	0.049	0.056	0.23	0.4	1.32	1.39	0.009	0.02	11.4	14	31	31.1	2	1.9	0.002	0.002	0.0025	0.0025	0.9	25.8
1/9/2010	0.14	0.18	2.7	3	26.8	26.4	0.015	0.011	0.03	0.05	0.07	0.08	0.9	1	0.015	0.05	15.4	15.9	28.4	28.2	0.165	0.05	0.002	0.01	0.02	0.02	0.6	1.6
4/12/2010	0.1	0.1	2.6	3.3	23.3	22.8	0.015	0.0135	0.04	0.05	0.07	0.13	0.7	0.8	0.03	0.041	9.37	9.88	29	30	0.165	0.06	0.002	0.0045	0.005	0.0015	2.1	2.3
7/23/2010	0.11	0.13	2.8	3.3	25.9	25.6	0.015	0.0135	0.05	0.05	0.07	0.065	1.1	1.2	0.03	0.041	3.94	11.4	32	32.4	0.165	0.06	0.002	0.01	0.01	0.01	0.6	0.405
10/18/2010	0.11	0.12	2.7	3	26.3	26.9	0.0135	0.0135	0.07	0.06	0.065	0.065	1.2	1.2	0.041	0.041	12	12.4	28	28.2	0.06	0.38	0.0045	0.0045	0.01	0.01	1.5	1.4
1/18/2011	0.09	0.11	2.4	2.7	24.6	25	0.0135	0.0135	0.08	0.09	0.065	0.065	1.2	1.3	0.041	0.041	8.81	9.55	31.5	32.5	0.06	0.06	0.0045	0.0045	0.01	0.01	1.67	1.92
4/25/2011	0.07	0.09	2.6	2.8	22.5	23.6	0.0105	0.0105	0.04	0.07	0.0225	0.055	1	1	0.023	0.023	4.56	5.1	26.8	27.1	0.59	0.065	0.004	0.01	0.01	0.01	0.25	0.25
7/19/2011	0.1	0.1	2.8	2.9	26.7	25.5	0.0105	0.0105	0.06	0.07	0.0225	0.0225	1.1	1.1	0.023	0.023	6.47	6.98	30.5	29.3	0.065	0.065	0.01	0.01	0.01	0.01	1.04	6
10/24/2011	0.1	0.09	3	3.3	28.7	26.8	0.0105	0.0105	0.07	0.07	0.0225	0.09	1.1	1	0.023	0.07	5.64	6.64	32	30.3	0.065	0.5	0.004	0.004	0.01	0.01	1.52	1.2
1/23/2012	0.09	0.09	2.3	2.8	25.5	24.6	0.0105	0.0105	0.06	0.06	0.0225	0.05	1.4	1.1	0.023	0.07	6.64	6.2	31.1	29.1	0.065	0.065	0.01	0.004	0.01	0.01	2.52	2.24
4/23/2012	0.06	0.07	2.4	2.8	25.2	25.6	0.0105	0.0105	0.1	0.05	0.055	0.09	1.2	1.3	0.023	0.023	5.32	6.59	30.9	29.7	0.065	0.6	0.02	0.004	0.03	0.002	0.83	1.18

Paired T Test															
p-level	0.008448	0.000607	0.128572	0	0.534652	0.051581	0.141924	0.003807	0.5049	0.977525	0.970437	0.946479	0.215693	0.158435	
Significant?	Yes	Yes	No	NA	No	No	No	Yes	No	No	No	No	No	No	

Wilcoxon Signed Rank Test															
W Value	190	412.5	317	7.5	89.5	198.5	301.5	304	410	234	71.5	20.5	10.5	173	
P-Level	0.009845	2.59E-05	0.083953	0.599174	0.275677	0.067921	0.007052	0.001146	0.000271	0.28481	0.555876	0.778906	0.326396	0.047554	
Significant?	Yes	Yes	No	No	No	No	Yes	Yes	Yes	No	No	No	No	Yes	

Correlation Analysis															
Pearson	0.951442	0.565604	0.996648	0.783717	0.85886	0.957745	0.737173	-0.03646	0.656879	0.997086	0.980297	0.999938	0.533197	0.049282	
n	1.11E-16	0.000562	0	9.24E-08	3.17E-10	0	1.12E-06	0.577188	1.65E-05	0	0	0	0.001006	0.39617	
Significant?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	

Spearman Test															
Spearman Rho	0.956766	0.796187	0.980938	0.803842	0.918413	0.819031	0.758719	0.153606	0.81711	0.970238	0.793325	0.682412	0.729247	0.655811	
p-level	2.14E-17	7.15E-08	1.74E-22	2.58E-08	1.67E-13	5.02E-09	3.78E-07	0.204683	3.29E-09	1.04E-19	5.11E-08	1.18E-05	1.63E-06	3.1E-05	
Significant?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	

Notes:
 NA = Not applicable, data too homogeneous
 α = 0.05
 All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-41. Comparative Analysis of Total and Dissolved Metals in Well MW-9A

Constituent	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc	
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T
7/27/2005	0.03	0.02	3.51	3.86	31.4	31.4	0.01	0.012	0.01	0.01	1.5	1.5	2.5	2.5	0.01	0.04	0.6	0.02	10	10	0.5	0.4	4.5	2	0.003	0.003	3	3
8/23/2005	0.0025	0.0025	2.8	2.8	38.1	41.5	0.002	0.002	0.006	0.014	1.5	1.5	2.5	5.9	0.005	0.026	0.2	0.9	10	10	0.3	0.3	0.001	0.001	0.001	0.001	3	3
9/20/2005	0.03	0.04	3.07	3.33	29.2	31.8	0.003	0.003	0.003	0.003	0.01	0.01	0.01	0.37	0.001	0.07	0.5	0.7	4.3	4.29	0.3	0.4	0.0025	0.0025	0.003	0.003	0.025	0.025
10/24/2005	0.0125	0.0125	3.8	3.9	30.4	54.6	0.01	0.01	0.028	0.035	0.05	0.05	0.5	0.97	0.11	0.091	0.4	0.2	1.6	2.05	0.5	0.5	0.005	0.005	0.005	0.005	3.64	2.51
11/15/2005	0.0025	0.0025	3.2	3.6	30.9	31.2	0.002	0.002	0.001	0.001	0.01	0.01	0.18	0.35	0.001	0.033	0.8	0.4	1.29	1.34	0.1	0.1	0.001	0.001	0.001	0.001	0.001	0.025
12/14/2005	0.015	0.01	2.8	3	29	30.5	0.002	0.002	0.003	0.006	0.63	0.74	0.13	0.14	0.002	0.011	0.5	0.6	2.76	2.8	0.3	0.3	0.001	0.001	0.001	0.001	0.025	0.025
1/17/2006	0.05	0.01	2.62	3.41	26.8	30	0.003	0.003	0.01	0.01	0.02	0.16	0.01	0.01	0.005	0.02	0.05	0.05	0.69	0.87	0.05	0.05	0.0025	0.0025	0.003	0.003	2.5	3.14
2/14/2006	0.024		3.3		31.1		0.002		0.001		0.35		0.26		0.001		0.3	0.3	1.84		0.4		0.001		0.001		0.025	
3/14/2006	0.0025		2.7		34.6		0.01		0.005		0.05	0.02	0.73		0.001		0.4	0.3	2.54		0.5		0.005		0.001		1.21	
4/11/2006	0.0025	0.0025			45	44.2	0.002	0.002	0.008	0.017	0.01	0.01	0.28	0.33	0.135	0.001	0.2	0.5	2.81	2.7	0.5	0.6	0.001	0.001	0.001	0.001	1.63	2.62
7/17/2006	0.04	0.04	2.6	2.8	68.9	68.2	0.004	0.004	0.01	0.01	0.1	0.11	0.53	0.55	0.004	0.004	1.8	1.7	2.59	2.47	0.4	0.4	0.0015	0.0015	0.0025	0.0025	1.9	4.7
10/10/2006	0.12	0.12	4.07	6.27	34	34.8	0.01	0.002	0.048	0.06	0.015	0.015	0.015	0.72	0.004	0.043	0.03	0.03	26.1	26.7	0.5	0.5	0.0035	0.0035	0.014	0.015	0.1	1.7
1/17/2007	0.07	0.07	3.12	5.12	97.5	110	0.002	0.002	0.01	0.02	0.26	0.3	0.49	0.53	0.056	0.058	0.03	0.03	0.5	0.6	0.1	0.2	0.0035	0.0035	0.004	0.004	14.2	5.6
4/16/2007	0.07	0.055	3.14	3.54	93.3	95.7	0.003	0.003	0.0035	0.0035	0.015	0.9	0.8	0.84	0.0015	0.014	0.2	0.2	0.8	0.8	2.9	2.8	0.0045	0.0045	0.006	0.006	0.05	0.05
7/17/2007	0.093	0.087	2.66	2.68	79.6	80.5	0.012	0.014	0.007	0.014	1.12	1.17	0.66	0.64	0.0045	0.011	0.4	0.5	1.3	1.1	0.3	0.3	0.005	0.002	0.003	0.0015	0.05	0.05
10/8/2007	0.139	0.15	0.04	0.04	72.1	73.4	0.021	0.019	0.0025	0.0025	0.98	0.84	0.32	0.37	0.0045	0.038	0.025	1.3	2.31	2.52	0.2	0.2	0.002	0.002	0.0015	0.0015	0.05	0.05
1/21/2008	0.063	0.068	1.38	2.22	62.1	67.9	0.004	0.008	0.0025	0.0025	0.51	0.44	0.4	0.46	0.0045	0.043	0.025	0.025	1.66	1.71	0.8	0.7	0.002	0.002	0.0015	0.0015	0.05	0.05
4/14/2008	0.08	0.07	1.58	1.74	54.9	56	0.003	0.009	0.0035	0.0035	1.06	1.06	0.23	0.25	0.0015	0.0015	0.8	0.8	2.14	2.18	1	0.9	0.0045	0.0045	0.0015	0.0015	0.025	0.025
7/28/2008	0.12	0.12	2.47	2.58	58.7	57.9	0.0015	0.0015	0.004	0.008	0.76	0.88	0.21	0.28	0.0015	0.024	1.32	1.19	2.29	2.34	0.3	0.3	0.0015	0.0015	0.0015	0.0015	0.56	0.99
10/20/2008	0.131	0.122	3.3	3.4	58.4	57.9	0.01	0.008	0.0025	0.0025	0.842	0.995	0.35	0.36	0.0015	0.0015	0.04	1.14	2.51	2.71	0.15	0.15	0.0025	0.0025	0.001	0.001	1	2.1
1/14/2009	0.0025	0.0025	1.5	1.7	63.1	64.1	0.004	0.004	0.0025	0.0025	0.002	0.002	0.15	0.17	0.0015	0.0015	0.04	1.44	0.95	0.95	0.2	0.4	0.0025	0.0025	0.001	0.001	0.9	1.4
4/6/2009	0.0025		1.7		62.8		0.004		0.0025		0.1		0.07		0.0015		0.025		1.08		0.2		0.0025		0.001		3.4	
7/21/2009	0.095	0.093	4.3	4.7	62.5	62	0.011	0.01	0.0025	0.01	0.64	0.67	0.38	0.38	0.0025	0.007	0.78	0.79	2.15	2.15	0.6	0.8	0.002	0.002	0.0025	0.0025	0.5	1
10/19/2009	0.085	0.082	4.4	4.5	71.9	73.7	0.003	0.003	0.0025	0.0025	0.57	0.56	0.52	0.44	0.008	0.006	0.64	0.66	0.85	0.94	1.2	1.3	0.002	0.002	0.0025	0.0025	0.9	0.7
1/9/2010	0.04	0.06	2	2	60	60.6	0.015	0.011	0.005	0.004	0.07	0.016	0.06	0.2	0.015	0.13	0.075	0.16	0.23	0.33	0.8	0.6	0.002	0.004	0.005	0.01	0.6	0.69
4/12/2010	0.01	0.04	2.1	2	61.4	61.4	0.015	0.0135	0.005	0.011	0.07	0.0265	0.06	0.115	0.03	0.041	0.075	0.075	0.41	0.37	0.8	0.7	0.002	0.0045	0.005	0.0015	0.6	1.1
7/23/2010	0.07	0.07	4.5	4.9	63.6	65.9	0.015	0.0135	0.03	0.03	0.14	0.065	0.24	0.26	0.03	0.041	0.68	0.51	0.9	0.9	0.165	0.9	0.002	0.0045	0.005	0.0015	0.6	0.405
10/18/2010	0.06	0.06	3.6	4.2	66	67.3	0.0135	0.0135	0.03	0.03	0.1	0.13	0.34	0.3	0.041	0.041	0.41	0.38	0.7	0.7	0.42	0.65	0.0045	0.0045	0.0015	0.0015	1.5	1.4
1/18/2011	0.01	0.03	1.6	1.5	66.4	71	0.0135	0.0135	0.011	0.011	0.065	0.065	0.29	0.39	0.041	0.041	0.24	0.2	0.23	0.24	0.9	0.06	0.0045	0.0045	0.0015	0.0015	0.405	0.83
4/25/2011	0.02	0.04	1.8	1.8	75.2	74.1	0.0105	0.0105	0.005	0.005	0.0225	0.0225	0.3	0.3	0.023	0.023	0.97	0.075	0.35	0.35	1	0.9	0.004	0.004	0.002	0.002	0.25	0.25
7/19/2011	0.05	0.04	3	2.8	78.1	76	0.0105	0.0105	0.02	0.005	0.08	0.055	0.35	0.37	0.023	0.023	0.075	0.075	0.5	0.49	1.9	0.065	0.004	0.004	0.002	0.002	0.59	2.51
10/24/2011	0.04	0.05	3.9	3.7	78.9	78.8	0.0105	0.0105	0.03	0.04	0.12	0.055	0.22	0.22	0.023	0.023	0.075	0.37	0.6	0.6	1	0.065	0.004	0.004	0.002	0.002	1.16	0.62
1/23/2012	0.03	0.02	1.4	1.5	80.7	80.2	0.0105	0.0105	0.005	0.02	0.055	0.055	0.29	0.25	0.023	0.023	0.075	0.075	0.5	0.46	0.9	1	0.004	0.004	0.002	0.002	1.65	1.85
4/23/2012	0.005	0.005	1.4	1.4	82.8	84.8	0.0105	0.0105	0.02	0.005	0.055	0.18	0.33	0.5	0.023	0.023	0.2	0.075	0.5	0.5	0.9	0.32	0.01	0.004	0.002	0.002	0.25	1.67

Paired T Test																											
p-level	0.932846		0.004278		0.020807		0		0.068339		0.222622		0.100784		0.139548		0.2926		0.063514		0.402797		0.324918		0.736773		0.814418
Significant?	No		Yes		Yes		NA		No		No		No		No		No		No		No		No		No		No

Wilcoxon Signed Rank Test																											
W Value	68		291		362.5		5		93		128		305.5		159		150		172		90		6		4		155
P-Level	0.66969		0.000565		0.001778		0.589639		0.064586		0.400835		0.000994		0.010591		0.726479		0.05155		0.587273		0.400381		0.853923		0.064584
Significant?	No		Yes		Yes		No		No		No		Yes		Yes		No		No		No		No		No		No

Correlation Analysis																											
Pearson	0.945415		0.919035		0.97048		0.790618		0.863647		0.935523		0.885577		0.231455		0.452649		0.999682		0.84157		0.999996		0.821575		0.751348
n	6.66E-16		3.86E-13		0		6.05E-08		1.99E-10		2.11E-15		1.81E-11		0.105135		0.004085		0		1.51E-09		0		7.37E-09		5.56E-07
Significant?	Yes		Yes		Yes		Yes		Yes		Yes		Yes		No		Yes		Yes		Yes		Yes		Yes		Yes

Spearman Test																											
Spearman Rho	0.944575		0.934202		0.986591		0.878414		0.812299		0.815348		0.750959		0.472706		0.36165		0.992833		0.597217		0.760326		0.834672		0.864539
p-level	7.26E-16		2.33E-14		1.1E-24		4.16E-11		1.44E-08		6.61E-09		5.67E-07		0.003622		0.01932		1.3E-28		0.000195		3.47E-07		2.67E-09		1.82E-10
Significant?	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes

Notes:
 NA = Not applicable, data too homogeneous
 α = 0.05
 All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-42. Comparative Analysis of Total and Dissolved Metals in Well MW-10

Constituent	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc		
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D
7/27/2005	0.1	0.09	0.83	1.06	15.4	16.4	0.025	0.033	0.01	0.01	1.5	1.5	2.5	2.5	0.02	0.03	4.6	7.1	10	10	2.5	3	2	2	0.003	0.003	3	3	
10/24/2005	0.05	0.025	1	0.5	24.7	14.7	0.04	0.02	0.124	0.039	1.72	1.06	3.24	2.28	0.272	0.12	6.1	6.1	9.51	5.76	2	1	0.02	0.01	0.02	0.01	6.69	3.08	
1/17/2006	0.58	0.57	0.32	0.39	47	47	0.012	0.008	0.114	0.13	0.68	0.47	3.11	3.13	0.005	0.05	4.8	6.3	3.96	3.82	0.35	0.35	0.0025	0.0025	0.003	0.003	5.9	3.71	
4/11/2006	0.18	0.01	0.7	0.69	19.3	20	0.011	0.013	0.04	0.05	0.9	0.98	1.17	1.2	0.005	0.02	7.4	8.9	3.5	3.7	0.4	0.2	0.0025	0.0025	0.014	0.011	2.47	6.01	
7/17/2006	0.13	0.12	0.6	0.6	19.3	19.1	0.01	0.012	0.03	0.04	0.52	0.54	1.24	1.18	0.004	0.014	5.6	7.7	3.27	3.24	1	1	0.004	0.0015	0.009	0.01	6.7	3.5	
10/10/2006	0.17	0.15	0.89	0.86	19.4	19.8	0.01	0.002	0.044	0.042	0.53	0.8	1.7	1.69	0.004	0.039	12.2	14.7	3.8	3.8	0.4	0.4	0.0035	0.0035	0.015	0.016	0.1	2.8	
1/17/2007	0.42	0.45	0.73	0.81	34.3	35.9	0.004	0.012	0.03	0.04	1.05	1.56	3.17	3.41	0.023	0.029	4	5.8	3	3.2	0.4	0.5	0.0035	0.0035	0.015	0.015	15.8	7.4	
4/16/2007	0.19	0.21	0.89	0.91	22.6	23	0.008	0.009	0.037	0.044	1.06	1.17	1.2	1.25	0.007	0.01	3.8	5.3	2.6	2.6	1.8	1.8	0.0045	0.0045	0.009	0.013	2.76	0.025	
7/17/2007	0.15	0.144	0.79	0.8	18.9	18.6	0.004	0.013	0.028	0.06	0.035	1.53	1.39	1.42	0.01	0.016	5.4	6.9	3	3	0.3	0.3	0.002	0.002	0.007	0.017	0.05	0.05	
10/8/2007	0.12	0.13	0.41	0.51	15.5	16.3	0.004	0.006	0.015	0.015	0.8	0.51	1.61	1.62	0.01	0.081	4	7	3.33	3.32	0.7	0.8	0.0015	0.0015	0.005	0.005	0.03	0.03	
1/21/2008	0.37	0.34	0.85	0.81	26.2	28.3	0.003	0.009	0.06	0.085	0.72	0.81	2.76	3.19	0.0015	0.0015	4.4	4.9	3.91	3.95	0.2	0.3	0.0045	0.0045	0.0015	0.0015	0.025	0.025	
4/14/2008	0.23	0.24	0.37	0.54	18.8	19.7	0.003	0.003	0.0035	0.0035	1	1.17	1.63	1.81	0.0015	0.004	2.5	3.1	2.83	2.88	0.4	0.7	0.0045	0.0045	0.0015	0.0015	0.025	1.77	
7/28/2008	0.13	0.14	0.11	0.26	17.3	18.1	0.0015	0.0015	0.081	0.114	0.28	0.3	1.11	1.08	0.0015	0.0015	3.46	3.8	2.59	2.49	0.2	0.1	0.0015	0.0015	0.0015	0.0015	1.92	1.07	
10/20/2008	0.113	0.114	0.29	0.42	13	13.1	0.004	0.004	0.021	0.027	0.208	0.312	1.16	1.1	0.0015	0.0015	0.04	2.41	3.35	3.21	0.15	0.15	0.0025	0.0025	0.008	0.001	2.6	2.6	
1/14/2009	0.69	0.68	0.1	0.4	24.8	25.6	0.004	0.004	0.024	0.035	0.35	0.336	3.44	3.64	0.0015	0.034	3.75	4.13	1.77	1.73	0.2	0.2	0.0025	0.0025	0.001	0.001	1.3	1.4	
4/6/2009	0.41		0.3		19.8		0.004		0.007		0.22		2.33		0.0015		1		2.05		0.2		0.0025		0.001		0.3		
7/21/2009	0.164	0.161	0.2	0.3	14.6	14.6	0.003	0.006	0.025	0.043	0.01	0.2	1.17	1.22	0.0025	0.008	1.46	2.09	2.73	2.63	0.3	0.4	0.002	0.002	0.0025	0.0025	1	1.2	
10/19/2009	0.124	0.13	0.4	0.05	13.1	13.4	0.003	0.003	0.0025	0.0025	0.25	0.19	1.42	1.41	0.0025	0.008	0.16	1.59	2.76	2.61	0.8	0.15	0.002	0.002	0.0025	0.0025	0.5	0.5	
1/9/2010	0.8	0.9	0.3	0.4	18.6	18.9	0.015	0.011	0.03	0.03	0.2	0.22	3.3	3.7	0.015	0.2	3.14	2.93	1.1	1.3	0.165	0.28	0.002	0.01	0.005	0.0015	0.6	1.6	
4/12/2010	0.2	0.2	0.2	0.2	12.7	12.9	0.015	0.0135	0.005	0.011	0.07	0.0265	1.4	1.4	0.03	0.041	1.92	2.28	2.1	2	0.38	0.45	0.002	0.0045	0.005	0.0015	0.6	1.2	
7/23/2010	0.12	0.12	0.3	0.3	11.2	11	0.015	0.0135	0.005	0.011	0.07	0.0265	1.6	1.3	0.03	0.041	1.3	1.63	3.2	3.1	0.6	0.5	0.002	0.0045	0.005	0.0015	5	1.3	
10/18/2010	0.15	0.13	0.3	0.2	11.1	10.7	0.0135	0.0135	0.03	0.011	0.0265	0.0265	1.5	1.5	0.041	0.041	2.08	2.21	2.9	2.8	0.6	0.6	0.0045	0.0045	0.0015	0.0015	7	1.6	
1/18/2011	0.4	0.4	0.3	0.3	11.4	11.3	0.0135	0.0135	0.011	0.011	0.13	0.12	2.4	2.3	0.041	0.041	2.61	2.62	1.3	1.2	0.34	0.33	0.0045	0.0045	0.0015	0.0015	0.9	1.19	
4/25/2011	0.13	0.12	0.3	0.2	10.3	10.5	0.0105	0.0105	0.005	0.005	0.17	0.0225	1.8	1.8	0.023	0.023	1.9	3.47	2.3	2.5	0.36	0.43	0.004	0.004	0.01	0.002	0.25	0.25	
7/19/2011	0.09	0.09	0.2	0.3	9.6	9.5	0.0105	0.0105	0.03	0.02	0.07	0.06	1.4	1.4	0.023	0.023	1.19	1.41	3.5	3.5	0.48	0.42	0.004	0.004	0.002	0.002	1.38	2.53	
10/24/2011	0.08	0.11	0.3	0.3	9	9	0.0105	0.0105	0.02	0.03	0.06	0.09	1.3	1.3	0.023	0.023	1.99	1.88	3.3	3.4	0.45	0.42	0.004	0.01	0.01	0.01	1.29	3.7	
1/23/2012	0.4	0.4	0.3	0.3	13.5	14	0.0105	0.0105	0.005	0.02	0.05	0.11	2.7	2.4	0.023	0.023	1.65	1.96	1.6	1.8	0.32	0.34	0.004	0.004	0.002	0.002	2.63	2.03	
4/23/2012	0.12	0.12	0.2	0.2	10.7	10.3	0.0105	0.0105	0.02	0.005	0.18	0.17	1.9	1.7	0.023	0.023	2.06	2.39	2.3	2.8	0.3	0.18	0.01	0.004	0.01	0.002	1.3	0.95	
Paired T Test																													
p-level	0.620424		0.605488		0.956161		0.94406		0.456187		0.365386		0.76719		0.252452		7.89E-06		0.417866		0.574409		0.97571		0.149607		0.205053		
Significant?	No		No		No		NA		No		No		No		No		Yes		No		No		No		No		No		
Wilcox Signed Rank Test																													
W Value	85		141.5		229		34.5		126.5		201		118		106		345		129		99		13.5		6		79		
P-Level	0.70056		0.178502		0.024803		0.507072		0.077169		0.306474		0.944542		0.00973		1.75E-05		0.948085		0.887934		1		0.031642		0.341106		
Significant?	No		No		Yes		No		No		No		No		Yes		Yes		No		No		No		Yes		No		
Correlation Analysis																													
Pearson	0.982432		0.828565		0.969874		0.718989		0.736048		0.753154		0.953093		0.434293		0.957573		0.936227		0.897294		0.999967		0.707374		0.687466		
n	0		4.73E-08		0		1.19E-05		6.05E-06		2.9E-06		8.66E-15		0.011802		2.55E-15		3.71E-13		1.15E-10		0		1.85E-05		3.72E-05		
Significant?	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		
Spearman Test																													
Spearman Rho	0.893679		0.73315		0.960769		0.76356		0.785996		0.744798		0.962737		0.652474		0.921997		0.981216		0.762796		0.6032		0.670528		0.56905		
p-level	1.74E-10		6.81E-06		9.76E-16		1.8E-06		5.91E-07		4.18E-06		5.18E-16		0.000113		4.25E-12		1.09E-19		1.87E-06		0.000433		6.48E-05		0.000976		
Significant?	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		

Notes:

NA = Not applicable, data too homogeneous

α = 0.05

All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-43. Comparative Analysis of Total and Dissolved Metals in Well MW-11

Constituent	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc	
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T
7/27/2005	0.05	0.04	1.09	0.99	0.35	0.35	0.003	0.003	0.013	0.028	1	3	4	4	0.005	0.005	0.9	0.05	4.3	4.8	0.05	0.05	4	4	0.003	0.003	1	2.9
10/24/2005	0.005	0.005	0.9	0.9	13.3	14.1	0.004	0.004	0.014	0.011	3.37	3.42	0.47	0.48	0.019	0.032	0.2	0.6	6.67	6.72	0.2	0.2	0.002	0.002	0.002	0.002	0.81	1.26
1/17/2006	0.04	0.05	0.33	0.41	9.7	10.1	0.003	0.003	0.003	0.006	1.62	1.67	0.01	0.78	0.005	0.01	0.8	1	4.17	4.14	0.35	0.35	0.0025	0.0025	0.003	0.003	4.31	3.37
4/11/2006	0.07	0.01	0.67	0.64	9.26	9	0.003	0.003	0.03	0.02	1.89	1.97	0.43	0.4	0.005	0.005	0.5	1.3	4.1	4.1	0.05	0.05	0.0025	0.0025	0.003	0.003	0.025	0.025
7/17/2006	0.06	0.04	0.8	0.8	11.1	11.3	0.004	0.004	0.01	0.01	2.16	2.19	0.51	0.5	0.004	0.004	1.9	1.9	5.07	5.21	0.1	0.1	0.0015	0.0015	0.0025	0.0025	3.8	3.2
10/10/2006	0.05	0.05	0.99	0.98	11.8	13.1	0.01	0.002	0.023	0.026	3.32	3.56	0.015	0.36	0.004	0.004	0.03	0.03	5.9	6.1	0.2	0.2	0.0035	0.0035	0.004	0.004	0.1	4.3
1/17/2007	0.05	0.04	0.62	0.67	8.43	8.63	0.002	0.002	0.01	0.01	2.2	2.34	0.52	0.56	0.009	0.022	0.03	0.03	4	4.1	0.1	0.1	0.0035	0.0035	0.004	0.004	9.6	10.2
4/16/2007	0.05	0.04	0.59	0.61	7.86	8.37	0.003	0.003	0.039	0.052	2.03	2.16	0.58	0.59	0.008	0.025	0.6	0.7	3.4	4	0.3	0.2	0.0045	0.0045	0.006	0.008	0.025	0.025
7/17/2007	0.06	0.04	0.79	0.76	9.67	9.16	0.003	0.003	0.0035	0.0035	2.14	2.1	0.49	0.47	0.0015	0.003	0.025	0.025	5.57	5.48	0.05	0.05	0.0045	0.0045	0.0015	0.0015	0.025	0.025
10/8/2007	0.02	0.03	0.8	0.79	10	10	0.0015	0.0015	0.004	0.015	2.79	2.86	0.29	0.31	0.007	0.021	0.025	0.025	5.01	5.08	0.1	0.1	0.0015	0.0015	0.0015	0.0015	0.03	0.03
1/21/2008	0.038	0.046	0.64	0.67	8.58	8.44	0.004	0.004	0.0025	0.0025	1.93	2	0.6	0.54	0.082	0.011	0.025	0.025	4.09	4.18	0.2	0.2	0.002	0.002	0.0015	0.0015	0.05	0.05
4/14/2008	0.06	0.04	0.36	0.41	8.66	8.73	0.003	0.003	0.0035	0.0035	2.26	2.14	0.71	1.05	0.0015	0.0015	0.025	0.025	4.18	4.11	0.1	0.1	0.0045	0.0045	0.0015	0.0015	0.025	1.76
7/28/2008	0.06	0.05	0.76	0.75	10.4	10.3	0.0015	0.0015	0.004	0.004	2.59	2.55	0.37	0.39	0.0015	0.0015	0.025	0.025	5.66	5.75	0.1	0.1	0.0015	0.0015	0.0015	0.0015	1.62	3.02
10/20/2008	0.0025	0.0025	0.9	0.93	9.06	9.2	0.004	0.004	0.0025	0.0025	2.47	2.59	0.26	0.27	0.0015	0.0015	0.04	0.04	5.04	5.13	0.15	0.15	0.0025	0.0025	0.001	0.001	0.7	1.6
1/14/2009	0.052	0.0025	0.69	0.61	7.69	7.8	0.004	0.009	0.0025	0.0025	1.55	1.58	0.32	0.47	0.0015	0.035	0.04	0.84	3.61	3.56	0.2	0.2	0.0025	0.0025	0.001	0.001	0.9	0.9
4/6/2009	0.0025		0.6		8.85		0.004		0.0025		1.6		0.37		0.0015		0.025		4.39		0.2		0.0025		0.001		1.1	
7/21/2009	0.0025	0.0025	0.8	0.8	10	10.2	0.003	0.003	0.012	0.013	2.11	2.12	0.47	0.43	0.0025	0.006	0.49	0.48	5.53	5.64	0.15	0.15	0.002	0.002	0.0025	0.0025	0.5	0.9
10/19/2009	0.06	0.0025	1	0.9	8.96	8.94	0.003	0.003	0.0025	0.0025	2.33	2.24	0.6	0.33	0.02	0.01	0.7	0.16	4.79	4.82	0.3	0.3	0.002	0.002	0.0025	0.0025	1.5	0.3
1/9/2010	0.05	0.07	0.5	0.6	7.4	8.9	0.015	0.011	0.02	0.02	0.9	1.2	0.45	0.7	0.015	0.16	0.52	1.44	4	4.5	0.165	0.13	0.002	0.004	0.005	0.0015	0.6	1.9
4/12/2010	0.03	0.03	0.6	0.6	8.5	8.3	0.015	0.0135	0.005	0.011	1.2	1.1	0.06	0.115	0.03	0.041	0.52	0.52	4.4	4	0.165	0.06	0.002	0.0045	0.005	0.0015	1.4	4.05
7/23/2010	0.07	0.06	1.3	1.3	9.7	9.3	0.015	0.0135	0.005	0.011	1.2	1.2	0.39	0.4	0.03	0.041	0.73	0.87	7.3	6.8	0.22	0.17	0.01	0.0045	0.005	0.0015	0.6	4.05
10/18/2010	0.05	0.04	0.8	0.8	8.7	8.7	0.0135	0.0135	0.011	0.011	1.4	1.4	0.44	0.33	0.041	0.041	0.52	0.74	5.2	5.1	0.15	0.15	0.0045	0.0045	0.0015	0.0015	1.1	1
1/18/2011	0.02	0.03	0.5	0.6	7.5	8.4	0.0135	0.0135	0.011	0.011	0.6	0.9	0.5	0.7	0.041	0.041	0.65	1.17	3.5	3.9	0.06	0.14	0.0045	0.0045	0.0015	0.0015	0.93	0.94
4/25/2011	0.04	0.04	0.6	0.7	9.6	9.8	0.0105	0.0105	0.005	0.005	0.39	0.5	0.5	0.6	0.023	0.023	0.63	2.41	4.1	4.3	0.17	0.24	0.004	0.004	0.002	0.002	0.25	0.25
7/19/2011	0.05	0.06	1.1	1.2	12	12.3	0.0105	0.0105	0.005	0.02	1	1	0.6	0.6	0.023	0.023	0.93	0.96	7.5	7.5	0.27	0.29	0.004	0.01	0.002	0.002	0.87	1.07
10/24/2011	0.04	0.005	0.9	0.9	11.5	11.7	0.0105	0.0105	0.005	0.03	1.7	2	0.32	0.37	0.023	0.023	1.86	1.15	6.7	7.4	0.065	0.13	0.004	0.004	0.002	0.002	0.73	1.4
1/23/2012	0.05	0.03	0.5	0.6	9.5	9.4	0.0105	0.0105	0.005	0.02	1	1.1	0.9	0.7	0.023	0.023	0.59	0.8	4	4.1	0.17	0.17	0.004	0.004	0.002	0.002	1.89	1.25
4/23/2012	0.005	0.005	0.5	0.5	9.5	9.6	0.0105	0.0105	0.005	0.005	0.7	0.7	0.7	0.8	0.023	0.023	0.76	0.57	3.9	4.2	0.14	0.22	0.01	0.004	0.002	0.002	0.25	0.72

Paired T Test	
p-level	0.015899
Significant?	Yes

Wilcoxon Signed Rank Test	
W Value	39
P-Level	0.014116
Significant?	Yes

Correlation Analysis	
Pearson	0.500882
n	0.003893
Significant?	Yes

Spearman Test	
Spearman Rho	0.441637
p-level	0.010549
Significant?	Yes

Notes:
 NA = Not applicable, data too homogeneous
 α = 0.05
 All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-44. Comparative Analysis of Total and Dissolved Metals in Well MW-12

Constituent	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc	
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T
7/27/2005	0.2	0.19	0.025	0.025	0.35	0.35	0.018	0.135	0.019	1	1	4	4	0.005	0.88	1.1	2.7	1	1	0.05	0.05	4	4	0.003	0.003	2.4	3.6	
10/24/2005	0.111	0.126	0.7	0.7	12.9	19.3	0.008	0.16	0.011	0.032	2.99	3.31	0.38	0.83	0.043	1.07	0.8	1.6	1.58	2.33	0.3	0.2	0.001	0.002	0.004	0.002	0.73	4.54
1/17/2006	0.17	0.15	0.17	0.22	9.61	10.4	0.009	0.024	0.039	0.054	1.13	1.21	0.48	0.5	0.005	0.19	1.4	1.7	0.015	1.22	0.35	0.35	0.0025	0.0025	0.003	0.003	0.025	4.76
4/11/2006	0.14	0.12	0.3	0.33	6.83	8.56	0.015	0.067	0.17	0.18	0.68	0.75	0.46	0.01	0.03	0.47	0.8	1.1	0.1	0.1	0.1	0.1	0.0025	0.0025	0.003	0.003	1.95	3.17
7/17/2006	0.15	0.11	0.05	0.05	11	13.5	0.002	0.002	0.05	0.05	2.62	2.95	0.21	0.43	0.004	0.268	2	2.8	0.9	1.3	0.3	0.3	0.0035	0.0035	0.0025	0.0025	6	4.5
10/10/2006	0.17	0.2	0.58	0.67	9.23	11	0.01	0.002	0.041	0.052	1.21	1.5	0.015	1.1	0.004	0.278	0.03	0.03	0.8	1.3	0.2	0.2	0.0035	0.0035	0.012	0.004	0.1	3.3
1/17/2007	0.08	0.08	0.28	0.3	5.93	6.9	0.009	0.021	0.02	0.03	0.82	0.91	0.55	0.67	0.048	0.193	0.03	0.03	0.9	0.8	0.1	0.2	0.0035	0.0035	0.004	0.004	16.3	18.8
4/16/2007	0.09	0.08	0.36	0.39	8.04	7.17	0.013	0.022	0.018	0.028	0.015	0.8	0.41	0.5	0.015	0.134	0.5	1	0.9	1	0.6	0.6	0.0045	0.0045	0.008	0.009	2.34	2.34
7/17/2007	0.1	0.085	0.54	0.58	9.02	9.82	0.013	0.021	0.022	0.028	0.035	1.94	0.01	0.52	0.012	0.083	0.025	0.025	1	1.1	0.3	0.3	0.002	0.002	0.007	0.007	0.05	0.05
10/8/2007	0.121	0.119	0.04	0.04	7.79	7.97	0.017	0.017	0.0025	0.0025	0.71	0.74	0.5	0.55	0.063	0.139	0.025	0.025	0.83	0.83	0.2	0.2	0.002	0.002	0.0015	0.0015	0.05	0.05
1/21/2008	0.07	0.06	0.4	0.45	5.56	6.49	0.011	0.024	0.056	0.096	0.45	0.51	0.45	0.75	0.0015	0.214	1	1.5	0.95	1.08	0.05	0.05	0.0045	0.0045	0.0015	0.0015	0.025	0.025
4/14/2008	0.07	0.06	0.29	0.21	5.33	5.55	0.011	0.012	0.0035	0.0035	0.34	0.36	0.36	0.34	0.004	0.026	1.2	1.9	0.78	0.8	0.3	0.1	0.0045	0.0045	0.0015	0.0015	1.11	0.86
7/28/2008	0.076	0.032	0.75	0.77	13.6	13.9	0.01	0.01	0.012	0.0025	1.34	1.34	0.53	0.55	0.032	0.059	0.025	0.025	3.51	3.57	0.25	0.25	0.0045	0.0045	0.016	0.01	2.47	2.34
10/20/2008	0.107	0.1	0.45	0.6	10	11.4	0.016	0.024	0.049	0.059	0.389	0.623	0.54	0.6	0.0015	0.159	0.04	1.28	1.38	1.58	0.15	0.15	0.0025	0.0025	0.008	0.001	2.7	3.4
1/14/2009	0.118	0.112	0.1	0.1	8.72	9.32	0.01	0.013	0.024	0.024	0.276	0.349	0.34	0.38	0.0015	0.054	1.06	1.04	1.11	1.22	0.2	0.2	0.0025	0.0025	0.001	0.001	2	2.3
4/6/2009	0.108		0.2		10.8		0.01		0.028		0.17		0.26		0.0015		0.025		1.9		0.2		0.0025		0.001		1.1	
7/21/2009	0.082	0.074	0.7	0.8	19.8	19.8	0.019	0.02	0.038	0.041	0.01	0.21	0.47	0.47	0.009	0.093	2.64	8.53	5.42	5.35	0.1	0.1	0.002	0.002	0.0025	0.005	1.1	1.4
10/19/2009	0.1	0.09	0.7	0.8	10.3	10.5	0.003	0.003	0.0025	0.0025	0.35	0.44	0.59	0.61	0.007	0.066	1.8	4.49	1.42	1.26	1.8	2	0.002	0.002	0.0025	0.0025	0.6	0.7
1/9/2010	0.08	0.14	0.5	0.5	8.8	9.5	0.015	0.011	0.005	0.004	0.07	0.17	0.39	0.49	0.015	0.1	4.77	8.71	1.4	1.4	0.8	1	0.002	0.004	0.005	0.01	0.6	0.97
4/12/2010	0.15	0.09	0.6	0.01	10.2	10.5	0.015	0.0135	0.03	0.03	0.07	0.05	0.48	0.5	0.03	0.041	18.6	30.1	2.2	2.1	1	0.05	0.002	0.004	0.005	0.0015	0.6	0.54
7/23/2010	0.05	0.05	0.05	0.033	22.3	22.4	0.015	0.0135	0.03	0.022	0.07	0.0265	0.5	0.6	0.03	0.041	28.1	56.9	8	8	0.165	0.06	0.002	0.0045	0.01	0.01	0.6	1
10/18/2010	0.11	0.12	0.033	0.14	10.8	11.4	0.0135	0.0135	0.05	0.05	0.22	0.12	0.8	0.8	0.041	0.041	35.3	63.6	1.9	1.9	0.06	0.06	0.0045	0.0045	0.01	0.01	1.6	1.3
1/18/2011	0.08	0.08	0.4	0.4	7.1	7.2	0.0135	0.0135	0.03	0.03	0.15	0.2	0.7	0.7	0.041	0.041	33.2	72.4	1.7	1.7	0.5	0.5	0.0045	0.0045	0.0015	0.0015	1.23	1.08
4/25/2011	0.1	0.11	0.16	0.6	7.2	8.3	0.0105	0.0105	0.005	0.02	0.06	0.08	0.6	0.6	0.023	0.023	30.6	96.2	2.4	2.9	0.065	0.63	0.004	0.01	0.01	0.01	0.25	0.25
7/19/2011	0.11	0.12	0.5	0.18	18.7	20.1	0.0105	0.0105	0.03	0.06	0.0225	0.11	0.6	0.7	0.023	0.1	49.7	146	8.1	8.5	0.28	0.065	0.004	0.01	0.01	0.01	1.24	3.9
10/24/2011	0.15	0.14	0.024	0.024	11.9	12.4	0.0105	0.0105	0.08	0.06	0.2	0.28	0.9	1	0.023	0.2	101	158	3	2.9	0.065	0.065	0.004	0.01	0.01	0.01	3.24	2.4
1/23/2012	0.09	0.09	0.16	0.07	7.4	8.3	0.0105	0.0105	0.02	0.02	0.29	0.39	1	0.9	0.023	0.08	56	77.1	1.6	1.8	0.065	0.065	0.004	0.004	0.002	0.002	1.84	1.67
4/23/2012	0.06	0.08	0.024	0.5	11.3	11	0.0105	0.0105	0.03	0.03	0.22	0.24	0.8	0.9	0.023	0.023	115	453	3.2	3.7	0.065	0.6	0.004	0.004	0.01	0.01	0.79	1.17

Paired T Test																											
p-level	0.297495		0.545629		0.002089		0.059658		0.030894		0.021913		0.038933		0.001796		0.053		0.007581		0.982186		0.018512		0.206058		0.021687
Significant?	No		No		Yes		NA		Yes		Yes		Yes		Yes		No		Yes		No		Yes		No		Yes

Wilcoxon Signed Rank Test																											
W Value	71.5		134		303		65		100		299		219.5		276		252		177.5		28.5		28		9		194
P-Level	0.128566		0.121191		0.000165		0.004652		0.024693		0.000253		0.002595		2.88E-05		4.93E-05		0.007144		0.959301		0.021303		0.446873		0.029605
Significant?	No		No		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		No		Yes		No		Yes

Correlation Analysis																											
Pearson	0.823297		0.734272		0.963574		0.02655		0.939663		0.888186		0.931031		0.056403		0.906072		0.988711		0.79067		0.999997		0.810547		0.912582
n	6.7E-08		6.51E-06		4.44E-16		0.447709		5.63E-13		3.17E-10		9.59E-13		0.389955		3.97E-11		0		4.61E-07		0		1.49E-07		1.68E-11
Significant?	Yes		Yes		Yes		No		Yes		Yes		Yes		No		Yes		Yes		Yes		Yes		Yes		Yes

Spearman Test																											
Spearman Rho	0.824621		0.675643		0.965791		0.009564		0.900053		0.708525		0.590423		-0.18287		0.981501		0.912718		0.492961		0.767994		0.785794		0.583665
p-level	6.14E-08		5.5E-05		1.81E-16		0.481119		1.95E-10		1.77E-05		0.000593		0.81938		9.05E-20		1.65E-11		0.004493		1.46E-06		5.97E-07		0.000697
Significant?	Yes		Yes		Yes		No		Yes		Yes		Yes		No		Yes		Yes		Yes		Yes		Yes		Yes

Notes:
 NA = Not applicable, data too homogeneous
 $\alpha = 0.05$
 All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-45. Comparative Analysis of Total and Dissolved Metals in Well MW-13B

Date	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Thallium		Zinc	
	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T
2/13/2007	0.07		0.8		0.97		0.004		0.02		0.38	0.52	0.35		0.004		1.6	2.1	0.6		0.3	0.4	0.0015		0.0025		1.3	
3/13/2007	0.06		0.7		1.38		0.008		0.08		0.035	0.035	0.31		0.011		1.2	1.2	1.33		0.1	0.2	0.0015		0.0025		0.9	
4/16/2007	0.04	0.03	0.47	0.46	2.6	1.54	0.004	0.014	0.04	0.06	0.035	0.035	0.25	0.26	0.004	0.013	0.025	1.5	1.66	1.72	0.1	0.1	0.0015	0.0015	0.0025	0.0025	1.5	3.4
5/15/2007	0.06		0.42		4.26		0.004		0.093		0.34	0.56	0.34		0.009		0.9	1.9	2.05		0.2	0.2	0.002		0.004		4.5	
6/12/2007	0.07	0.06	0.61	0.6	2.04	1.82	0.0015	0.004	0.277	0.45	0.015	0.015	0.29	0.34	0.0015	0.211	0.9	1.2	2.03	2.08	0.1	0.1	0.0015	0.0015	0.0015	0.0015	1.26	3.9
12/11/2007	0.028		0.36		1.85		0.004		0.0025		0.58	0.73	0.33		0.117		1.9	1.9	0.02		0.2	0.2	0.002		0.0015		0.05	
1/21/2008	0.015	0.04	0.23	0.23	2.85	2.94	0.008	0.025	0.067	0.125	0.41	0.42	0.49	0.55	0.043	0.1	1.3	1.2	1.27	1.31	0.05	0.05	0.0045	0.0045	0.0015	0.007	0.025	0.025
4/14/2008	0.04	0.03	0.07	0.09	3.98	4.16	0.01	0.013	0.0035	0.0035	0.7	0.81	0.44	0.39	0.0015	0.014	1.3	2	1.33	1.19	0.1	0.1	0.0045	0.0045	0.0015	0.0015	1.77	1.42
1/14/2009	0.0025	0.0025	0.26	0.32	2.44	2.66	0.009	0.011	0.021	0.026	0.42	0.509	0.37	0.4	0.046	0.068	1.44	2.13	0.89	0.95	0.2	0.2	0.0025	0.0025	0.001	0.001	5	3.8
4/6/2009	0.0025		0.1		3.32		0.004		0.016		0.34		0.29		0.0015		0.025		0.72		0.2		0.0025		0.001		2.4	
7/21/2009	0.074	0.0025	0.3	0.4	3.99	4.15	0.003	0.009	0.028	0.026	0.65	0.67	0.42	0.28	0.025	0.016	0.025	1.07	1.33	1.24	0.1	0.1	0.002	0.002	0.0025	0.0025	2.5	0.9
1/9/2010	0.09	0.13	0.4	0.6	5.3	6.1	0.015	0.011	0.005	0.01	0.07	0.27	0.8	1	0.015	0.12	6.62	8.9	1	2	0.165	0.39	0.002	0.02	0.02	0.02	0.6	2.8
4/12/2010	0.05	0.05	0.3	0.3	12.5	12.8	0.015	0.03	0.03	0.5	0.19	0.07	0.5	1.1	0.03	0.041	21.1	41.6	1.7	1.3	0.165	0.4	0.002	0.004	0.005	0.01	0.6	3.6
7/23/2010	0.04	0.04	0.5	0.5	15.5	15.1	0.015	0.0135	0.005	0.011	0.25	0.3	0.7	0.6	0.03	0.041	9.36	13	2.1	2.6	0.37	0.37	0.002	0.0045	0.005	0.0015	0.6	4.05
1/18/2011	0.09	0.1	0.5	0.4	14.4	14.3	0.0135	0.0135	0.04	0.05	0.18	0.19	1	1	0.041	0.041	31.1	47	1.3	1.2	0.7	0.7	0.0045	0.0045	0.0015	0.0015	1.38	1.38
4/25/2011	0.12	0.12	0.6	0.6	31	31.4	0.0105	0.0105	0.02	0.02	0.32	0.35	1.6	1.7	0.023	0.023	47.7	74	2.6	2.6	0.8	1	0.004	0.004	0.002	0.002	0.25	0.25
7/19/2011	0.09	0.09	0.5	0.5	25	24.1	0.0105	0.0105	0.02	0.02	0.47	0.4	1.2	1	0.023	0.023	28	34	1.9	1.8	0.43	0.6	0.004	0.004	0.002	0.002	1.4	1.48
1/23/2012	0.06	0.08	0.3	0.4	8.4	9.1	0.0105	0.0105	0.005	0.03	0.2	0.28	1.2	1	0.023	0.023	3.97	6.37	1	0.9	0.21	0.23	0.004	0.004	0.002	0.002	1.81	1.96
4/23/2012	0.02	0.04	0.5	0.5	32.4	34.2	0.0105	0.0105	0.03	0.03	0.7	0.6	2.4	1.4	0.023	0.023	10.8	12.3	1.9	3.2	0.43	0.24	0.01	0.004	0.01	0.002	3.24	1.43
Paired T Test																												
p-level	0.890108		0.196557		0.473387		0.052299		0.131952		0.057739		0.622996		0.077018		0.021325		0.257154		0.07226		0.411293		0.934293		0.413985	
Significant?	No		No		No		No		No		No		No		No		Yes		No		No		No		No		No	
Wilcox Signed Rank Test																												
W Value	29.5		28		64		21		36		94		40		42		135		46		31		7		5		41	
P-Level	0.440465		0.182893		0.501587		0.036032		0.014147		0.056983		0.726447		0.024265		0.000585		1		0.080058		0.583882		1		0.50488	
Significant?	No		No		No		Yes		Yes		No		No		Yes		Yes		No		No		No		No		No	
Correlation Analysis																												
Pearson	0.783349		0.893535		0.998101		0.320541		0.666221		0.924764		0.832627		-0.14962		0.987133		0.741866		0.903517		-0.06665		0.812253		0.351566	
n	0.00046		8.33E-06		3.33E-16		0.131924		0.004641		2.03E-08		0.00011		0.69516		1.82E-14		0.001192		1.39E-07		0.589547		0.000208		0.108858	
Significant?	Yes		Yes		Yes		No		Yes		Yes		Yes		No		Yes		Yes		Yes		No		Yes		No	
Spearman Test																												
Spearman Rho	0.763133		0.852943		0.982418		0.445957		0.862821		0.941602		0.896597		0.311792		0.937306		0.754969		0.849818		0.491908		0.607112		0.350997	
p-level	0.000749		5.28E-05		0		0.054991		3.56E-05		2.83E-09		7.04E-06		0.138918		4.92E-09		0.0009		4.02E-06		0.036997		0.010655		0.109257	
Significant?	Yes		Yes		Yes		No		Yes		Yes		Yes		No		Yes		Yes		Yes		Yes		Yes		No	

Notes:

NA = Not applicable, data too homogeneous

α = 0.05

All results reported as ug/L except total and dissolved mercury, which are reported as ng/L.

Table 5-46. Summary of the Comparison of Dissolved and Total Metals

A: Paired Comparison Test Summary

Well	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
MW-1A	No	No	Yes	No	Yes	No	Yes	Yes	No	Yes	No	No	No	Yes
MW-2A	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No
MW-4A	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	No	No	No	No	No
MW-5	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
MW-6	No	Yes	Yes	No	Yes	No	No	Yes	No	No	No	No	No	Yes
MW-7	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	No	No	No	No
MW-8A	Yes	Yes	No	No	No	No	Yes	Yes	Yes	No	No	No	No	Yes
MW-9A	No	Yes	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No
MW-10	No	No	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes	No
MW-11	Yes	No	Yes	No	Yes	Yes	No	Yes	No	Yes	No	No	No	No
MW-12	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
MW-13B	No	No	No	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No

Notes:

Yes indicates a significant difference using either the Paired t-test or Wilcoxon Signed Rank test (or both).

No indicates no significant difference using both the Paired t-test and Wilcoxon Signed Rank test.

B: Correlation Analysis Summary

Well	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
MW-1A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MW-2A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MW-4A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MW-5	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
MW-6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MW-7	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
MW-8A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
MW-9A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MW-10	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MW-11	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MW-12	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
MW-13B	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No

Notes:

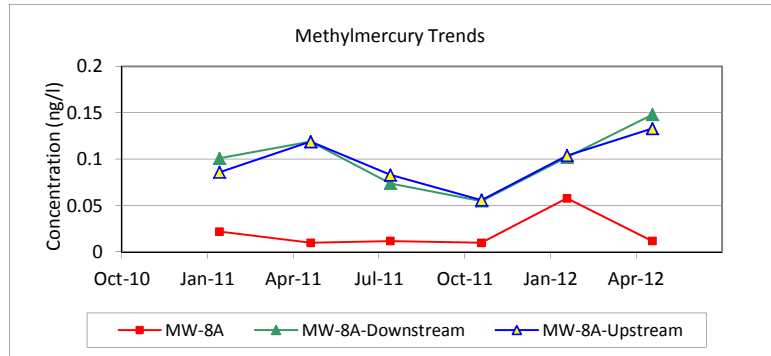
Yes indicates a significant correlation (i.e., dissolved and total concentrations for a given metal in a well have similar slope values).

Both the Pearson and Spearman correlations were conducted.

Table 5-48 MW-8A Mercury Trends

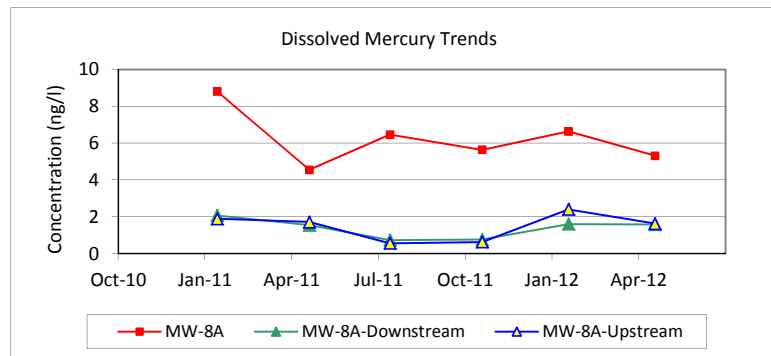
Methylmercury

Date	MW-8A	MW-8A-Downstream	MW-8A-Upstream
Jan-11	0.022	0.101	0.086
Apr-11	0.01	0.119	0.119
Jul-11	0.012	0.074	0.083
Oct-11	0.01	0.055	0.056
Jan-12	0.058	0.102	0.104
Apr-12	0.012	0.148	0.133



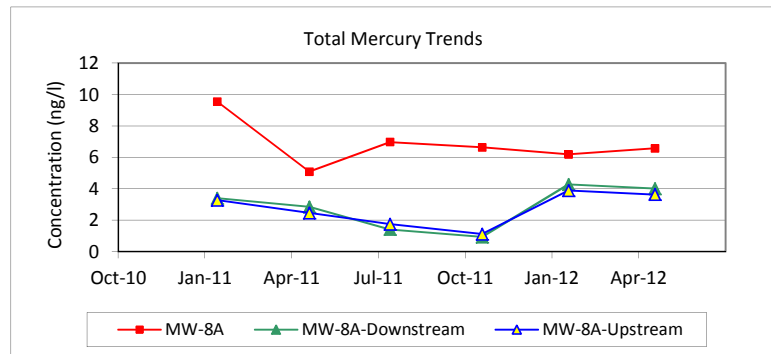
Dissolved Mercury

Date	MW-8A	MW-8A-Downstream	MW-8A-Upstream
Jan-11	8.81	2.08	1.9
Apr-11	4.56	1.55	1.72
Jul-11	6.47	0.74	0.57
Oct-11	5.64	0.77	0.64
Jan-12	6.64	1.61	2.41
Apr-12	5.32	1.59	1.64



Total Mercury

Date	MW-8A	MW-8A-Downstream	MW-8A-Upstream
Jan-11	9.55	3.41	3.29
Apr-11	5.1	2.85	2.47
Jul-11	6.98	1.42	1.75
Oct-11	6.64	0.94	1.12
Jan-12	6.2	4.28	3.9
Apr-12	6.59	4.01	3.64



All concentrations ng/L.

MW-8A is a groundwater monitoring well.

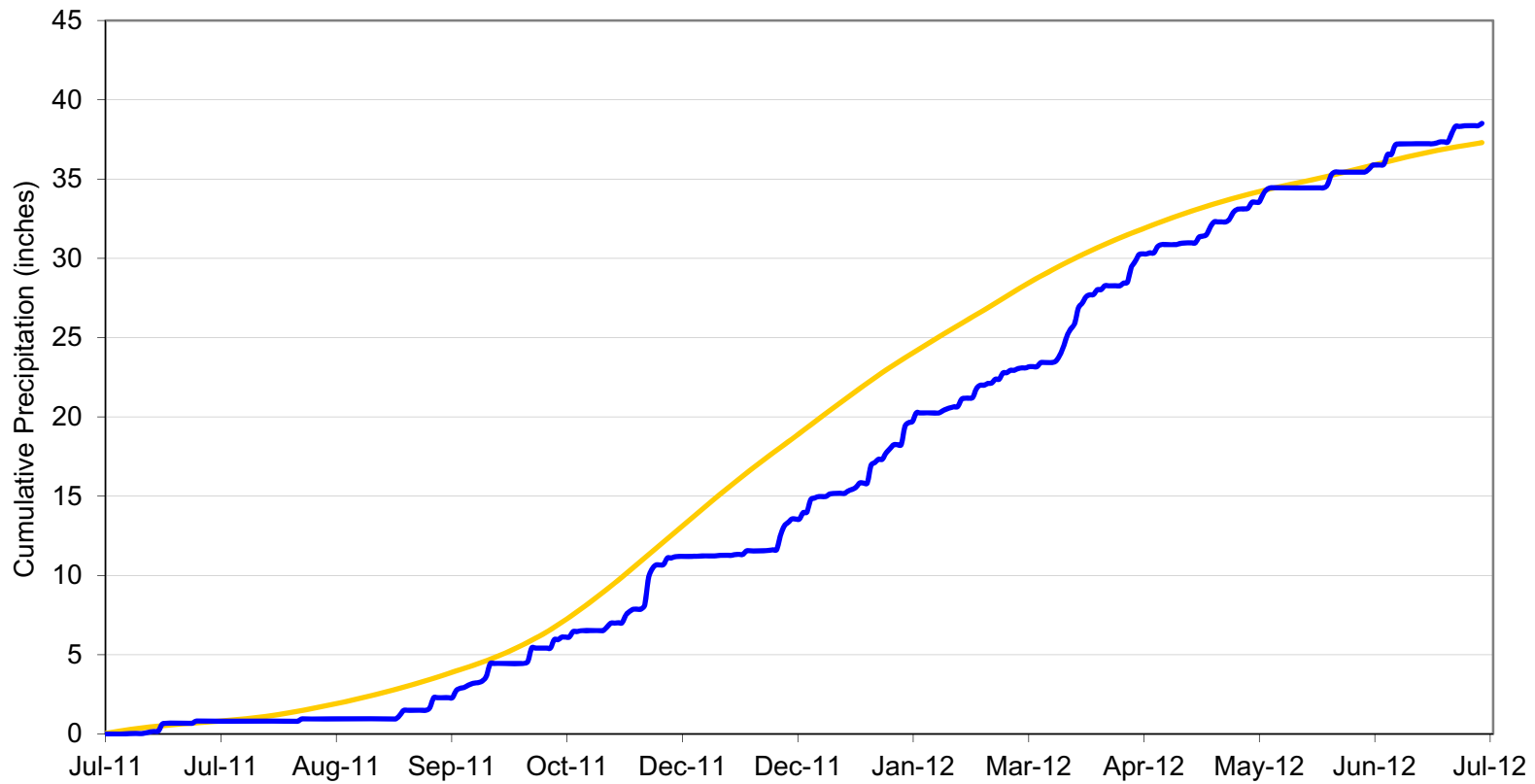
MW-8A-Upstream and MW-8A-Downstream are surface water sampling locations at Miller creek up and down stream from MW-8A.



Figure 1-1
EFMP Monitoring Locations

Port of Seattle
Embankment Fill Monitoring Program

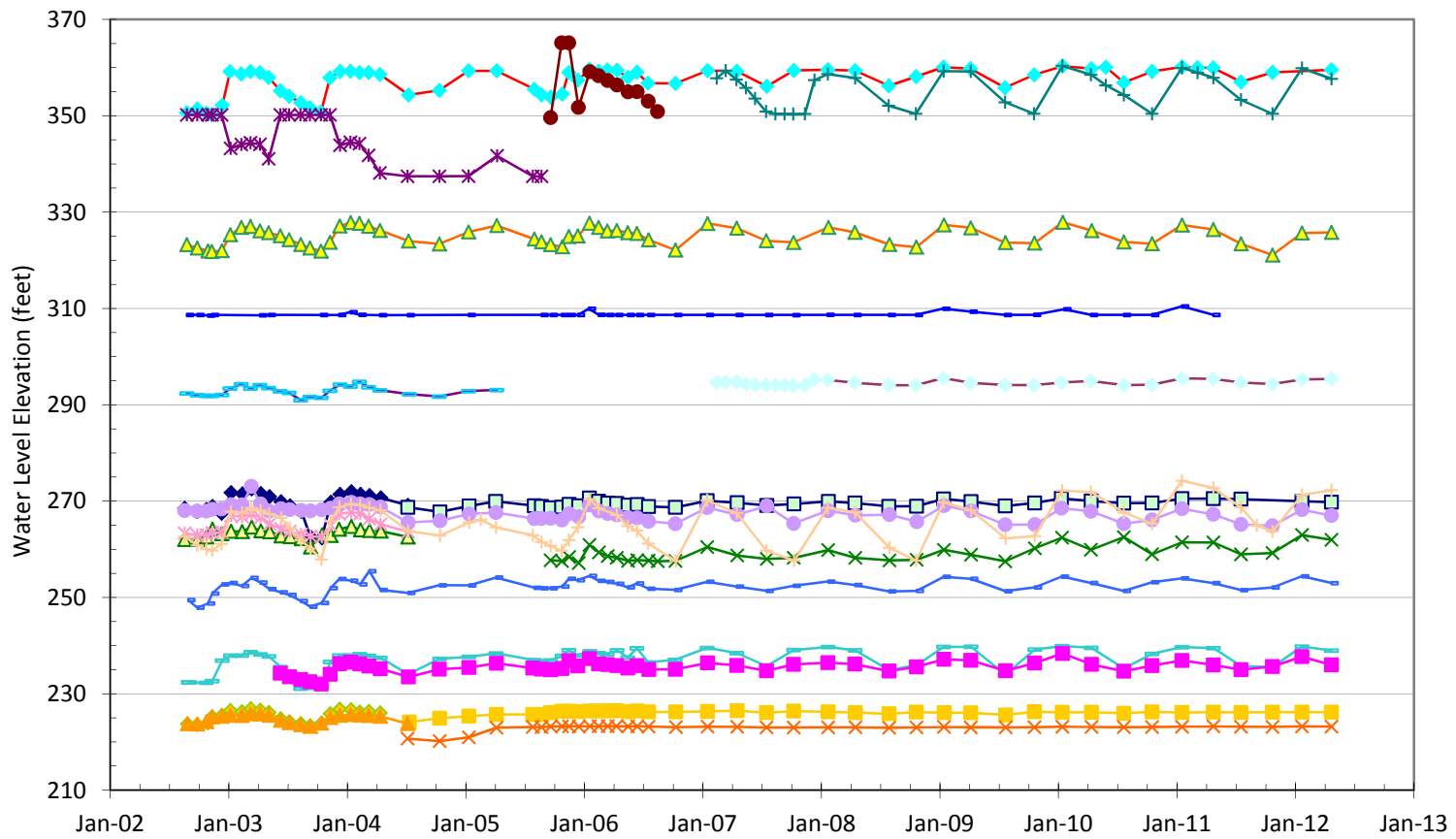
- ⊕ EFMP Monitoring Well
- Decommissioned Well
- Miller Creek Monitoring Location
- EFMP Seep
- ▨ Embankment Fill Footprint
- Walls



— Average Cumulative Rainfall (1961 to 1990)
— 2011-2012 Data

Figure 2-1. Hyetograph for Seattle-Tacoma International Airport
 Port of Seattle EFMP



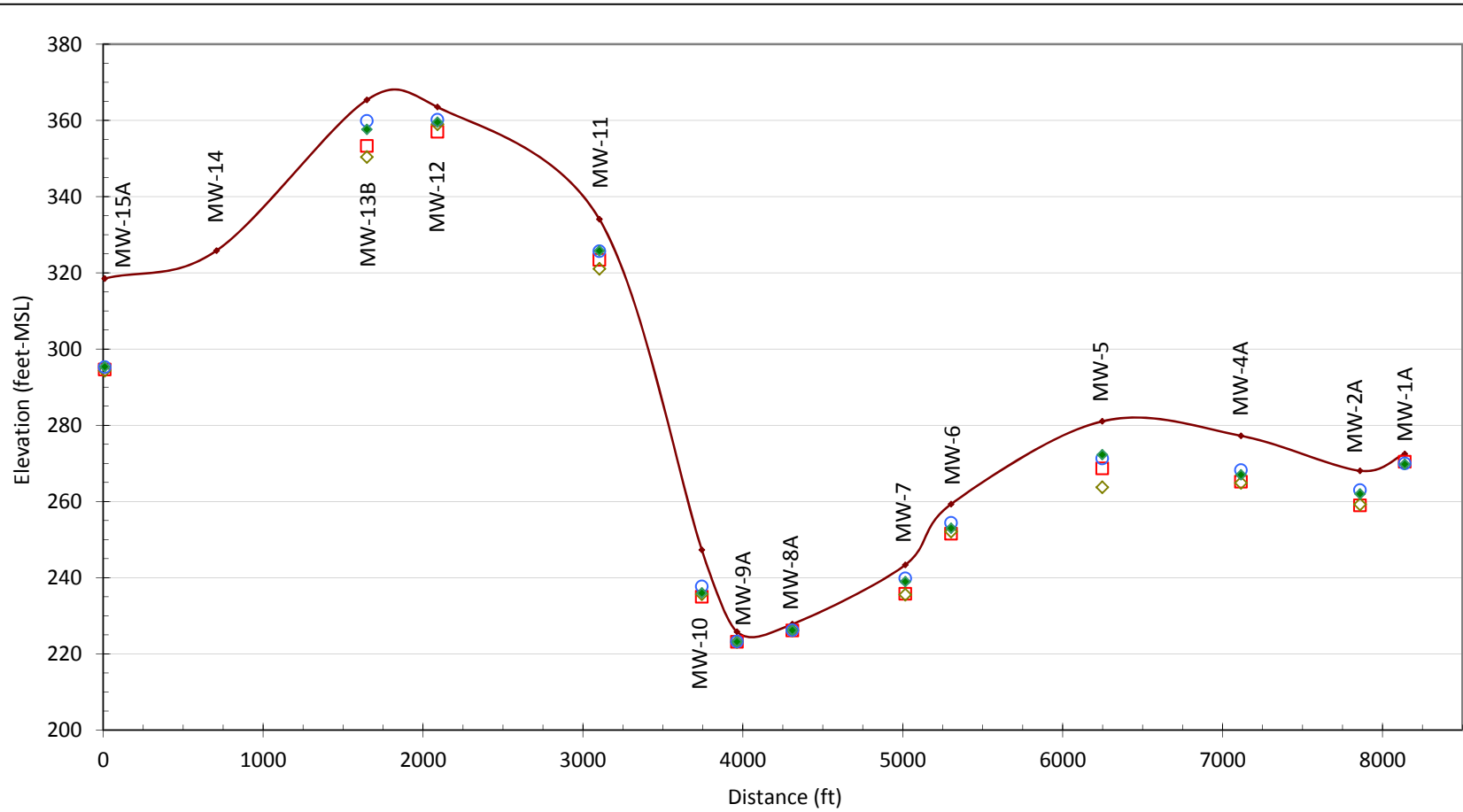


- ◆ MW-1 □ MW-1A ▲ MW-2 × MW-2A * MW-3 ● MW-4A
- MW-5 — MW-6 — MW-7 ◆ MW-8 ■ MW-8A ▲ MW-9
- × MW-9A ■ MW-10 ▲ MW-11 ◆ MW-12 * MW-13 ● MW-13A
- MW-13B — MW-14 — MW-15 ● MW-15A

Note: MW-14 dry in all events July 2011 to April 2012.

Figure 5-1. Groundwater Elevations August 2002 through April 2012
Port of Seattle EFMP

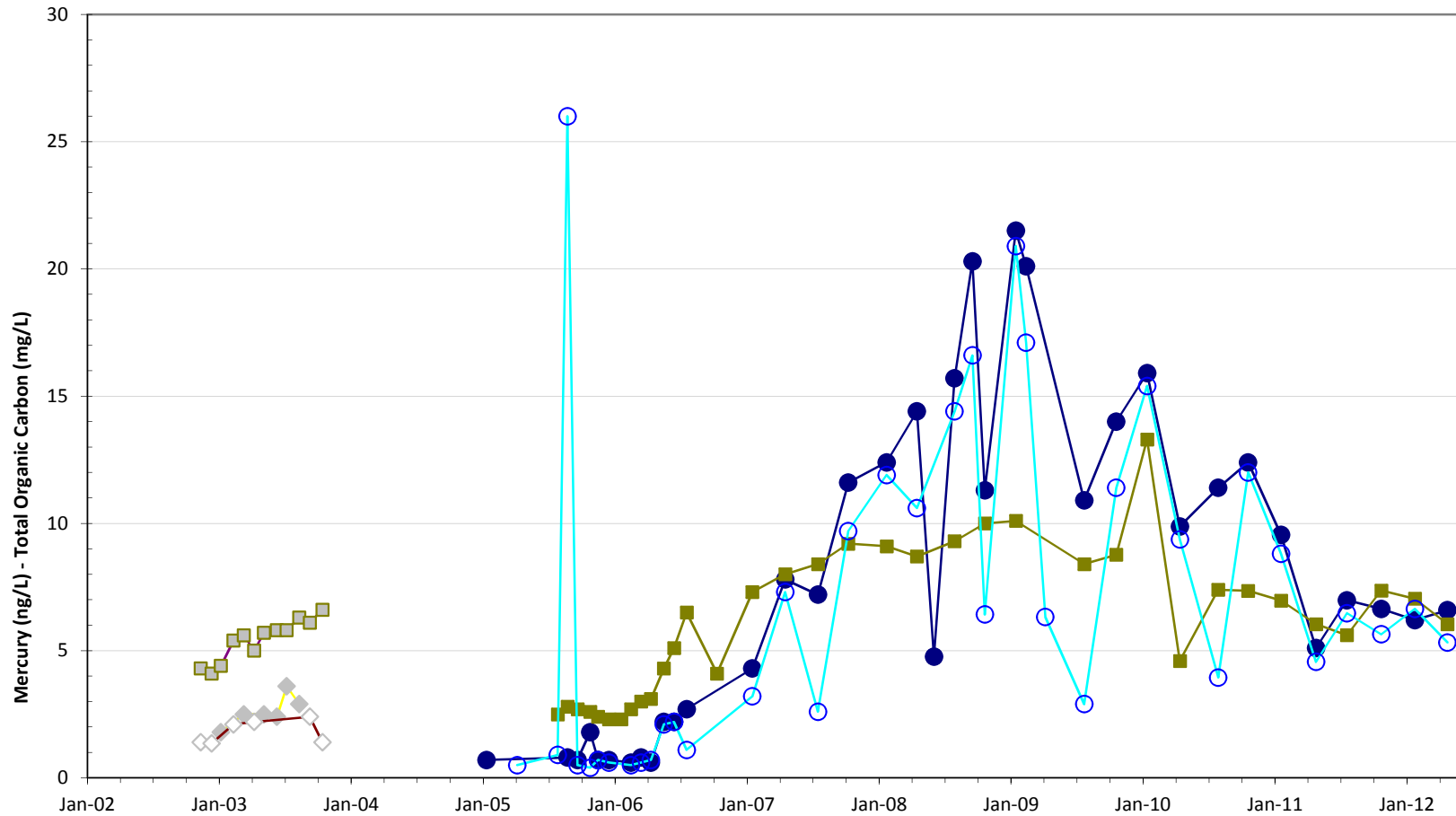




- ◆— Ground Surface
- ◆ Oct 11
- ◆ Apr 12
- Jul 11
- Jan 12

Figure 5-2. Conceptual Cross Section of Groundwater Levels and Variations
 Port of Seattle EFMP





- MW-8A Total Mercury
- MW-8A Dissolved Mercury
- ◆ MW-8 Total Mercury
- ◇ MW-8 Dissolved Mercury
- MW-8A Total Organic Carbon
- MW-8 Total Organic Carbon

Figure 5-3. MW-8A Mercury and TOC Trends
Port of Seattle EFMP

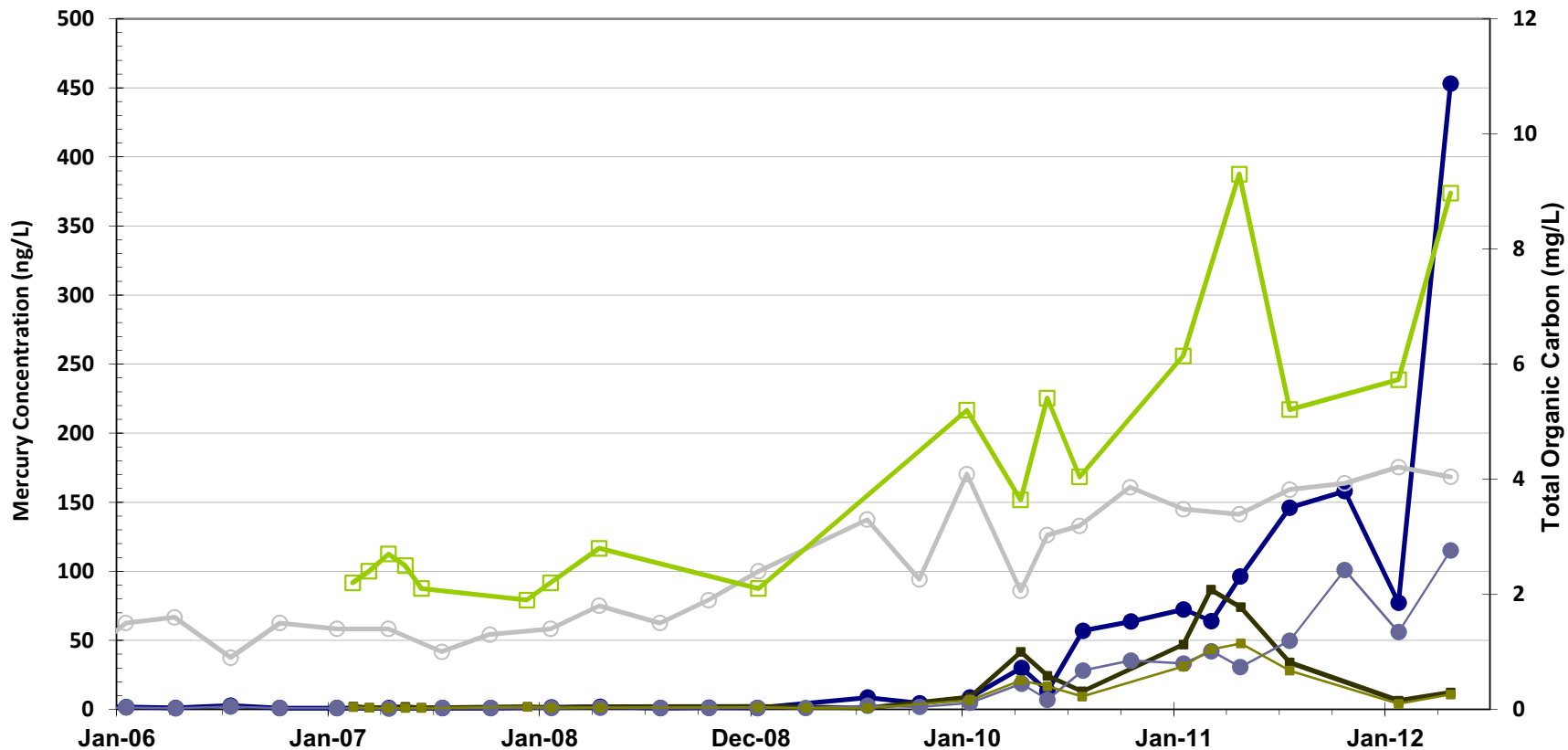


Figure 5-4.
MW-12 and MW-13B Mercury and TOC Trends
 Port of Seattle EFMP

● MW-12 Total Hg ■ MW-13B Total Hg ● MW-12 Diss. Hg
 ■ MW-13B Diss. Hg ● MW-12 TOC ■ MW-13B TOC

APPENDIX A
DATA VALIDATION REPORTS FOR EFMP-GWM PY□/PY□ DATA

Data Evaluation for the Embankment Fill Monitoring Program, Seattle-Tacoma International Airport, Supplemental Monitoring, September 2011

Two water samples from a single station in a single sample delivery group were collected on September 1, 2011, for the analyses of selected conventional parameters [total organic carbon (TOC), alkalinity and anions], and selected metals. Samples were collected by Pacific Groundwater Group of Seattle, Washington, and analyzed by Analytical Resources, Inc. (ARI) of Tukwila, Washington. Analytical subcontracting to ARI was performed by Brooks-Rand of Seattle, Washington for low-level mercury analyses. Sampling and analyses were conducted in accordance with the specifications of the *Embankment Fill Monitoring Program (EFMP)*, *Groundwater Monitoring Work Plan*, and *EFMP, Seep Monitoring Work Plan*, both prepared by Port of Seattle, April 17, 2006. All sample results are presented in the attached Table, entitled, "Embankment Fill Monitoring Program, Supplemental Monitoring, September 2011".

Samples were received at the laboratory with complete documentation, including completed Analytical Request and Chain-of-Custody (C-O-C) forms, within 2 hours of collection. Sample container custody seals were not employed for this project, however, samples were transported and handled by identifiable project personnel (samples were hand-delivered to the project laboratory by field personnel), as indicated on completed Chain-of-Custody forms.

Analytical methods employed are summarized here:

Analyte(s)	Method	Analyte(s)	Method
Total Suspended Solids (TSS)	U.S. EPA 160.2	Mercury (Hg)	U.S. EPA 1631
		Methyl mercury (Me-Hg)	U.S. EPA 1630
Total Organic Carbon (TOC)	U.S. EPA 415.1 (combustion/IR)	Alkalinity	SM.2320
Metals (Ca, Fe, Mg & Mn)	SW-846 6010B	Anions (NO ₂ , NO ₃ , Cl & SO ₄)	U.S. EPA 300.0
Metals (Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, Ag, Tl & Zn)	U.S. EPA 200.8	Total Phosphorus	U.S. EPA 365.2
Total Sulfides	U.S. EPA 376.2		

Reported alkalinities in sitewaters are principally associated with bicarbonate anion. No significant anomalies or problems were encountered with any of the analyses performed for this monitoring event. Sample collection dates in the attached results table were verified against the dates reported on the C-O-C / Analytical Request forms. Field filtrations of samples were performed for dissolved metals with use of an in-line 0.45 µm capsule filter. No other parameters were field-filtered. The capsule filters have been previously evaluated and determined to be acceptable for use in low-level metals monitoring.

All **holding times and conditions** were found to be acceptable or within the requirements of the EFMP work plans. Samples were shipped on ice and held under refrigeration upon receipt at

the laboratory. Samples were received by the project laboratory at 14.9 °C, even though sufficient ice was present in sample cooler containers. Because samples were received immediately following collection (within 2 hours), sample temperatures had not attained the specified 4 °C while in contact with ice. Selected aliquots were transferred to the subcontractor laboratory for Hg analyses and received at 3.1 °C on the same day of collection. Chemical preservation of samples, as appropriate, was checked upon arrival at the project laboratory, and found to be in compliance with work plan specifications (HNO₃ for total and dissolved metals). Total sulfides were preserved in the field with zinc acetate and pH adjustment with sodium hydroxide was made upon receipt at the laboratory. HCl was not employed for preservation of samples designated for total and dissolved Hg analyses, as specified in the EFMP work plan, rather method 1631 requires addition of BrCl directly to [nonpreserved] sample containers at least 24 hours prior to analysis, as accomplished. No headspace was observed in the sample aliquot designated for alkalinity. Sample-holding times and conditions were either acceptable or in compliance with the specifications of the EFMP work plans.

All initial and continuing **calibrations** and calibration blanks met the specifications of the respective methods. Procedural/method blank corrections were made for mercury (Hg) and methylmercury (Me-Hg) analyses, as specified by the methods.

Method/procedural **blanks** for all analytical procedures were analyzed and reported for each delivery group. Blanks exhibited no detectable analytes above the lower reporting limits (quantitation limits), with the exception of nitrate. Nitrate was reported as detected in both the primary sample and its duplicate at the lower reporting limit of 0.1 mg/L. The nitrate value of 0.1 mg/L is qualified as potentially affected by background [blank] contributions with the "B" qualifier code. All Hg and Me-Hg results are blank-corrected, as allowed by the analytical method. No other data required further qualification based on blank analyses. No field equipment rinsate blanks were submitted nor specified in the EFMP work plans.

ICP interference check sample solutions were analyzed for the target analytes at the beginning of each analytical run, as specified in the [metals] methods. Recoveries for the target analytes of concern were within acceptance limits (80-120%). ICP-MS interference corrections were applied as required by the method.

Laboratory control samples (LCS's or spiked blanks) were analyzed at the required frequency (at least one sample per preparation batch) for all target analytes. All target analytes were within acceptable limits (80-120% recovery for metals; 75-125% recovery for conventional parameters). No qualification of results due to out-of-compliance LCS results is required.

Analyte recoveries were also evaluated with the use of **matrix spikes** (MS). All matrix spike recoveries were within acceptable limits (75-125%), with the exception of silver in both filtered and nonfiltered samples. Silver recoveries are reported at 19% and 26%; requiring the qualification of sample nondetects with the "UJ" qualifier code (as an estimated lower reporting limit). The lower recoveries are likely due to the presence of some chloride in the digestion acid used for sample preparation. Recoveries reported for LCS's and "certified" reference materials for all analytes were within their corresponding acceptance ranges. No other results required qualification due to unacceptable recoveries.

Laboratory **duplicate analyses** were performed for all parameters. RPDs (relative percent differences) were all acceptable at less than 20 (for detections greater than 5x the lower reporting limit). No results required qualification due to unacceptable replicate analytical results.

No **field duplicates** were submitted for analysis in this monitoring event.

Lower reporting limits for all parameters in all samples are considered acceptable. However, an exception to meeting the EFMP work plan detection limit goal is noted. Lower reporting limits for total and dissolved mercury (Hg) is elevated from the goal of 0.1 U to 0.15 U due to statistics associated with procedural/method blanks. Mercury was detected in both samples submitted (MW-5 filtered and nonfiltered). All other reporting limits meet the specifications of EFMP work plans.

The overall **data quality** is within the criteria set forth and specifications outlined in the EFMP work plans and respective analytical methodologies. The reported data as presented in the attached results table are determined to be usable for the intended purposes of the project.

Embankment Fill Monitoring Program Groundwater Supplemental Monitoring, September 2011

Field I.D.	Collection		Lab I.D.	Method:	TSS	TOC	Sb	As	Ba	Be	Cd
	Date	Matrix		Lab:	ARI	ARI	ARI	ARI	ARI	ARI	ARI
				units:	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L
MW-5	9/1/11	grd water, total	1118940-TK64A		6.5	7.34	0.2 U	5.1	36.6	0.2 U	0.1 U
MW-5	9/1/11	grd water, dissolved	1118941-TK64B				0.2 U	5.2	37.1	0.2 U	0.1 U
<i>Ground water action level</i>							6	17.4	1000	4	5
<i>Seep water action level</i>							30	190	1450	51	1.2

U qualifier - nondetected at the associated lower reporting limit

J qualifier - associated value is an estimate.

B qualifier - associated value may not be significantly different from [blank] background.

Embankment Fill Monitoring Program Groundwater Supplemental Monitoring, September 2011

Field I.D.	Collection Date	Matrix	Cr	Cu	Pb	Ni	Se	Ag	Tl	Zn	Ca	Fe
			200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	6010B ARI ug/L	6010B ARI ug/L
MW-5	9/1/11	grd water, total	0.5 U	0.8	0.1 U	20.9	2 U	0.2 UJ	0.2 U	4 U	66,400	4260
MW-5	9/1/11	grd water, dissolved	0.5 U	0.5 U	0.1 U	21.6	2 U	0.2 UJ	0.2 U	4 U	65,800	4140
<i>Ground water action level</i>			<i>50</i>	<i>1000</i>	<i>15</i>	<i>100</i>	<i>10</i>	<i>50</i>	<i>2</i>	<i>5000</i>		
<i>Seep water action level</i>			<i>205</i>	<i>13</i>	<i>3</i>	<i>182</i>	<i>5</i>	<i>1.0</i>	<i>40</i>	<i>121</i>		

U qualifier - nondetected at the associated lower reporting limit

J qualifier - associated value is an estimate.

B qualifier - associated value may not be significantly different from [blank] background.

Embankment Fill Monitoring Program Groundwater Supplemental Monitoring, September 2011

Field I.D.	Collection Date	Matrix	Mg	Mn	Hg	Alkalinity	NO ₂	NO ₃	Cl	SO ₄	total Phosphorus	total Sulfides
			6010B	6010B	1631	SM.2320	300.0	300.0	300.0	300.0	300.0	365.2
			ARI	ARI	B-R	ARI	ARI	ARI	ARI	ARI	ARI	ARI
			ug/L	ug/L	ng/L	mg/L CaCO ₃	mg-N/L	mg-N/L	mg/L	mg/L	mg-P/L	mg/L
MW-5	9/1/11	grd water, total	25,100	2280	9.72	252	2.8	0.1 B	6.1	48.8	0.073	0.05 U
MW-5	9/1/11	grd water, dissolved	25,100	2260	4.09							

Ground water action level

Seep water action level

2000

12

U qualifier - nondetected at the associated lower reporting limit

J qualifier - associated value is an estimate.

B qualifier - associated value may not be significantly different from [blank] background.

Data Evaluation for the Embankment Fill Monitoring Program, Seattle-Tacoma International Airport, Groundwater and Seep Monitoring, July 2011

Thirty-seven water samples in three sample delivery groups were collected during July 19-22, 2011, for the analyses of selected conventional parameters [total suspended solids (TSS), total organic carbon (TOC), and anions], total petroleum hydrocarbons (TPH), and metals. Samples were collected by Pacific Groundwater Group of Seattle, Washington, and analyzed by Analytical Resources, Inc. (ARI) of Tukwila, Washington. Analytical subcontracting to ARI was performed by Brooks-Rand of Seattle, Washington for low-level mercury. Sampling and analyses were conducted in accordance with the specifications of the *Embankment Fill Monitoring Program (EFMP), Groundwater Monitoring Work Plan, and EFMP, Seep Monitoring Work Plan*, both prepared by Port of Seattle, April 17, 2006. All sample results are presented in the attached Table, entitled, "Embankment Fill Monitoring Program, Groundwater & Seeps Monitoring, July 2011".

Samples were received at the laboratory with complete documentation, including completed Analytical Request and Chain-of-Custody (C-O-C) forms, within 6, 7 and 7 hours of collection for the three delivery groups. Sample container custody seals were not employed for this project, however, samples were transported and handled by identifiable project personnel (samples were hand-delivered to the project laboratory by field or laboratory personnel), as indicated on completed Chain-of-Custody forms.

Analytical methods employed are summarized here:

Analyte(s)	Method	Analyte(s)	Method
Total Suspended Solids (TSS)	U.S. EPA 160.2	Mercury (Hg) Methyl mercury (Me-Hg)	U.S. EPA 1631 U.S. EPA 1630
Total Organic Carbon (TOC)	U.S. EPA 415.1 (combustion/IR)	Alkalinity	SM.2320
Petroleum Hydrocarbon I.D.	WDOE NWTPH-HCID	Anions (NO ₂ , NO ₃ , Cl & SO ₄)	U.S. EPA 300.0
Metals (Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, Ag, Tl & Zn)	U.S. EPA 200.8	Total Phosphorus	U.S. EPA 365.2
Metals (Ca, Fe, Mg & Mn)	SW-846 6010B	Total Sulfides	U.S. EPA 376.2

Petroleum hydrocarbon HCID analyses were performed without acid cleanup or silica gel chromatography, as is occasionally performed for NWTPHD analyses. Reported alkalinities are principally associated with bicarbonate anion. No significant anomalies or problems were encountered with any of the analyses performed for this monitoring event. Sample collection dates in the attached results table were verified against the dates reported on the C-O-C / Analytical Request forms. Field filtrations of samples were performed for dissolved metals (only) with use of an in-line 0.45 µm capsule filter. No other parameters were filtered.

All **holding times and conditions** were within the requirements of the EFMP work plans or acceptable limits. Samples were shipped on ice and held under refrigeration upon receipt at the laboratory. All samples were received by the project laboratory within 7 hours of collection, and at 4.9-12.8 °C upon arrival. The elevated temperatures were associated with samples for which insufficient ice was present (sample delivery group TE93). Selected aliquots were transferred to the subcontractor laboratory for Hg analyses and received at 2.9 - 6.6 °C. Chemical preservation of samples, as appropriate, was checked upon arrival at the project laboratory, and found to be in compliance with work plan specifications (HNO₃ for total and dissolved metals, HCl for Me-Hg, H₂SO₄ for total phosphorus and TOC, and HCl for HCID). Total sulfides were preserved in the field with zinc acetate and pH adjustment with sodium hydroxide was made upon receipt at the laboratory. HCl was not employed for preservation of samples designated for total and dissolved Hg analyses, as specified in the EFMP work plan, rather method 1631 requires addition of BrCl directly to [nonpreserved] sample containers at least 24 hours prior to analysis, as accomplished. No headspace was observed in samples designated for alkalinity and HCID/gasoline determinations, as required. Occasional "peabubbles" (2-4 mm diameter) were noted in some of the alkalinity and HCID samples in sample delivery group TF12. All other sample-holding times and conditions were in compliance with the specifications of the EFMP work plans. No data quality limitations are identified due to sample holding-times and conditions.

All initial and continuing **calibrations** and calibration blanks met the specifications of the respective methods. The closing calibration blank for one batch of chlorides (sample delivery group TE93) exhibited a detection at 0.127 mg/L, whereas the lower reporting limit is normally 0.1 mg/L. Since all chlorides were sufficiently greater than the closing calibration blank (> 10x), no adverse effects on data quality are identified. Procedural/method blank corrections were made for mercury (Hg) and methylmercury (Me-Hg) analyses, as specified by the methods.

Method/procedural **blanks** for all analytical procedures were analyzed and reported for each delivery group of less than 20 samples. Blanks exhibited no detectable analytes above the lower reporting limits (quantitation limits). All Hg and Me-Hg results are blank-corrected, as allowed by the analytical method. Six sample results are lab-qualified as potentially affected by background [blank] contributions - results for total and dissolved Hg in MW-1A (0.16 and 0.25 ng/L, respectively), total and dissolved Hg in MW-2A (0.23 and 0.26 ng/L, respectively), Me-Hg in MW-8A (0.012 ng/L), and dissolved Hg in S-102K (0.38 ng/L) are "B" qualified. These data qualifications are due to values reported at less than or equal to the 0.41 ng/L method reporting limits (MRL) for Hg; the reported backgrounds (MDL) for these analytical groups are 0.15 ng/L. Methyl-Hg MRL is reported at 0.030 ng/L and the MDL at 0.010 ng/L. No data required further qualification based on blank analyses. No field equipment rinsate blanks were submitted nor specified in the EFMP work plans.

ICP interference check sample solutions were analyzed for the target analytes at the beginning of each analytical run, as specified in the [metals] methods. Recoveries for the target analytes of concern were within acceptance limits (80-120%). ICP-MS interference corrections were applied as required by the method; in the case of arsenic, corrections for chloride and bromide were applied (although these corrections are minimal, as the level of total chloride ion present in site waters is relatively low).

Laboratory control samples (LCS's or spiked blanks) were analyzed at the required frequency (at least one sample per preparation batch) for all target analytes. All target analytes were within acceptable limits (80-120% recovery for metals; 56-103% recovery for diesel in HCID analyses; 75-125% recovery for conventional parameters). No qualification of results due to out-of-compliance LCS results is required.

Analyte recoveries were also evaluated with the use of **matrix spikes** (MS and matrix spike duplicates [MSDs]). All matrix spike recoveries, and matrix spike duplicates where applied (MS/MSD analyses were not performed for NWTPH-HCID), were within acceptable limits (75-125%), with the exception of silver (Ag) for total metals in analytical group TE93 and TF12. Matrix spike recovery for Ag in S-102K (analytical group TE93) was 52% and in MW-7 (analytical group TF12) was 51%. Associated LCS results for Ag were within acceptable limits (103% and 107%). No Ag was detected in any project samples during this event, nor has Ag been detected in previous monitoring events. An initial MS analysis for Hg in S-102K reported at 36%; a subsequent reanalysis reported acceptable recovery. Recoveries reported for LCS's and "certified" reference materials for all analytes, including Ag, were within their corresponding acceptance ranges. Petroleum hydrocarbon HCID analyses are not normally evaluated with matrix spikes and were not performed here. No results required qualification due to unacceptable MS recoveries.

Laboratory **duplicate analyses** were performed for all parameters, with the exception of HCID. RPDs (relative percent differences) were all acceptable at less than 20 (for detections greater than 5x the lower reporting limit). No results required qualification due to unacceptable replicate analytical results.

Field replicates were submitted for analyses in this monitoring event; five duplicate pairs (MW-4A (dissolved), MW-4A (total), S-102K (dissolved), S-102K (total), and MW-8A, upstream (Me-Hg, only) were submitted and results are presented in the attached table. Variability in terms of relative percent difference (RPD's) for all parameters was less than 25 (for results greater than 5x the lower reporting limit). Greatest monitoring variability is determined for Hg in S-102K at 39 RPD about a mean of 0.71 ng/L for total and 45 RPD about a mean of 0.74 ng/L for dissolved species (note however that the reported levels are < 5x the MRL for Hg). Field replicate precision is reasonable and is considered acceptable.

All **surrogate compound recoveries** for HCID analyses were in compliance with laboratory-specified limits (50-150%). No petroleum hydrocarbons were detected in project samples. Surrogate recoveries are determined to be within acceptable limits.

Lower reporting limits for all parameters in all samples were significantly less than the project action thresholds in order to allow a comparison to applicable criteria. However, an exception to meeting the EFMP work plan detection limit goal is noted. Lower reporting limits for all total and dissolved mercury (Hg) is elevated from the goal of 0.1 U to 0.15 U due to statistics associated with procedural/method blanks. All other reporting limits meet the specifications of EFMP work plans.

The overall **data quality** is within the criteria set forth and specifications outlined in the EFMP work plans and respective analytical methodologies. The reported data as presented in the attached results table are determined to be usable for the intended purposes of the project.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, July 2011

<u>Field I.D.</u>	<u>Collection Date</u>	<u>Matrix</u>	<u>Lab I.D.</u>	<u>Method:</u> <u>Lab:</u> <u>units:</u>	<u>TSS</u> 160.2 ARI mg/L	<u>TOC</u> 415.1 ARI mg/L	<u>HCID</u>		
							<u>Gasoline</u>	<u>Diesel</u> NWTPH-HCID	<u>Lube Oil</u>
MW-1A	7/19/11	grd water, total	1115448-TE68D		1.1 U	1.50 U	0.25 U	0.50 U	0.50 U
MW-1A	7/19/11	grd water, dissolved	1115454-TE68J						
MW-2A	7/19/11	grd water, total	1115445-TE68A		2.7	4.72	0.25 U	0.50 U	0.50 U
MW-2A	7/19/11	grd water, dissolved	1115451-TE68G						
MW-4A	7/19/11	grd water, total	1115446-TE68B		1.1 U	1.59	0.25 U	0.50 U	0.50 U
MW-4A	7/19/11	grd water, dissolved	1115452-TE68H						
MW-4A (dup)	7/19/11	grd water, total	1115447-TE68C		1.1 U	1.68	0.25 U	0.50 U	0.50 U
MW-4A (dup)	7/19/11	grd water, dissolved	1115453-TE68I						
MW-5	7/19/11	grd water, total	1115449-TE68E		1.9	5.42	0.25 U	0.50 U	0.50 U
MW-5	7/19/11	grd water, dissolved	1115455-TE68K						
MW-6	7/19/11	grd water, total	1115450-TE68F		2.3	1.50 U	0.25 U	0.50 U	0.50 U
MW-6	7/19/11	grd water, dissolved	1115456-TE68L						
MW-7	7/21/11	grd water, total	1115712-TF12A		4.8	4.98	0.25 U	0.50 U	0.50 U
MW-7	7/21/11	grd water, dissolved	1115729-TF12H						
MW-8A	7/20/11	grd water, total	1115513-TE93A		1.1 U	5.61	0.25 U	0.50 U	0.50 U
MW-8A	7/20/11	grd water, dissolved	1115519-TE93G						
MW-8A, dnstrm	7/21/11	surface water, total	1115713-TF12B		2.2	4.87			
MW-8A, dnstrm	7/21/11	surface water, dissolved	1115730-TF12I						
MW-8A, upstrm	7/21/11	surface water, total	1115714-TF12C		2.8	4.80			
MW-8A, upstrm (dup)	7/22/11	surface water, total	1115728-TF12G						
MW-8A, upstrm	7/21/11	surface water, dissolved	1115731-TF12J						

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, July 2011

<u>Field I.D.</u>	Collection <u>Date</u>	<u>Matrix</u>	<u>Lab I.D.</u>	Method: Lab: units:	TSS 160.2 ARI mg/L	TOC 415.1 ARI mg/L	HCID		
							<u>Gasoline</u>	<u>Diesel</u> NWTPH-HCID ARI mg/L	<u>Lube Oil</u>
MW-9A	7/20/11	grd water, total	1115514-TE93B		4.4	5.21	0.25 U	0.50 U	0.50 U
MW-9A	7/20/11	grd water, dissolved	1115520-TE93H						
MW-10	7/20/11	grd water, total	1115517-TE93E		1.1 U	3.21	0.25 U	0.50 U	0.50 U
MW-10	7/20/11	grd water, dissolved	1115523-TE93K						
MW-11	7/20/11	grd water, total	1115518-TE93F		1.1 U	1.52	0.25 U	0.50 U	0.50 U
MW-11	7/20/11	grd water, dissolved	1115524-TE93L						
MW-12	7/21/11	grd water, total	1115715-TF12D		3.2	3.82	0.25 U	0.50 U	0.50 U
MW-12	7/21/11	grd water, dissolved	1115732-TF12K						
MW-13B	7/21/11	grd water, total	1115716-TF12E			5.21	0.25 U	0.50 U	0.50 U
MW-13B	7/21/11	grd water, dissolved	1115733-TF12L						
S-102K	7/20/11	seep water, total	1115515-TE93C		7.8	6.57	0.25 U	0.50 U	0.50 U
S-102K	7/20/11	seep water, dissolved	1115521-TE93I						
S-102K (dup)	7/20/11	seep water, total	1115516-TE93D		7.6	6.54	0.25 U	0.50 U	0.50 U
S-102K (dup)	7/20/11	seep water, dissolved	1115522-TE93J						
S-105	7/21/11	seep water, total	1115717-TF12F		1.1 U	4.12	0.25 U	0.50 U	0.50 U
S-105	7/21/11	seep water, dissolved	1115734-TF12M						
<i>Ground water action level</i>							<i>0.27</i>	<i>0.67</i>	<i>0.67</i>
<i>Seep water action level</i>							<i>0.27</i>	<i>0.67</i>	<i>0.67</i>

U qualifier - nondetected at the associated lower reporting limit
B qualifier - associated value may not be significantly different
from [blank] background.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, July 2011

Field I.D.	Collection Date	Matrix	<u>Sb</u>	<u>As</u>	<u>Ba</u>	<u>Be</u>	<u>Cd</u>	<u>Cr</u>	<u>Cu</u>	<u>Pb</u>	<u>Ni</u>
			200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L
MW-1A	7/19/11	grd water, total	0.2 U	12.9	27.3	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	0.5 U
MW-1A	7/19/11	grd water, dissolved	0.2 U	12.2	25.0	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	0.5 U
MW-2A	7/19/11	grd water, total	0.2 U	1.7	47.0	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	3.3
MW-2A	7/19/11	grd water, dissolved	0.2 U	0.9	47.0	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	3.3
MW-4A	7/19/11	grd water, total	0.2 U	0.7	17.5	0.2 U	0.1 U	0.5 U	1.0	0.1 U	1.1
MW-4A	7/19/11	grd water, dissolved	0.2 U	0.6	16.5	0.2 U	0.1 U	0.5 U	0.9	0.1 U	1.0
MW-4A (dup)	7/19/11	grd water, total	0.2 U	0.6	17.4	0.2 U	0.1 U	0.5 U	1.0	0.1 U	1.0
MW-4A (dup)	7/19/11	grd water, dissolved	0.2 U	0.6	17.6	0.2 U	0.1 U	0.5 U	1.0	0.1 U	1.1
MW-5	7/19/11	grd water, total	0.2 U	2.9	37.0	0.2 U	0.1 U	0.5 U	1.0	0.1 U	16.3
MW-5	7/19/11	grd water, dissolved	0.2 U	3.1	36.2	0.2 U	0.1 U	0.5 U	0.6	0.1 U	16.2
MW-6	7/19/11	grd water, total	0.2 U	14.9	13.2	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	0.7
MW-6	7/19/11	grd water, dissolved	0.2 U	13.6	12.4	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	0.7
MW-7	7/21/11	grd water, total	0.2 U	3.1	22.5	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	6.3
MW-7	7/21/11	grd water, dissolved	0.2 U	3.0	22.4	0.2 U	0.1 U	0.5 U	0.8	0.1 U	7.0
MW-8A	7/20/11	grd water, total	0.2 U	2.9	25.5	0.2 U	0.1 U	0.5 U	1.1	0.1 U	29.3
MW-8A	7/20/11	grd water, dissolved	0.2 U	2.8	26.7	0.2 U	0.1 U	0.5 U	1.1	0.1 U	30.5
MW-8A, dnstrm	7/21/11	surface water, total	0.2 U	1.7	10.6	0.2 U	0.1 U	0.5 U	1.0	0.6	1.4
MW-8A, dnstrm	7/21/11	surface water, dissolved	0.2 U	1.3	8.4	0.2 U	0.1 U	0.5 U	1.0	0.1 U	1.9
MW-8A, upstrm	7/21/11	surface water, total	0.2 U	1.7	10.5	0.2 U	0.1 U	0.5 U	1.0	0.7	2.0
MW-8A, upstrm (dup)	7/22/11	surface water, total									
MW-8A, upstrm	7/21/11	surface water, dissolved	0.2 U	1.4	8.7	0.2 U	0.1 U	0.5 U	0.9	0.1 U	1.8

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, July 2011

Field I.D.	Collection Date	Matrix	<u>Sb</u>	<u>As</u>	<u>Ba</u>	<u>Be</u>	<u>Cd</u>	<u>Cr</u>	<u>Cu</u>	<u>Pb</u>	<u>Ni</u>
			200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L
MW-9A	7/20/11	grd water, total	0.2 U	2.8	76.0	0.2 U	0.1 U	1 U	0.5 U	0.1 U	0.5 U
MW-9A	7/20/11	grd water, dissolved	0.2 U	3.0	78.1	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	0.5
MW-10	7/20/11	grd water, total	0.2 U	0.3	9.5	0.2 U	0.1 U	0.5 U	1.4	0.1 U	3.5
MW-10	7/20/11	grd water, dissolved	0.2 U	0.2	9.6	0.2 U	0.1 U	0.5 U	1.4	0.1 U	3.5
MW-11	7/20/11	grd water, total	0.2 U	1.2	12.3	0.2 U	0.1 U	1.0	0.6	0.1 U	7.5
MW-11	7/20/11	grd water, dissolved	0.2 U	1.1	12.0	0.2 U	0.1 U	1.0	0.6	0.1 U	7.5
MW-12	7/21/11	grd water, total	0.2 U	0.5 U	20.1	0.2 U	0.1 U	0.5 U	0.7	0.1	8.5
MW-12	7/21/11	grd water, dissolved	0.2 U	0.5	18.7	0.2 U	0.1 U	0.5 U	0.6	0.1 U	8.1
MW-13B	7/21/11	grd water, total	0.2 U	0.5	24.1	0.2 U	0.1 U	0.5 U	1.0	0.1 U	1.8
MW-13B	7/21/11	grd water, dissolved	0.2 U	0.5	25.0	0.2 U	0.1 U	0.5 U	1.2	0.1 U	1.9
S-102K	7/20/11	seep water, total	0.2 U	2.6	33.5	0.2 U	0.1 U	0.5 U	0.6	0.1 U	3.0
S-102K	7/20/11	seep water, dissolved	0.2 U	2.6	33.6	0.2 U	0.1 U	0.5 U	0.6	0.1 U	2.9
S-102K (dup)	7/20/11	seep water, total	0.2 U	2.6	33.2	0.2 U	0.1 U	0.5 U	0.6	0.1 U	3.1
S-102K (dup)	7/20/11	seep water, dissolved	0.2 U	2.5	32.5	0.2 U	0.1 U	0.5 U	0.7	0.1 U	2.8
S-105	7/21/11	seep water, total	0.2 U	1.0	17.2	0.2 U	0.1 U	0.5 U	0.6	0.1 U	12.2
S-105	7/21/11	seep water, dissolved	0.2 U	0.9	16.3	0.2 U	0.1 U	1 U	0.6	0.1 U	12.2
<i>Ground water action level</i>			<i>6</i>	<i>17.4</i>	<i>1000</i>	<i>4</i>	<i>5</i>	<i>50</i>	<i>1000</i>	<i>15</i>	<i>100</i>
<i>Seep water action level</i>			<i>30</i>	<i>190</i>	<i>1450</i>	<i>51</i>	<i>1.2</i>	<i>205</i>	<i>13</i>	<i>3</i>	<i>182</i>

U qualifier - nondetected at the associated lower reporting limit
B qualifier - associated value may not be significantly different
from [blank] background.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, July 2011

Field I.D.	Collection Date	Matrix	Se	Ag	Tl	Zn	Ca	Fe	Mg	Mn	Hg	Me-Hg
			200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	1631 B-R ng/L	1630 B-R ng/L
MW-1A	7/19/11	grd water, total	0.5 U	0.2 U	0.2 U	4 U	43,100	50	19,700	159	0.16 B	
MW-1A	7/19/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	44,200	50 U	20,400	150	0.25 B	
MW-2A	7/19/11	grd water, total	2 U	0.2 U	0.2 U	4 U	85,700	3290	44,100	2370	0.23 B	
MW-2A	7/19/11	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	83,900	2890	43,100	2250	0.26 B	
MW-4A	7/19/11	grd water, total	0.5 U	0.2 U	0.2 U	4 U	41,800	50 U	12,500	16	1.26	
MW-4A	7/19/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	42,200	50 U	12,400	13	1.13	
MW-4A (dup)	7/19/11	grd water, total	0.5 U	0.2 U	0.2 U	4 U	41,100	50 U	12,200	14	1.32	
MW-4A (dup)	7/19/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	41,800	50 U	12,400	14	1.22	
MW-5	7/19/11	grd water, total	2 U	0.2 U	0.2 U	6	69,400	1250	25,900	2940	17.2	
MW-5	7/19/11	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	66,800	1340	25,000	2740	5.23	
MW-6	7/19/11	grd water, total	0.5 U	0.2 U	0.2 U	4 U	25,000	980	11,900	405	0.15 U	
MW-6	7/19/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	25,700	710	12,200	417	0.15 U	
MW-7	7/21/11	grd water, total	2 U	0.2 U	0.2 U	4 U	50,000	1850	23,700	639	1.39	
MW-7	7/21/11	grd water, dissolved	1.0	0.2 U	0.2 U	4 U	51,700	1720	24,400	647	0.83	
MW-8A	7/20/11	grd water, total	2 U	0.2 U	0.2 U	6	81,800	180	56,600	114	6.98	0.012 B
MW-8A	7/20/11	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	84,400	160	58,500	119	6.47	
MW-8A, dnstrm	7/21/11	surface water, total	0.5 U	0.2 U	0.2 U	7	24,000	440	15,100	76	1.42	0.074
MW-8A, dnstrm	7/21/11	surface water, dissolved	0.5 U	0.2 U	0.2 U	5	24,500	60	15,300	48	0.74	
MW-8A, upstrm	7/21/11	surface water, total	0.5 U	0.2 U	0.2 U	9	24,100	460	15,300	81	1.75	0.083
MW-8A, upstrm (dup)	7/22/11	surface water, total										0.081
MW-8A, upstrm	7/21/11	surface water, dissolved	0.5 U	0.2 U	0.2 U	5	24,400	60	15,500	43	0.57	

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, July 2011

Field I.D.	Collection Date	Matrix	Se	Ag	Tl	Zn	Ca	Fe	Mg	Mn	Hg	Me-Hg
			200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	1631 B-R ng/L	1630 B-R ng/L
MW-9A	7/20/11	grd water, total	2 U	0.2 U	0.2 U	4 U	99,900	2230	49,300	1370	0.15 U	
MW-9A	7/20/11	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	105,000	2390	52,400	1520	0.15 U	
MW-10	7/20/11	grd water, total	0.5 U	0.2 U	0.2 U	4 U	30,300	130	19,500	1150	1.41	
MW-10	7/20/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	30,800	50 U	19,500	1100	1.19	
MW-11	7/20/11	grd water, total	0.5 U	0.2 U	0.2 U	4 U	36,800	50 U	28,100	20	0.96	
MW-11	7/20/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	36,000	50 U	27,300	17	0.93	
MW-12	7/21/11	grd water, total	2 U	0.2 U	0.2 U	4 U	41,400	130	28,600	255	146	
MW-12	7/21/11	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	42,500	50 U	29,600	244	49.7	
MW-13B	7/21/11	grd water, total	0.6	0.2 U	0.2 U	4 U	41,400	50 U	11,100	9	34.0	
MW-13B	7/21/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	43,300	50 U	11,600	8	28.0	
S-102K	7/20/11	seep water, total	2 U	0.2 U	0.2 U	4 U	96,400	4370	31,200	10,600	0.85	
S-102K	7/20/11	seep water, dissolved	2 U	0.2 U	0.2 U	4 U	99,000	4330	32,200	11,000	0.38 B	
S-102K (dup)	7/20/11	seep water, total	2 U	0.2 U	0.2 U	4 U	94,800	4280	30,300	10,400	0.57	
S-102K (dup)	7/20/11	seep water, dissolved	2 U	0.2 U	0.2 U	4 U	98,900	4390	31,700	11,000	0.71	
S-105	7/21/11	seep water, total	0.5 U	0.2 U	0.2 U	4 U	54,200	80	34,800	1060	1.89	
S-105	7/21/11	seep water, dissolved	0.5 U	0.2 U	0.2 U	4 U	54,700	50 U	34,900	1040	1.37	
<i>Ground water action level</i>			<i>10</i>	<i>50</i>	<i>2</i>	<i>5000</i>					<i>2000</i>	
<i>Seep water action level</i>			<i>5</i>	<i>1.0</i>	<i>40</i>	<i>121</i>					<i>12</i>	

U qualifier - nondetected at the associated lower reporting limit
B qualifier - associated value may not be significantly different from [blank] background.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, July 2011

Field I.D.	Collection Date	Matrix	Alkalinity	NO ₂	NO ₃	Cl	SO ₄	total Phosphorus	total Sulfides
			SM.2320 ARI mg/L CaCO ₃	300.0 ARI mg-N/L	300.0 ARI mg-N/L	300.0 ARI mg/L	300.0 ARI mg/L	365.2 ARI mg-P/L	376.2 ARI mg/L
MW-1A	7/19/11	grd water, total	213	0.1 U	0.1 U	4.8	19.5	0.211	0.05 U
MW-1A	7/19/11	grd water, dissolved							
MW-2A	7/19/11	grd water, total	397	0.1 U	0.1 U	8.1	23.6	0.021	0.05 U
MW-2A	7/19/11	grd water, dissolved							
MW-4A	7/19/11	grd water, total	152	0.1 U	0.4	2.5	16.1	0.116	0.05 U
MW-4A	7/19/11	grd water, dissolved							
MW-4A (dup)	7/19/11	grd water, total	153	0.1 U	0.4	2.5	15.8	0.090	0.05 U
MW-4A (dup)	7/19/11	grd water, dissolved							
MW-5	7/19/11	grd water, total	257	0.1 U	0.1 U	3.8	45.9	0.038	0.05 U
MW-5	7/19/11	grd water, dissolved							
MW-6	7/19/11	grd water, total	108	0.1 U	0.1 U	4.5	15.9	0.212	0.05 U
MW-6	7/19/11	grd water, dissolved							
MW-7	7/21/11	grd water, total	243	0.1 U	0.1 U	4.6	16.0	0.090	0.161
MW-7	7/21/11	grd water, dissolved							
MW-8A	7/20/11	grd water, total	444	0.5 U	0.5	8.8	18.0	0.029	0.05 U
MW-8A	7/20/11	grd water, dissolved							
MW-8A, dnstrm	7/21/11	surface water, total	127	0.1 U	1.0	7.7	14.3	0.126	0.05 U
MW-8A, dnstrm	7/21/11	surface water, dissolved							
MW-8A, upstrm	7/21/11	surface water, total	126	0.1 U	1.0	7.7	14.3	0.112	0.05 U
MW-8A, upstrm (dup)	7/22/11	surface water, total							
MW-8A, upstrm	7/21/11	surface water, dissolved							

Embankment Fill Monitoring Program Groundwater & Seeps Monitoring, July 2011

<u>Field I.D.</u>	<u>Collection Date</u>	<u>Matrix</u>	<u>Alkalinity</u>	<u>NO₂</u>	<u>NO₃</u>	<u>Cl</u>	<u>SO₄</u>	<u>total Phosphorus</u>	<u>total Sulfides</u>
			SM.2320 ARI mg/L CaCO ₃	300.0 ARI mg-N/L	300.0 ARI mg-N/L	300.0 ARI mg/L	300.0 ARI mg/L	365.2 ARI mg-P/L	376.2 ARI mg/L
MW-9A	7/20/11	grd water, total	491	0.2 U	0.2	6.2	3.6	0.072	0.092
MW-9A	7/20/11	grd water, dissolved							
MW-10	7/20/11	grd water, total	152	1.0 U	1.0	5.4	32.3	0.021	0.05 U
MW-10	7/20/11	grd water, dissolved							
MW-11	7/20/11	grd water, total	195	1.0 U	1.2	8.3	29.3	0.095	0.05 U
MW-11	7/20/11	grd water, dissolved							
MW-12	7/21/11	grd water, total	217	0.1 U	0.1 U	5.9	37.3	0.038	0.05 U
MW-12	7/21/11	grd water, dissolved							
MW-13B	7/21/11	grd water, total	149	0.1 U	3.0	4.3	48.6	0.044	0.05 U
MW-13B	7/21/11	grd water, dissolved							
S-102K	7/20/11	seep water, total	403	0.5 U	0.5	7.9	8.8	0.029	0.05 U
S-102K	7/20/11	seep water, dissolved							
S-102K (dup)	7/20/11	seep water, total	402	0.5 U	0.5 U	7.8	8.8	0.023	0.05 U
S-102K (dup)	7/20/11	seep water, dissolved							
S-105	7/21/11	seep water, total	290	0.1 U	0.1 U	3.7	22.3	0.030	0.05 U
S-105	7/21/11	seep water, dissolved							

Ground water action level

Seep water action level

U qualifier - nondetected at the associated lower reporting limit

B qualifier - associated value may not be significantly different from [blank] background.

Data Evaluation for the Embankment Fill Monitoring Program, Seattle-Tacoma International Airport, Groundwater and Seep Monitoring, October 2011

Thirty-three water samples in three sample delivery groups were collected during October 24-26, 2011, for the analyses of selected conventional parameters [total suspended solids (TSS), total organic carbon (TOC), and anions], total petroleum hydrocarbons (TPH), and metals. Samples were collected by Pacific Groundwater Group of Seattle, Washington, and analyzed by Analytical Resources, Inc. (ARI) of Tukwila, Washington. Analytical subcontracting to ARI was performed by Brooks-Rand of Seattle, Washington for low-level mercury. Sampling and analyses were conducted in accordance with the specifications of the *Embankment Fill Monitoring Program (EFMP), Groundwater Monitoring Work Plan, and EFMP, Seep Monitoring Work Plan*, both prepared by Port of Seattle, April 17, 2006. All sample results are presented in the attached Table, entitled, "Embankment Fill Monitoring Program, Groundwater & Seeps Monitoring, October 2011".

Samples were received at the laboratory with complete documentation, including completed Analytical Request and Chain-of-Custody (C-O-C) forms, within 3, 7 and 7 hours of collection for the three delivery groups. Sample container custody seals were not employed for this project, however, samples were transported and handled by identifiable project personnel (samples were hand-delivered to the project laboratory by field or laboratory personnel), as indicated on completed Chain-of-Custody forms.

Analytical methods employed are summarized here:

Analyte(s)	Method	Analyte(s)	Method
Total Suspended Solids (TSS)	U.S. EPA 160.2	Mercury (Hg) Methyl mercury (Me-Hg)	U.S. EPA 1631 U.S. EPA 1630
Total Organic Carbon (TOC)	U.S. EPA 415.1 (combustion/IR)	Alkalinity	SM.2320
Petroleum Hydrocarbon I.D.	WDOE NWTPH-HCID	Anions (NO ₂ , NO ₃ , Cl & SO ₄)	U.S. EPA 300.0
Metals (Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, Ag, Tl & Zn)	U.S. EPA 200.8	Total Phosphorus	U.S. EPA 365.2
Metals (Ca, Fe, Mg & Mn)	SW-846 6010B	Total Sulfides	U.S. EPA 376.2

Petroleum hydrocarbon HCID analyses were performed without acid cleanup or silica gel chromatography, as is occasionally performed for NWTPHD analyses. Reported alkalinities are principally associated with bicarbonate anion. No significant anomalies or problems were encountered with any of the analyses performed for this monitoring event. Sample collection dates in the attached results table were verified against the dates reported on the C-O-C / Analytical Request forms. Field filtrations of samples were performed for dissolved metals (only) with use of an in-line 0.45 µm capsule filter. No other parameters were filtered. Positive

bias is associated with some of the dissolved mercury results (filtered samples) compared to the total mercury measurements (nonfiltered samples). A preliminary investigation suggests that the filtration process (filtration medium) is occasionally contaminated and may contribute up to 0.5-1.2 ng/L, and, in one case, up to 3.0 ng/L mercury to the filtered sample.

All **holding times and conditions** were within the requirements of the EFMP work plans or acceptable limits. Samples were shipped on ice and held under refrigeration upon receipt at the laboratory. All samples were received by the project laboratory within 7 hours of collection, and at 1.5-9.4 °C upon arrival. The elevated temperatures were associated with samples for which insufficient ice was present (sample delivery group TT79). Selected aliquots were transferred to the subcontractor laboratory for Hg analyses and received at 3.5 - 10.4 °C. Chemical preservation of samples, as appropriate, was checked upon arrival at the project laboratory, and found to be in compliance with work plan specifications (HNO₃ for total and dissolved metals, HCl for Me-Hg, H₂SO₄ for total phosphorus and TOC, and HCl for HCID). Total sulfides were preserved in the field with zinc acetate and pH adjustment with sodium hydroxide was made upon receipt at the laboratory. HCl was not employed for preservation of samples designated for total and dissolved Hg analyses, as specified in the EFMP work plan, rather method 1631 requires addition of BrCl directly to [nonpreserved] sample containers at least 24 hours prior to analysis, as accomplished. No headspace or bubbles were observed in samples designated for alkalinity and HCID/gasoline determinations, as specified. The 48-hour maximum recommended holding time was exceeded by 24 hours for NO₂/NO₃ measurements in samples from MW-5, MW-6 and MW-7. The reported results are determined to be uneffected since all three samples showed nondetects for both parameters. All other sample-holding times and conditions were in compliance with the specifications of the EFMP work plans. No data quality limitations are identified due to sample holding-times and conditions.

All initial and continuing **calibrations** and calibration blanks met the specifications of the respective methods. Procedural/method blank corrections were made for mercury (Hg) and methylmercury (Me-Hg) analyses, as specified by the methods.

Method/procedural **blanks** for all analytical procedures were analyzed and reported for each delivery group of less than 20 samples. Blanks exhibited no detectable analytes above the lower reporting limits (quantitation limits). All Hg and Me-Hg results are blank-corrected, as allowed by the analytical method. Three sample results are lab-qualified as potentially affected by background [blank] contributions - results for total Hg in MW-2A (0.25 ng/L), total Hg in MW-6 (0.27 ng/L), and total Hg in MW-9A (0.37 ng/L) are "B" qualified. These data qualifications are due to values reported at less than or equal to the 0.40 ng/L method reporting limits (MRL) for Hg; the reported backgrounds (MDL) for these analytical groups are 0.15 ng/L. Methyl-Hg MRL is reported at 0.025 ng/L and the MDL at 0.010 ng/L. No data required further qualification based on blank analyses. No field equipment rinsate blanks were submitted nor specified in the EFMP work plans.

More than half of the wells sampled exhibited dissolved (filtered) mercury results greater than for the total (nonfiltered) samples. In many cases, the dissolved Hg values were also slightly greater than reported for the previous quarter. This is consistent with previous observations made by laboratory personnel indicating some slight positive bias associated with likely

background contributions from the filter media if insufficient flushing/purging of the filters is performed. No filtered Hg results were qualified if the results were within 1.2 ng/L of the total (nonfiltered) values. One exception, however, is noted for the filtered Hg value for MW-9A, which was reported as 3.04 ng/L. The associated total Hg value is 0.37 B ng/L, and the previous quarter's dissolved and total Hg results are both reported at 0.15 U ng/L. Consequently, the dissolved (filtered) value of 3.04 ng/L for MW-9A is determined to be significantly affected by filter media contamination and is reported as unusable or rejected with the "R" qualifier code. Avoidance of future background contamination for Hg from filtration media will be attempted by longer preflush of filters prior to sample collection.

ICP interference check sample solutions were analyzed for the target analytes at the beginning of each analytical run, as specified in the [metals] methods. Recoveries for the target analytes of concern were within acceptance limits (80-120%). ICP-MS interference corrections were applied as required by the method; in the case of arsenic, corrections for chloride and bromide were applied (although these corrections are minimal, as the level of total chloride ion present in site waters is relatively low).

Laboratory control samples (LCS's or spiked blanks) were analyzed at the required frequency (at least one sample per preparation batch) for all target analytes. All target analytes were within acceptable limits (80-120% recovery for metals; 56-103% recovery for diesel in HCID analyses; 75-125% recovery for conventional parameters). No qualification of results due to out-of-compliance LCS results is required.

Analyte recoveries were also evaluated with the use of **matrix spikes** (MS and matrix spike duplicates [MSDs]). All matrix spike recoveries, and matrix spike duplicates where applied (MS/MSD analyses were not performed for NWTPH-HCID), were within acceptable limits (75-125%). Recoveries reported for LCS's and "certified" reference materials for all analytes were within their corresponding acceptance ranges. Petroleum hydrocarbon HCID analyses are not normally evaluated with matrix spikes and were not performed here. No results required qualification due to unacceptable MS recoveries.

Laboratory **duplicate analyses** were performed for all parameters, with the exception of HCID. RPDs (relative percent differences) were all acceptable at less than 20 (for detections greater than 5x the lower reporting limit). No results required qualification due to unacceptable replicate analytical results.

Field replicates were submitted for analyses in this monitoring event; five duplicate pairs (MW-4A (dissolved), MW-4A (total), S-102K (dissolved), S-102K (total), and MW-8A, upstream (Me-Hg, only) were submitted and results are presented in the attached table. Variability in terms of relative percent difference (RPD's) for all parameters was less than 25 (for results greater than 5x the lower reporting limit), with the exception of total phosphorus in MW-4A with an RPD of 190 and an RPD of 130 in S-102K. Laboratory duplicate analyses for total phosphorus exhibited acceptable results and were as high as 14 RPD. Field replicate precision is reasonable and is considered acceptable for all parameters with the possible exception of total phosphorus.

All **surrogate compound recoveries** for HCID analyses were in compliance with laboratory-specified limits (50-150%). No petroleum hydrocarbons were detected in project samples. Surrogate recoveries are determined to be within acceptable limits.

Lower reporting limits for all parameters in all samples were significantly less than the project action thresholds in order to allow a comparison to applicable criteria. However, an exception to meeting the EFMP work plan detection limit goal is noted. Lower reporting limits for all total and dissolved mercury (Hg) is elevated from the goal of 0.1 U to 0.15 U due to statistics associated with procedural/method blanks. All other reporting limits meet the specifications of EFMP work plans.

The overall **data quality** is within the criteria set forth and specifications outlined in the EFMP work plans and respective analytical methodologies. Some positive bias is observed for dissolved mercury results due to background contributions from the field filtration process. The dissolved mercury value for MW-9A is determined to be unusable due to background contamination, likely from the filter media. Total phosphorus values exhibited a relatively large amount of variability in field replicate analyses. The reported data as presented in the attached results table are determined to be usable for the intended purposes of the project.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, October 2011

Field I.D.	Collection Date	Matrix	Lab I.D.	Method: Lab: units:	TSS 160.2 ARI mg/L	TOC 415.1 ARI mg/L	HCID		
							Gasoline	Diesel NWTPH-HCID	Lube Oil
MW-2A	10/24/11	grd water, total	1124422-TT44A		2.5	5.82	0.25 U	0.50 U	0.50 U
MW-2A	10/24/11	grd water, dissolved	1124428-TT44G						
MW-4A	10/24/11	grd water, total	1124423-TT44B		1.1 U	2.32	0.25 U	0.50 U	0.50 U
MW-4A	10/24/11	grd water, dissolved	1124429-TT44H						
MW-4A (dup)	10/24/11	grd water, total	1124424-TT44C		1.0 U	2.30	0.25 U	0.50 U	0.50 U
MW-4A (dup)	10/24/11	grd water, dissolved	1124430-TT44I						
MW-5	10/24/11	grd water, total	1124425-TT44D		8.1	8.15	0.25 U	0.50 U	0.50 U
MW-5	10/24/11	grd water, dissolved	1124431-TT44J						
MW-6	10/24/11	grd water, total	1124426-TT44E		4.2	1.50 U	0.25 U	0.50 U	0.50 U
MW-6	10/24/11	grd water, dissolved	1124432-TT44K						
MW-7	10/24/11	grd water, total	1124427-TT44F		1.1 U	4.57	0.25 U	0.50 U	0.50 U
MW-7	10/24/11	grd water, dissolved	1124433-TT44L						
MW-8A	10/25/11	grd water, total	1124627-TT65A		1.1 U	7.36	0.25 U	0.50 U	0.50 U
MW-8A	10/25/11	grd water, dissolved	1124635-TT65I						
MW-8A, dnstrm	10/26/11	surface water, total	1124619-TT79C		1.0 U	4.87			
MW-8A, dnstrm	10/26/11	surface water, dissolved	1124622-TT79F						
MW-8A, upstrm	10/26/11	surface water, total	1124617-TT79A		1.1	4.64			
MW-8A, upstrm (dup)	10/26/11	surface water, total	1124618-TT79B						
MW-8A, upstrm	10/26/11	surface water, dissolved	1124621-TT79E						

Embankment Fill Monitoring Program Groundwater & Seeps Monitoring, October 2011

Field I.D.	Collection Date	Matrix	Lab I.D.	Method: Lab: units:	TSS 160.2 ARI mg/L	TOC 415.1 ARI mg/L	HCID		
							Gasoline	Diesel NWTPH-HCID	Lube Oil
MW-9A	10/25/11	grd water, total	1124628-TT65B		9.2	7.08	0.25 U	0.50 U	0.50 U
MW-9A	10/25/11	grd water, dissolved	1124636-TT65J						
MW-10	10/25/11	grd water, total	1124629-TT65C		1.1 U	3.97	0.25 U	0.50 U	0.50 U
MW-10	10/25/11	grd water, dissolved	1124637-TT65K						
MW-11	10/25/11	grd water, total	1124630-TT65D		1.2	1.65	0.25 U	0.50 U	0.50 U
MW-11	10/25/11	grd water, dissolved	1124638-TT65L						
MW-12	10/25/11	grd water, total	1124633-TT65G		4.1	3.93	0.25 U	0.50 U	0.50 U
MW-12	10/25/11	grd water, dissolved	1124641-TT65O						
S-102K	10/25/11	seep water, total	1124631-TT65E		3.0	6.64	0.25 U	0.50 U	0.50 U
S-102K	10/25/11	seep water, dissolved	1124639-TT65M						
S-102K (dup)	10/25/11	seep water, total	1124632-TT65F		3.8	6.61	0.25 U	0.50 U	0.50 U
S-102K (dup)	10/25/11	seep water, dissolved	1124640-TT65N						
S-105	10/26/11	seep water, total	1124620-TT79D		1.1 U	4.64	0.25 U	0.50 U	0.50 U
S-105	10/26/11	seep water, dissolved	1124623-TT79G						

Ground water action level

Seep water action level

0.27 0.67 0.67

0.27 0.67 0.67

U qualifier - nondetected at the associated lower reporting limit.

B qualifier - associated value may not be significantly different
from [blank] background.

R qualifier - value unusable or rejected.

Embankment Fill Monitoring Program Groundwater & Seeps Monitoring, October 2011

Field I.D.	Collection		Sb	As	Ba	Be	Cd	Cr	Cu	Pb	Ni
	Date	Matrix	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L
MW-2A	10/24/11	grd water, total	0.2 U	5.7	40.3	0.2 U	0.1 U	1 U	0.5 U	0.1 U	3.0
MW-2A	10/24/11	grd water, dissolved	0.2 U	5.7	39.0	0.2 U	0.1 U	0.5 U	0.6	0.1 U	3.4
MW-4A	10/24/11	grd water, total	0.3	1.0	29.8	0.2 U	0.1 U	0.5 U	1.0	0.1 U	2.5
MW-4A	10/24/11	grd water, dissolved	0.4	1.0	30.4	0.2 U	0.1	1 U	0.8	0.1 U	2.5
MW-4A (dup)	10/24/11	grd water, total	0.3	1.0	31.1	0.2 U	0.1	0.5 U	0.9	0.1 U	2.5
MW-4A (dup)	10/24/11	grd water, dissolved	0.4	1.1	31.2	0.2 U	0.1	0.5 U	0.8	0.1 U	2.7
MW-5	10/24/11	grd water, total	0.2 U	5.3	41.6	0.2 U	0.1 U	0.5 U	1.5	0.2	14.0
MW-5	10/24/11	grd water, dissolved	0.2 U	5.1	43.9	0.2 U	0.1 U	1 U	0.6	0.1 U	14.6
MW-6	10/24/11	grd water, total	0.2 U	23.8	25.2	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	0.9
MW-6	10/24/11	grd water, dissolved	0.2 U	16.2	14.3	0.2 U	0.1 U	1 U	0.5 U	0.1 U	0.9
MW-7	10/24/11	grd water, total	0.4	1.5	27.4	0.2 U	0.1 U	0.5 U	1.6	0.1 U	14.4
MW-7	10/24/11	grd water, dissolved	0.4	1.0	27.1	0.2 U	0.1	0.5 U	0.9	0.1 U	14.1
MW-8A	10/25/11	grd water, total	0.2 U	3.3	26.8	0.2 U	0.1 U	0.5 U	1.0	0.1 U	30.3
MW-8A	10/25/11	grd water, dissolved	0.2 U	3.0	28.7	0.2 U	0.1 U	0.5 U	1.1	0.1 U	32.0
MW-8A, dnstrm	10/26/11	surface water, total	0.2 U	1.3	9.9	0.2 U	0.1 U	0.5 U	1.1	0.2	1.4
MW-8A, dnstrm	10/26/11	surface water, dissolved	0.2 U	1.2	9.7	0.2 U	0.1 U	0.5 U	1.1	0.1 U	1.5
MW-8A, upstrm	10/26/11	surface water, total	0.2 U	1.2	9.6	0.2 U	0.1 U	0.5 U	1.1	0.2	1.4
MW-8A, upstrm (dup)	10/26/11	surface water, total									
MW-8A, upstrm	10/26/11	surface water, dissolved	0.2 U	1.1	9.3	0.2 U	0.1 U	0.5 U	1.0	0.1 U	1.9

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, October 2011

Field I.D.	Collection Date	Matrix	Sb	As	Ba	Be	Cd	Cr	Cu	Pb	Ni
			200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L
MW-9A	10/25/11	grd water, total	0.2 U	3.7	78.8	0.2 U	0.1 U	1 U	0.5 U	0.1 U	0.6
MW-9A	10/25/11	grd water, dissolved	0.2 U	3.9	78.9	0.2 U	0.1 U	1 U	0.5 U	0.1 U	0.6
MW-10	10/25/11	grd water, total	0.2 U	0.3	9.0	0.2 U	0.1 U	0.5 U	1.3	0.1 U	3.4
MW-10	10/25/11	grd water, dissolved	0.2 U	0.3	9.0	0.2 U	0.1 U	0.5 U	1.3	0.1 U	3.3
MW-11	10/25/11	grd water, total	0.2 U	0.9	11.7	0.2 U	0.1 U	2	0.5 U	0.1 U	7.4
MW-11	10/25/11	grd water, dissolved	0.2 U	0.9	11.5	0.2 U	0.1 U	1.7	0.5 U	0.1 U	6.7
MW-12	10/25/11	grd water, total	0.2 U	0.5 U	12.4	0.2 U	0.1 U	0.5 U	1.0	0.2	2.9
MW-12	10/25/11	grd water, dissolved	0.2 U	0.5 U	11.9	0.2 U	0.1 U	0.5 U	0.9	0.1 U	3.0
S-102K	10/25/11	seep water, total	0.2 U	2.0	28.8	0.2 U	0.1 U	1 U	0.6	0.1 U	2.5
S-102K	10/25/11	seep water, dissolved	0.2 U	1.6	28.7	0.2 U	0.1 U	1 U	0.5	0.1 U	2.5
S-102K (dup)	10/25/11	seep water, total	0.2 U	2.5	29.8	0.2 U	0.1 U	1 U	0.6	0.1 U	2.8
S-102K (dup)	10/25/11	seep water, dissolved	0.2 U	1.5	28.0	0.2 U	0.1 U	1 U	0.5	0.1 U	2.5
S-105	10/26/11	seep water, total	0.2 U	0.8	14.1	0.2 U	0.1 U	0.5 U	0.6	0.1 U	8.7
S-105	10/26/11	seep water, dissolved	0.2 U	0.8	14.4	0.2 U	0.1 U	0.5 U	0.6	0.1 U	10
<i>Ground water action level</i>			<i>6</i>	<i>17.4</i>	<i>1000</i>	<i>4</i>	<i>5</i>	<i>50</i>	<i>1000</i>	<i>15</i>	<i>100</i>
<i>Seep water action level</i>			<i>30</i>	<i>190</i>	<i>1450</i>	<i>51</i>	<i>1.2</i>	<i>205</i>	<i>13</i>	<i>3</i>	<i>182</i>

U qualifier - nondetected at the associated lower reporting limit.
 B qualifier - associated value may not be significantly different
 from [blank] background.
 R qualifier - value unusable or rejected.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, October 2011

Field I.D.	Collection		Se	Ag	Tl	Zn	Ca	Fe	Mg	Mn	Hg
	Date	Matrix	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	1631 B-R ng/L
MW-2A	10/24/11	grd water, total	0.7	0.2 U	0.2 U	4 U	79,500	2930	33,600	2590	0.25 B
MW-2A	10/24/11	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	79,200	2950	33,600	2570	0.97
MW-4A	10/24/11	grd water, total	0.5 U	0.2 U	0.2 U	4 U	47,800	50	16,100	91	1.00
MW-4A	10/24/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	48,800	50	16,600	104	1.12
MW-4A (dup)	10/24/11	grd water, total	0.5 U	0.2 U	0.2 U	4 U	49,000	50	16,400	89	0.95
MW-4A (dup)	10/24/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	48,500	60	16,600	108	2.18
MW-5	10/24/11	grd water, total	2 U	0.2 U	0.2 U	4 U	73,500	3590	23,900	4670	10.5
MW-5	10/24/11	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	79,400	3480	25,600	5010	6.63
MW-6	10/24/11	grd water, total	0.5 U	0.2 U	0.2 U	4 U	23,000	2530	10,800	1110	0.27 B
MW-6	10/24/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	23,600	1260	11,200	520	0.65
MW-7	10/24/11	grd water, total	1.3	0.2 U	0.2 U	4 U	59,600	90	35,800	158	2.46
MW-7	10/24/11	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	60,600	70	36,700	153	3.13
MW-8A	10/25/11	grd water, total	2 U	0.2 U	0.2 U	4 U	79,500	180	53,700	111	6.64
MW-8A	10/25/11	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	88,900	140	60,300	124	5.64
MW-8A, dnstrm	10/26/11	surface water, total	0.5 U	0.2 U	0.2 U	4 U	29,100	320	17,300	50	0.94
MW-8A, dnstrm	10/26/11	surface water, dissolved	0.5 U	0.2 U	0.2 U	4 U	29,000	140	17,200	43	0.77
MW-8A, upstrm	10/26/11	surface water, total	0.5 U	0.2 U	0.2 U	4 U	28,200	300	16,900	44	1.12
MW-8A, upstrm (dup)	10/26/11	surface water, total									
MW-8A, upstrm	10/26/11	surface water, dissolved	0.5 U	0.2 U	0.2 U	4 U	28,700	70	17,300	31	0.64

Embankment Fill Monitoring Program Groundwater & Seeps Monitoring, October 2011

Field I.D.	Collection		Se	Ag	Tl	Zn	Ca	Fe	Mg	Mn	Hg
	Date	Matrix	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	1631 B-R ng/L
MW-9A	10/25/11	grd water, total	2 U	0.2 U	0.2 U	4 U	104,000	3830	50,500	2190	0.37 B
MW-9A	10/25/11	grd water, dissolved	1.0	0.2 U	0.2 U	4 U	111,000	4030	54,600	2280	- R
MW-10	10/25/11	grd water, total	0.5 U	0.2 U	0.2 U	4 U	31,200	110	20,100	824	1.88
MW-10	10/25/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	34,700	60	22,100	851	1.99
MW-11	10/25/11	grd water, total	0.5 U	0.2 U	0.2 U	4 U	28,000	70	23,500	3	1.15
MW-11	10/25/11	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	31,500	50 U	26,400	1	1.86
MW-12	10/25/11	grd water, total	2 U	0.2 U	0.2 U	4 U	28,600	110	16,500	30	158
MW-12	10/25/11	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	28,500	50 U	16,500	30	101
S-102K	10/25/11	seep water, total	2 U	0.2 U	0.2 U	4 U	85,000	4090	27,100	10,300	0.96
S-102K	10/25/11	seep water, dissolved	2 U	0.2 U	0.2 U	4 U	90,300	4200	29,300	10,800	1.00
S-102K (dup)	10/25/11	seep water, total	0.8	0.2 U	0.2 U	4 U	89,700	4370	28,700	10,800	0.87
S-102K (dup)	10/25/11	seep water, dissolved	2 U	0.2 U	0.2 U	4 U	90,100	4140	29,300	10,800	0.79
S-105	10/26/11	seep water, total	0.5 U	0.2 U	0.2 U	4 U	58,200	50 U	37,000	678	1.60
S-105	10/26/11	seep water, dissolved	0.5 U	0.2 U	0.2 U	4 U	61,300	50 U	39,300	707	1.60
<i>Ground water action level</i>			<i>10</i>	<i>50</i>	<i>2</i>	<i>5000</i>					<i>2000</i>
<i>Seep water action level</i>			<i>5</i>	<i>1.0</i>	<i>40</i>	<i>121</i>					<i>12</i>

U qualifier - nondetected at the associated lower reporting limit.

B qualifier - associated value may not be significantly different from [blank] background.

R qualifier - value unusable or rejected.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, October 2011

Field I.D.	Collection Date	Matrix	Me-Hg	Alkalinity	NO ₂	NO ₃	Cl	SO ₄	total Phosphorus	total Sulfides
			1630 B-R ng/L	SM.2320 ARI mg/L CaCO ₃	300.0 ARI mg-N/L	300.0 ARI mg-N/L	300.0 ARI mg/L	300.0 ARI mg/L	365.2 ARI mg-P/L	376.2 ARI mg/L
MW-2A	10/24/11	grd water, total		347	0.1 U	0.1 U	7.9	36.0	0.115	0.05 U
MW-2A	10/24/11	grd water, dissolved								
MW-4A	10/24/11	grd water, total		179	0.1 U	0.3	4.5	31.3	0.014	0.05 U
MW-4A	10/24/11	grd water, dissolved								
MW-4A (dup)	10/24/11	grd water, total		184	0.1 U	0.3	4.5	34.3	0.489	0.05 U
MW-4A (dup)	10/24/11	grd water, dissolved								
MW-5	10/24/11	grd water, total		260	0.1 U	0.1 U	3.5	84.6	0.178	0.05 U
MW-5	10/24/11	grd water, dissolved								
MW-6	10/24/11	grd water, total		115	0.1 U	0.1 U	4.6	18.4	0.061	0.05 U
MW-6	10/24/11	grd water, dissolved								
MW-7	10/24/11	grd water, total		327	0.1 U	0.1 U	6.6	25.0	0.261	0.05 U
MW-7	10/24/11	grd water, dissolved								
MW-8A	10/25/11	grd water, total	0.010 U	470	0.1 U	0.1 U	7.7	14.7	0.206	0.05 U
MW-8A	10/25/11	grd water, dissolved								
MW-8A, dnstrm	10/26/11	surface water, total	0.055	131	0.1 U	0.9	8.0	16.8	0.076	0.05 U
MW-8A, dnstrm	10/26/11	surface water, dissolved								
MW-8A, upstrm	10/26/11	surface water, total	0.056	131	0.1 U	0.9	8.0	16.8	0.081	0.05 U
MW-8A, upstrm (dup)	10/26/11	surface water, total	0.064							
MW-8A, upstrm	10/26/11	surface water, dissolved								

Embankment Fill Monitoring Program Groundwater & Seeps Monitoring, October 2011

Field I.D.	Collection Date	Matrix	Me-Hg	Alkalinity	NO ₂	NO ₃	Cl	SO ₄	total Phosphorus	total Sulfides
			1630 B-R ng/L	SM.2320 ARI mg/L CaCO ₃	300.0 ARI mg-N/L	300.0 ARI mg-N/L	300.0 ARI mg/L	300.0 ARI mg/L	365.2 ARI mg-P/L	376.2 ARI mg/L
MW-9A	10/25/11	grd water, total		535	0.1 U	0.1 U	5.9	3.0	0.035	0.053
MW-9A	10/25/11	grd water, dissolved								
MW-10	10/25/11	grd water, total		164	0.1 U	0.1 U	5.5	30.8	0.179	0.05 U
MW-10	10/25/11	grd water, dissolved								
MW-11	10/25/11	grd water, total		162	0.1 U	1.0	9.5	29.6	0.228	0.05 U
MW-11	10/25/11	grd water, dissolved								
MW-12	10/25/11	grd water, total		119	0.1 U	0.2	5.8	36.4	0.021	0.05 U
MW-12	10/25/11	grd water, dissolved								
S-102K	10/25/11	seep water, total		381	0.1 U	0.1 U	5.6	9.2	0.039	0.05 U
S-102K	10/25/11	seep water, dissolved								
S-102K (dup)	10/25/11	seep water, total		375	0.1 U	0.1 U	5.6	9.0	0.008 U	0.05 U
S-102K (dup)	10/25/11	seep water, dissolved								
S-105	10/26/11	seep water, total		302	0.1 U	0.1 U	5.4	26.2	0.048	0.05 U
S-105	10/26/11	seep water, dissolved								

Ground water action level

Seep water action level

U qualifier - nondetected at the associated lower reporting limit.

B qualifier - associated value may not be significantly different
from [blank] background.

R qualifier - value unusable or rejected.

Data Evaluation for the Embankment Fill Monitoring Program, Seattle-Tacoma International Airport, Groundwater and Seep Monitoring, January 2012

Thirty-seven water samples in three sample delivery groups were collected during January 23-26, 2012, for the analyses of selected conventional parameters [total suspended solids (TSS), total organic carbon (TOC), and anions], total petroleum hydrocarbons (TPH), and metals. Samples were collected by Pacific Groundwater Group of Seattle, Washington, and analyzed by Analytical Resources, Inc. (ARI) of Tukwila, Washington. Analytical subcontracting to ARI was performed by Brooks-Rand of Seattle, Washington for low-level mercury. Sampling and analyses were conducted in accordance with the specifications of the *Embankment Fill Monitoring Program (EFMP)*, *Groundwater Monitoring Work Plan*, and *EFMP, Seep Monitoring Work Plan*, both prepared by Port of Seattle, April 17, 2006. All sample results are presented in the attached Table, entitled, "Embankment Fill Monitoring Program, Groundwater & Seeps Monitoring, January 2012".

Samples were received at the laboratory with complete documentation, including completed Analytical Request and Chain-of-Custody (C-O-C) forms, within 7, 22 and 28 hours of collection for the three delivery groups. Sample container custody seals were not employed for this project, however, samples were transported and handled by identifiable project personnel (samples were hand-delivered to the project laboratory by field or laboratory personnel), as indicated on completed Chain-of-Custody forms.

Analytical methods employed are summarized here:

Analyte(s)	Method	Analyte(s)	Method
Total Suspended Solids (TSS)	U.S. EPA 160.2	Mercury (Hg) Methyl mercury (Me-Hg)	U.S. EPA 1631 U.S. EPA 1630
Total Organic Carbon (TOC)	U.S. EPA 415.1 (combustion/IR)	Alkalinity	SM.2320
Petroleum Hydrocarbon I.D.	WDOE NWTPH-HCID	Anions (NO ₂ , NO ₃ , Cl & SO ₄)	U.S. EPA 300.0
Metals (Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, Ag, Tl & Zn)	U.S. EPA 200.8	Total Phosphorus	U.S. EPA 365.2
Metals (Ca, Fe, Mg & Mn)	SW-846 6010B	Total Sulfides	U.S. EPA 376.2

Petroleum hydrocarbon HCID analyses were performed without acid cleanup or silica gel chromatography, as is occasionally performed for NWTPHD analyses. Reported alkalinities are principally associated with bicarbonate anion. No significant anomalies or problems were encountered with any of the analyses performed for this monitoring event. Sample collection dates in the attached results table were verified against the dates reported on the C-O-C / Analytical Request forms. Field filtrations of samples were performed for dissolved metals (only) with use of an in-line 0.45 µm capsule filter. No other parameters were filtered.

All **holding times and conditions** were within the requirements of the EFMP work plans or acceptable limits. Samples were shipped on ice and held under refrigeration upon receipt at the laboratory. All samples were received by the project laboratory within 28 hours of collection, and at 3.0-5.9 °C upon arrival. Selected aliquots were transferred to the subcontractor laboratory for Hg analyses and received at 2.0 - 4.4 °C. Chemical preservation of samples, as appropriate, was checked upon arrival at the project laboratory, and found to be in compliance with work plan specifications (HNO₃ for total and dissolved metals, HCl for Me-Hg, H₂SO₄ for total phosphorus and TOC, and HCl for HCID). Total sulfides were preserved in the field with zinc acetate and pH adjustment with sodium hydroxide was made upon receipt at the laboratory. HCl was not employed for preservation of samples designated for total and dissolved Hg analyses, as specified in the EFMP work plan, rather method 1631 requires addition of BrCl directly to [nonpreserved] sample containers at least 24 hours prior to analysis, as accomplished. No headspace or bubbles were observed in samples designated for alkalinity and HCID/gasoline determinations, as specified. All sample-holding times and conditions were in compliance with the specifications of the EFMP work plans. No data quality limitations are identified due to sample holding-times and conditions.

All initial and continuing **calibrations** and calibration blanks met the specifications of the respective methods; with one exception. Continuing calibration blanks for chloride determinations exhibited some slight bias for samples analyzed on 1/23/12, 1/26/12 and 1/31/12. This had no adverse effect on results since all site samples reported values greater than 10x the values exhibited by the calibration blanks, and no chloride was detected in the method blanks. Procedural/method blank corrections were made for mercury (Hg) and methylmercury (Me-Hg) analyses, as specified by the methods.

Method/procedural **blanks** for all analytical procedures were analyzed and reported for each delivery group of less than 20 samples. Blanks exhibited no detectable analytes above the lower reporting limits (quantitation limits), with the exception of barium (at 0.7 µg/L) for analytical group UF06. This has no adverse effect on sample results, since all results are greater than 10x the method blank value. All Hg and Me-Hg results are blank-corrected, as allowed by the analytical method. Three sample results are lab-qualified as potentially affected by background [blank] contributions - results for total Hg in MW-1A (0.18 ng/L) and dissolved Hg in S-102K (0.35 ng/L) are "B" qualified. These data qualifications are due to values reported at less than or equal to the 0.41 ng/L method reporting limits (MRL) for Hg; the reported backgrounds (MDL) for these analytical groups are 0.15 ng/L. Methyl-Hg MRL is reported at 0.026 ng/L and the MDL at 0.010 ng/L. No data required further qualification based on blank analyses. No field equipment rinsate blanks were submitted nor specified in the EFMP work plans.

Unlike previous quarter's analyses where more than half of the wells sampled exhibited dissolved (filtered) mercury results greater than for the total (nonfiltered) samples, this event showed total values greater than or similar to dissolved values. This is likely a result of extended sample filter purge times prior to sample collection in the field. Extending the filter apparatus purge times prior to sample collection ensures that any small contamination on the filter apparatus and tubing is removed prior to sample collection.

ICP interference check sample solutions were analyzed for the target analytes at the beginning of each analytical run, as specified in the [metals] methods. Recoveries for the target analytes of concern were within acceptance limits (80-120%). ICP-MS interference corrections were applied as required by the method; in the case of arsenic, corrections for chloride and bromide were applied (although these corrections are minimal, as the level of total chloride ion present in site waters is relatively low).

Laboratory control samples (LCS's or spiked blanks) were analyzed at the required frequency (at least one sample per preparation batch) for all target analytes. All target analytes were within acceptable limits (80-120% recovery for metals; 56-103% recovery for diesel in HCID analyses; 75-125% recovery for conventional parameters). No qualification of results due to out-of-compliance LCS results is required.

Analyte recoveries were also evaluated with the use of **matrix spikes** (MS and matrix spike duplicates [MSDs]). All matrix spike recoveries, and matrix spike duplicates where applied (MS/MSD analyses were not performed for NWTPH-HCID), were within acceptable limits (75-125%). The matrix spike for manganese in sample S-102K was reported at 148% due to a high native level (~5000 µg/L) compared to the spike level of 500 µg/L. This MS is nonevaluable due to the relatively small spike level compared to the high native concentration. Recoveries reported for LCS's and "certified" reference materials for all analytes were within their corresponding acceptance ranges. Petroleum hydrocarbon HCID analyses are not normally evaluated with matrix spikes and were not performed here. No results required qualification due to unacceptable MS recoveries.

Laboratory **duplicate analyses** were performed for all parameters, with the exception of HCID. RPDs (relative percent differences) were all acceptable at less than 20 (for detections greater than 5x the lower reporting limit). No results required qualification due to unacceptable replicate analytical results.

Field replicates were submitted for analyses in this monitoring event; five duplicate pairs (MW-4A (dissolved), MW-4A (total), S-102K (dissolved), S-102K (total), and MW-8A, upstream (Me-Hg, only) were submitted and results are presented in the attached table. Variability in terms of relative percent difference (RPD's) for all parameters was less than 25 (for results greater than 5x the lower reporting limit), with the exception of total/nonfiltered zinc in S-102K with an RPD of 86 (S-102K @ 10 µg/L and S-102K(dup) @ 4 µg/L U [nondetected]). Laboratory duplicate analyses for zinc in nonfiltered S-102K exhibited acceptable results (both detected at 10 µg/L). Field replicate precision is reasonable and is considered acceptable for all parameters.

All **surrogate compound recoveries** for HCID analyses were in compliance with laboratory-specified limits (50-150%). No petroleum hydrocarbons were detected in project samples. Surrogate recoveries are determined to be within acceptable limits.

Lower reporting limits for all parameters in all samples were significantly less than the project action thresholds in order to allow a comparison to applicable criteria. However, an exception to meeting the EFMP work plan detection limit goal is noted. Lower reporting limits for all total

and dissolved mercury (Hg) is elevated from the goal of 0.1 U to 0.15 U due to statistics associated with procedural/method blanks. All other reporting limits meet the specifications of EFMP work plans.

The overall **data quality** is within the criteria set forth and specifications outlined in the EFMP work plans and respective analytical methodologies. The reported data as presented in the attached results table are determined to be usable for the intended purposes of the project.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, January 2012

Field I.D.	Collection		Lab I.D.	Method:	TSS	TOC	HCID		
	Date	Matrix					Gasoline	Diesel	Lube Oil
				units:	mg/L	mg/L	NWTPH-HCID		
							ARI		
							mg/L		
MW-1A	1/25/2012	grd water, total	121197-UF67A		2.3	2.74	0.25 U	0.50 U	0.50 U
MW-1A	1/25/2012	grd water, dissolved	121205-UF67I						
MW-2A	1/23/2012	grd water, total	12806-UE86A		1.0 U	25.8	0.25 U	0.50 U	0.50 U
MW-2A	1/23/2012	grd water, dissolved	12811-UE86F						
MW-4A	1/23/2012	grd water, total	12807-UE86B		1.0 U	5.05	0.25 U	0.50 U	0.50 U
MW-4A	1/23/2012	grd water, dissolved	12812-UE86G						
MW-4A (dup)	1/23/2012	grd water, total	12808-UE86C		1.0 U	4.73	0.25 U	0.50 U	0.50 U
MW-4A (dup)	1/23/2012	grd water, dissolved	12813-UE86H						
MW-5	1/23/2012	grd water, total	12809-UE86D		1.1	8.68	0.25 U	0.50 U	0.50 U
MW-5	1/23/2012	grd water, dissolved	12814-UE86I						
MW-6	1/23/2012	grd water, total	12810-UE86E		2.3	1.97	0.25 U	0.50 U	0.50 U
MW-6	1/23/2012	grd water, dissolved	12815-UE86J						
MW-7	1/24/2012	grd water, total	12877-UF06A		1.1 U	4.90	0.25 U	0.50 U	0.50 U
MW-7	1/24/2012	grd water, dissolved	12882-UF06F						
MW-8A	1/24/2012	grd water, total	12878-UF06B		1.0 U	7.04	0.25 U	0.50 U	0.50 U
MW-8A	1/24/2012	grd water, dissolved	12883-UF06G						
MW-8A, dnstrm	1/25/2012	surface water, total	121198-UF67B		15.3	26.7			
MW-8A, dnstrm	1/25/2012	surface water, dissolved	121206-UF67J						
MW-8A, upstrm	1/25/2012	surface water, total	121199-UF67C		14.9	27.0			
MW-8A, upstrm (dup)	1/25/2012	surface water, total	122208-UF67R						
MW-8A, upstrm	1/25/2012	surface water, dissolved	121207-UF67K						

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, January 2012

Field I.D.	Collection		Lab I.D.	Method:	TSS	TOC	HCID		
	Date	Matrix					Gasoline	Diesel	Lube Oil
				units:	mg/L	mg/L	NWTPH-HCID		
							ARI		
							mg/L		
MW-9A	1/24/2012	grd water, total	12879-UF06C		2.6	5.36	0.25 U	0.50 U	0.50 U
MW-9A	1/24/2012	grd water, dissolved	12884-UF06H						
MW-10	1/24/2012	grd water, total	12880-UF06D		1.1 U	7.19	0.25 U	0.50 U	0.50 U
MW-10	1/24/2012	grd water, dissolved	12885-UF06I						
MW-11	1/24/2012	grd water, total	12881-UF06E		1.1 U	2.90	0.25 U	0.50 U	0.50 U
MW-11	1/24/2012	grd water, dissolved	12886-UF06J						
MW-12	1/26/2012	grd water, total	121203-UF67G		4.4	4.21	0.25 U	0.50 U	0.50 U
MW-12	1/26/2012	grd water, dissolved	121211-UF67O						
MW-13B	1/25/2012	grd water, total	121202-UF67F		1.6	5.73	0.25 U	0.50 U	0.50 U
MW-13B	1/25/2012	grd water, dissolved	121210-UF67N						
S-102K	1/25/2012	seep water, total	121200-UF67D		3.2	4.10	0.25 U	0.50 U	0.50 U
S-102K	1/25/2012	seep water, dissolved	121208-UF67L						
S-102K (dup)	1/25/2012	seep water, total	121201-UF67E		3.8	4.44	0.25 U	0.50 U	0.50 U
S-102K (dup)	1/25/2012	seep water, dissolved	121209-UF67M						
S-105	1/26/2012	seep water, total	121204-UF67H		1.1 U	4.03	0.25 U	0.50 U	0.50 U
S-105	1/26/2012	seep water, dissolved	121212-UF67P						
<i>Ground water action level</i>							<i>0.27</i>	<i>0.67</i>	<i>0.67</i>
<i>Seep water action level</i>							<i>0.27</i>	<i>0.67</i>	<i>0.67</i>

U qualifier - nondetected at the associated lower reporting limit

B qualifier - associated value may not be significantly different
from [blank] background.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, January 2012

<u>Field I.D.</u>	<u>Collection</u>		<u>Sb</u>	<u>As</u>	<u>Ba</u>	<u>Be</u>	<u>Cd</u>	<u>Cr</u>	<u>Cu</u>	<u>Pb</u>	<u>Ni</u>
	<u>Date</u>	<u>Matrix</u>	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L
MW-1A	1/25/2012	grd water, total	0.2 U	12.8	34.2	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	0.5
MW-1A	1/25/2012	grd water, dissolved	0.2 U	12.4	32.4	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	0.5 U
MW-2A	1/23/2012	grd water, total	1.3	5.0	23.5	0.2 U	0.2	1 U	5.4	0.3	4.3
MW-2A	1/23/2012	grd water, dissolved	1.3	4.7	23.4	0.2 U	0.2	1 U	5.2	0.2	4.2
MW-4A	1/23/2012	grd water, total	0.2 U	0.3	34.1	0.2 U	0.1 U	0.5 U	1.2	0.1 U	0.6
MW-4A	1/23/2012	grd water, dissolved	0.2 U	0.3	35.6	0.2 U	0.1 U	0.5 U	1.3	0.1 U	0.6
MW-4A (dup)	1/23/2012	grd water, total	0.2 U	0.3	34.4	0.2 U	0.1 U	0.5 U	1.2	0.1 U	0.6
MW-4A (dup)	1/23/2012	grd water, dissolved	0.2 U	0.3	34.4	0.2 U	0.1 U	0.5 U	1.2	0.1 U	0.5
MW-5	1/23/2012	grd water, total	0.2 U	3.7	28.4	0.2 U	0.1 U	0.5 U	1.3	0.1 U	5.4
MW-5	1/23/2012	grd water, dissolved	0.2 U	3.5	29.6	0.2 U	0.1 U	0.5 U	0.9	0.1 U	5.6
MW-6	1/23/2012	grd water, total	0.2 U	15.8	14.9	0.2 U	0.1 U	1 U	0.5 U	0.1 U	0.5 U
MW-6	1/23/2012	grd water, dissolved	0.2 U	12.9	11.5	0.2 U	0.1 U	1 U	0.5 U	0.1 U	0.8
MW-7	1/24/2012	grd water, total	0.6	0.6	7.8	0.2 U	0.1 U	0.5 U	3.0	0.1	1.2
MW-7	1/24/2012	grd water, dissolved	0.6	0.4	7.1	0.2 U	0.1 U	0.5 U	3.0	0.1 U	1.3
MW-8A	1/24/2012	grd water, total	0.2 U	2.8	24.6	0.2 U	0.1 U	0.5 U	1.1	0.1 U	29.1
MW-8A	1/24/2012	grd water, dissolved	0.2 U	2.3	25.5	0.2 U	0.1 U	0.5 U	1.4	0.1 U	31.1
MW-8A, dnstrm	1/25/2012	surface water, total	0.4	0.9	23.3	0.2 U	0.1 U	0.7	3.8	1.2	2.1
MW-8A, dnstrm	1/25/2012	surface water, dissolved	0.4	0.8	21.7	0.2 U	0.1 U	0.5 U	2.8	0.3	1.9
MW-8A, upstrm	1/25/2012	surface water, total	0.4	0.9	22.7	0.2 U	0.1 U	0.6	3.8	1.1	2.0
MW-8A, upstrm (dup)	1/25/2012	surface water, total									
MW-8A, upstrm	1/25/2012	surface water, dissolved	0.4	0.8	24.3	0.2 U	0.1 U	0.5 U	3.0	0.3	1.8

Embankment Fill Monitoring Program Groundwater & Seeps Monitoring, January 2012

<u>Field I.D.</u>	<u>Collection</u>		<u>Sb</u>	<u>As</u>	<u>Ba</u>	<u>Be</u>	<u>Cd</u>	<u>Cr</u>	<u>Cu</u>	<u>Pb</u>	<u>Ni</u>
	<u>Date</u>	<u>Matrix</u>	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L
MW-9A	1/24/2012	grd water, total	0.2 U	1.5	80.2	0.2 U	0.1 U	1 U	0.5 U	0.1 U	0.5 U
MW-9A	1/24/2012	grd water, dissolved	0.2 U	1.4	80.7	0.2 U	0.1 U	1 U	0.5 U	0.1 U	0.5
MW-10	1/24/2012	grd water, total	0.4	0.3	14.0	0.2 U	0.1 U	0.5 U	2.4	0.1 U	1.8
MW-10	1/24/2012	grd water, dissolved	0.4	0.3	13.5	0.2 U	0.1 U	0.5 U	2.7	0.1 U	1.6
MW-11	1/24/2012	grd water, total	0.2 U	0.6	9.4	0.2 U	0.1 U	1.1	0.7	0.1 U	4.1
MW-11	1/24/2012	grd water, dissolved	0.2 U	0.5	9.5	0.2 U	0.1 U	1.0	0.9	0.1 U	4.0
MW-12	1/26/2012	grd water, total	0.2 U	0.5 U	8.3	0.2 U	0.1 U	0.5 U	0.9	0.1 U	1.8
MW-12	1/26/2012	grd water, dissolved	0.2 U	0.5 U	7.4	0.2 U	0.1 U	0.5 U	1.0	0.1 U	1.6
MW-13B	1/25/2012	grd water, total	0.2 U	0.4	9.1	0.2 U	0.1 U	0.5 U	1.0	0.1 U	0.9
MW-13B	1/25/2012	grd water, dissolved	0.2 U	0.3	8.4	0.2 U	0.1 U	0.5 U	1.2	0.1 U	1.0
S-102K	1/25/2012	seep water, total	0.2 U	1.9	15.7	0.2 U	0.1 U	0.5 U	0.6	0.1 U	1.3
S-102K	1/25/2012	seep water, dissolved	0.2 U	1.6	16.4	0.2 U	0.1 U	0.5 U	0.5	0.1 U	1.2
S-102K (dup)	1/25/2012	seep water, total	0.2 U	2.1	15.7	0.2 U	0.1 U	0.5 U	0.6	0.1 U	1.3
S-102K (dup)	1/25/2012	seep water, dissolved	0.2 U	1.5	15.6	0.2 U	0.1 U	0.5 U	0.6	0.1 U	1.2
S-105	1/26/2012	seep water, total	0.2 U	0.6	11.5	0.2 U	0.1 U	0.5 U	0.9	0.1 U	4.6
S-105	1/26/2012	seep water, dissolved	0.2 U	0.6	12.3	0.2 U	0.1 U	0.5 U	1.2	0.1 U	4.9
<i>Ground water action level</i>			<i>6</i>	<i>17.4</i>	<i>1000</i>	<i>4</i>	<i>5</i>	<i>50</i>	<i>1000</i>	<i>15</i>	<i>100</i>
<i>Seep water action level</i>			<i>30</i>	<i>190</i>	<i>1450</i>	<i>51</i>	<i>1.2</i>	<i>205</i>	<i>13</i>	<i>3</i>	<i>182</i>

U qualifier - nondetected at the associated lower reporting limit

B qualifier - associated value may not be significantly different
from [blank] background.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, January 2012

Field I.D.	Collection		<u>Se</u>	<u>Ag</u>	<u>Tl</u>	<u>Zn</u>	<u>Ca</u>	<u>Fe</u>	<u>Mg</u>	<u>Mn</u>	<u>Hg</u>	<u>Me-Hg</u>
	Date	Matrix	ARI	ARI	ARI	ARI	ARI	ARI	ARI	ARI	B-R	B-R
			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ng/L	ng/L
MW-1A	1/25/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	50,800	110	23,200	199	0.18	B
MW-1A	1/25/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	50,800	50 U	23,200	184	0.15 U	
MW-2A	1/23/2012	grd water, total	0.5 U	0.2 U	0.2 U	24	47,400	320	14,500	42	8.00	
MW-2A	1/23/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	24	47,200	170	14,500	43	6.32	
MW-4A	1/23/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	57,400	50 U	16,300	2	1.56	
MW-4A	1/23/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	57,700	50 U	16,400	1	1.12	
MW-4A (dup)	1/23/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	57,800	50 U	16,400	2	1.40	
MW-4A (dup)	1/23/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	57,200	50 U	16,000	1	0.80	
MW-5	1/23/2012	grd water, total	0.7	0.2 U	0.2 U	4 U	75,600	1260	17,900	7900	16.9	
MW-5	1/23/2012	grd water, dissolved	0.8	0.2 U	0.2 U	4 U	77,500	990	18,200	8130	2.78	
MW-6	1/23/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	25,600	1390	12,800	519	0.15 U	
MW-6	1/23/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	25,200	680	12,700	328	0.15 U	
MW-7	1/24/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	26,400	120	8760	26	1.73	
MW-7	1/24/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	27,000	50 U	8920	5	0.74	
MW-8A	1/24/2012	grd water, total	2 U	0.2 U	0.2 U	4 U	80,700	270	55,500	123	6.20	0.058
MW-8A	1/24/2012	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	80,500	130	55,400	121	6.64	
MW-8A, dnstrm	1/25/2012	surface water, total	0.5 U	0.2 U	0.2 U	21	17,700	510	6240	104	4.28	0.102
MW-8A, dnstrm	1/25/2012	surface water, dissolved	0.5 U	0.2 U	0.2 U	17	17,900	210	6290	98	1.61	
MW-8A, upstrm	1/25/2012	surface water, total	0.5 U	0.2 U	0.2 U	20	17,700	500	6220	107	3.90	0.104
MW-8A, upstrm (dup)	1/25/2012	surface water, total										0.107
MW-8A, upstrm	1/25/2012	surface water, dissolved	0.5 U	0.2 U	0.2 U	17	17,700	220	6270	99	2.41	

Embankment Fill Monitoring Program Groundwater & Seeps Monitoring, January 2012

<u>Field I.D.</u>	<u>Collection</u>		<u>Se</u>	<u>Ag</u>	<u>Tl</u>	<u>Zn</u>	<u>Ca</u>	<u>Fe</u>	<u>Mg</u>	<u>Mn</u>	<u>Hg</u>	<u>Me-Hg</u>
	<u>Date</u>	<u>Matrix</u>	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	1631 B-R ng/L	1630 B-R ng/L
MW-9A	1/24/2012	grd water, total	1.0	0.2 U	0.2 U	4 U	106,000	1340	54,300	605	0.15 U	
MW-9A	1/24/2012	grd water, dissolved	0.9	0.2 U	0.2 U	4 U	107,000	1280	54,500	579	0.15 U	
MW-10	1/24/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	50,400	120	17,700	252	1.96	
MW-10	1/24/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	50,900	90	17,700	246	1.65	
MW-11	1/24/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	51,000	50 U	25,800	6	0.80	
MW-11	1/24/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	50,900	50 U	25,800	5	0.59	
MW-12	1/26/2012	grd water, total	2 U	0.2 U	0.2 U	4 U	19,300	70	10,500	11	77.1	
MW-12	1/26/2012	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	19,700	50 U	10,600	9	56.0	
MW-13B	1/25/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	39,600	50 U	7900	6	6.37	
MW-13B	1/25/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	37,900	50 U	8360	5	3.97	
S-102K	1/25/2012	seep water, total	0.5 U	0.2 U	0.2 U	10	46,500	1990	14,500	5070	0.75	
S-102K	1/25/2012	seep water, dissolved	0.6	0.2 U	0.2 U	4 U	47,900	1720	15,000	5260	0.35 B	
S-102K (dup)	1/25/2012	seep water, total	0.5 U	0.2 U	0.2 U	4 U	47,100	2150	14,800	5120	0.77	
S-102K (dup)	1/25/2012	seep water, dissolved	0.5 U	0.2 U	0.2 U	4 U	48,000	1740	15,200	5280	0.44	
S-105	1/26/2012	seep water, total	0.5 U	0.2 U	0.2 U	16	55,000	50 U	31,000	131	1.52	
S-105	1/26/2012	seep water, dissolved	0.5 U	0.2 U	0.2 U	4 U	55,500	50 U	31,400	125	1.37	
<i>Ground water action level</i>			<i>10</i>	<i>50</i>	<i>2</i>	<i>5000</i>					<i>2000</i>	
<i>Seep water action level</i>			<i>5</i>	<i>1.0</i>	<i>40</i>	<i>121</i>					<i>12</i>	

U qualifier - nondetected at the associated lower reporting limit
B qualifier - associated value may not be significantly different
from [blank] background.

**Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, January 2012**

<u>Field I.D.</u>	<u>Collection</u>		<u>Alkalinity</u>	<u>NO₂</u>	<u>NO₃</u>	<u>Cl</u>	<u>SO₄</u>	<u>total Phosphorus</u>	<u>total Sulfides</u>
	<u>Date</u>	<u>Matrix</u>	SM.2320 ARI mg/L CaCO ₃	300.0 ARI mg-N/L	300.0 ARI mg-N/L	300.0 ARI mg/L	300.0 ARI mg/L	365.2 ARI mg-P/L	376.2 ARI mg/L
MW-1A	1/25/2012	grd water, total	273	0.1 U	0.1	5.8	20.6	0.223	0.05 U
MW-1A	1/25/2012	grd water, dissolved							
MW-2A	1/23/2012	grd water, total	66.1	0.1 U	6.8	7.2	73.8	0.170	0.05 U
MW-2A	1/23/2012	grd water, dissolved							
MW-4A	1/23/2012	grd water, total	129	0.1 U	12.3	17.9	30.1	0.041	0.05 U
MW-4A	1/23/2012	grd water, dissolved							
MW-4A (dup)	1/23/2012	grd water, total	130	0.1 U	13.7	18.9	31.0	0.057	0.05 U
MW-4A (dup)	1/23/2012	grd water, dissolved							
MW-5	1/23/2012	grd water, total	209	0.1 U	0.1 U	3.5	71.8	0.052	0.05 U
MW-5	1/23/2012	grd water, dissolved							
MW-6	1/23/2012	grd water, total	116	0.1 U	0.1	4.4	21.3	0.164	0.05 U
MW-6	1/23/2012	grd water, dissolved							
MW-7	1/24/2012	grd water, total	97.0	0.1 U	0.1 U	2.2	17.5	0.033	0.05 U
MW-7	1/24/2012	grd water, dissolved							
MW-8A	1/24/2012	grd water, total	438	0.1 U	0.1 U	9.3	15.6	0.085	0.05 U
MW-8A	1/24/2012	grd water, dissolved							
MW-8A, dnstrm	1/25/2012	surface water, total	92.6	0.1 U	0.4	25.9	8.7	0.128	0.05 U
MW-8A, dnstrm	1/25/2012	surface water, dissolved							
MW-8A, upstrm	1/25/2012	surface water, total	92.6	0.1 U	0.5	26.7	8.7	0.067	0.05 U
MW-8A, upstrm (dup)	1/25/2012	surface water, total							
MW-8A, upstrm	1/25/2012	surface water, dissolved							

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, January 2012

<u>Field I.D.</u>	<u>Collection</u>		<u>Alkalinity</u>	<u>NO₂</u>	<u>NO₃</u>	<u>Cl</u>	<u>SO₄</u>	total	total
	<u>Date</u>	<u>Matrix</u>	SM.2320 ARI mg/L CaCO ₃	300.0 ARI mg-N/L	300.0 ARI mg-N/L	300.0 ARI mg/L	300.0 ARI mg/L	Phosphorus ARI mg-P/L	Sulfides ARI mg/L
MW-9A	1/24/2012	grd water, total	525	0.1 U	0.1 U	6.7	3.9	0.124	0.080
MW-9A	1/24/2012	grd water, dissolved							
MW-10	1/24/2012	grd water, total	206	0.1 U	0.2	3.5	21.8	0.031	0.05 U
MW-10	1/24/2012	grd water, dissolved							
MW-11	1/24/2012	grd water, total	216	0.1 U	0.3	7.9	27.9	0.043	0.05 U
MW-11	1/24/2012	grd water, dissolved							
MW-12	1/26/2012	grd water, total	86.0	0.1 U	0.2	4.8	32.8	0.032	0.05 U
MW-12	1/26/2012	grd water, dissolved							
MW-13B	1/25/2012	grd water, total	117	0.1 U	3.6	4.0	47.2	0.030	0.05 U
MW-13B	1/25/2012	grd water, dissolved							
S-102K	1/25/2012	seep water, total	223	0.1 U	0.1	4.6	14.2	0.041	0.05 U
S-102K	1/25/2012	seep water, dissolved							
S-102K (dup)	1/25/2012	seep water, total	221	0.1 U	0.1	4.6	14.1	0.032	0.05 U
S-102K (dup)	1/25/2012	seep water, dissolved							
S-105	1/26/2012	seep water, total	296	0.1 U	0.2	4.5	23.8	0.045	0.05 U
S-105	1/26/2012	seep water, dissolved							

Ground water action level

Seep water action level

U qualifier - nondetected at the associated lower reporting limit

B qualifier - associated value may not be significantly different
from [blank] background.

Data Evaluation for the Embankment Fill Monitoring Program, Seattle-Tacoma International Airport, Groundwater and Seep Monitoring, April 2012

Thirty-seven water samples in two sample delivery groups were collected during April 23-25, 2012, for the analyses of selected conventional parameters [total suspended solids (TSS), total organic carbon (TOC), and anions], total petroleum hydrocarbons (TPH), and metals. Samples were collected by Pacific Groundwater Group of Seattle, Washington, and analyzed by Analytical Resources, Inc. (ARI) of Tukwila, Washington. Analytical subcontracting to ARI was performed by Brooks Rand Labs of Seattle, Washington for low-level mercury. Sampling and analyses were conducted in accordance with the specifications of the *Embankment Fill Monitoring Program (EFMP)*, *Groundwater Monitoring Work Plan*, and *EFMP, Seep Monitoring Work Plan*, both prepared by Port of Seattle, April 17, 2006. All sample results are presented in the attached Table, entitled, "Embankment Fill Monitoring Program, Groundwater & Seeps Monitoring, April 2012".

Samples were received at the laboratory with complete documentation, including completed Analytical Request and Chain-of-Custody (C-O-C) forms, within 22.5 and 26 hours of collection for the two delivery groups. Sample container custody seals were not employed for this project, however, samples were transported and handled by identifiable project personnel (samples were hand-delivered to the project laboratory by field or laboratory personnel), as indicated on completed Chain-of-Custody forms.

Analytical methods employed are summarized here:

Analyte(s)	Method	Analyte(s)	Method
Total Suspended Solids (TSS)	U.S. EPA 160.2	Mercury (Hg) Methyl mercury (Me-Hg)	U.S. EPA 1631 U.S. EPA 1630
Total Organic Carbon (TOC)	U.S. EPA 415.1 (combustion/IR)	Alkalinity	SM.2320
Petroleum Hydrocarbon I.D.	WDOE NWTPH-HCID	Anions (NO ₂ , NO ₃ , Cl & SO ₄)	U.S. EPA 300.0
Metals (Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, Ag, Tl & Zn)	U.S. EPA 200.8	total Phosphorus	U.S. EPA 365.2
Metals (Ca, Fe, Mg & Mn)	SW-846 6010B	total Sulfides	U.S. EPA 376.2

Petroleum hydrocarbon HCID analyses were performed without acid cleanup or silica gel chromatography, as is occasionally performed for NWTPHD analyses. Reported alkalinities are principally associated with bicarbonate anion. No significant anomalies or problems were encountered with any of the analyses performed for this monitoring event. Sample collection dates in the attached results table were verified against the dates reported on the C-O-C / Analytical Request forms. Field filtrations of samples were performed for dissolved metals (only) with use of an in-line 0.45 µm capsule filter. No other parameters were filtered.

All **holding times and conditions** were within the requirements of the EFMP work plans or acceptable limits. Samples were shipped on ice and held under refrigeration upon receipt at the laboratory. All samples were received by the project laboratory within 26 hours of collection, and at 0.4 – 6.0 °C upon arrival. Selected aliquots were transferred to the subcontractor laboratory for Hg analyses and received at 0.4 – 1.3 °C. Chemical preservation of samples, as appropriate, was checked upon arrival at the project laboratory, and found to be in compliance with work plan specifications (HNO₃ for total and dissolved metals, HCl for Me-Hg, H₂SO₄ for total phosphorus and TOC, and HCl for HCID). Total sulfides were preserved in the field with zinc acetate and pH adjustment with sodium hydroxide was made upon receipt at the laboratory. HCl was not employed for preservation of samples designated for total and dissolved Hg analyses, as specified in the EFMP work plan, rather method 1631 requires addition of BrCl directly to [nonpreserved] sample containers at least 24 hours prior to analysis, as accomplished. No headspace or bubbles were observed in samples designated for alkalinity and HCID/gasoline determinations, as specified. All sample-holding times and conditions were in compliance with the specifications of the EFMP work plans. No data quality limitations are identified due to sample holding-times and conditions.

All initial and continuing **calibrations** and calibration blanks met the specifications of the respective methods. An Hg instrument blank showed nontypical peak shape requiring trap replacement and reanalysis of the blank; yielding a normal response. Procedural/method blank corrections were made for Hg and Me-Hg analyses, as specified by the methods.

Method/procedural **blanks** for all analytical procedures were analyzed and reported for each delivery group of less than 20 samples. Blanks exhibited no detectable analytes above the lower reporting limits (quantitation limits). All Hg and Me-Hg results are blank-corrected, as allowed by the analytical method. Four sample results are lab-qualified as potentially affected by background [blank] contributions - results for dissolved Hg in MW-9A (0.20 ng/L), S-102K (0.35 ng/L) and S-102K-dup (0.38 ng/L), and total Me-Hg in MW-8A (0.012 ng/L) are "B" qualified. These data qualifications are due to values reported at less than or equal to the method reporting limits (MRL's). The Hg MRL is 0.41 ng/L and the reported backgrounds (MDL) for these analytical groups are 0.15 ng/L. Methyl-Hg MRL is reported at 0.025 ng/L and the MDL at 0.010 ng/L. No data required further qualification based on blank analyses. No field equipment rinsate blanks were submitted nor specified in the EFMP work plans.

Five station pairs sampled out of eighteen exhibited dissolved (filtered) mercury results greater than for the total (nonfiltered) samples. Dissolved values (filtered samples) reported for these sample pairs show a mean [positive] bias of 0.48 ng/L with a range of 0.17 to 0.94 ng/L. The mean bias is similar to the lab's MRL for Hg, indicating the bias to be insignificant and the Hg, for these samples, to be predominantly in the dissolved phase.

ICP interference check sample solutions were analyzed for the target analytes at the beginning of each analytical run, as specified in the [metals] methods. Recoveries for the target analytes of concern were within acceptance limits (80-120%). ICP-MS interference corrections were applied as required by the method; in the case of arsenic, corrections for chloride and bromide were applied (although these corrections are minimal, as the level of total chloride ion present in site waters is relatively low).

Laboratory control samples (LCS's or spiked blanks) were analyzed at the required frequency (at least one sample per preparation batch) for all target analytes. All target analytes were within acceptable limits (80-120% recovery for metals; 56-103% recovery for diesel in HCID analyses; 75-125% recovery for conventional parameters). No qualification of results due to out-of-compliance LCS results is required.

Analyte recoveries were also evaluated with the use of **matrix spikes** (MS and matrix spike duplicates [MSDs]). All matrix spike recoveries, and matrix spike duplicates where applied (MS/MSD analyses were not performed for NWT PH-HCID), were within acceptable limits (75-125%), with the exception of a silver (Ag) spike in S-102K-dup reported at 41.6%. The associated LCS and SRM performances for Ag were acceptable. While no Ag was reported as detected in project samples, the lower reporting limit may be less than the actual or effective limit based on potentially low Ag recoveries. Recoveries reported for LCS's and "certified" reference materials for all analytes were within their corresponding acceptance ranges. Petroleum hydrocarbon HCID analyses are not normally evaluated with matrix spikes and were not performed here. It is noted that approximately half of the matrix spike evaluations for Hg analyses were performed on non-project samples. No results required qualification due to unacceptable MS recoveries.

Laboratory **duplicate analyses** were performed for all parameters, with the exception of HCID. RPDs (relative percent differences) were all acceptable at less than 20 (for detections greater than 5x the lower reporting limit). No results required qualification due to unacceptable replicate analytical results.

Field replicates were submitted for analyses in this monitoring event; five duplicate pairs (MW-4A (dissolved), MW-4A (total), S-102K (dissolved), S-102K (total), and MW-8A, upstream (Me-Hg, only) were submitted and results are presented in the attached table. Variability in terms of relative percent difference (RPD's) for all parameters was less than 25 (for results greater than 5x the lower reporting limit), with the exception of TSS in MW-4A (MW-4A @ 1.1 U and MW-4A-dup @ 6.4 mg/L), total/nonfiltered Hg in MW-4A with an RPD of 40 (MW-4A @ 2.29 ng/L and MW-4A-dup @ 1.52 ng/L), and total/nonfiltered Hg in S-102K with an RPD of 88 (S-102K @ 2.30 ng/L and S-102K -dup @ 0.89 ng/L). Laboratory duplicate analyses for matrix spiked Hg in [total/nonfiltered] MW-4A and S-102K exhibited acceptable results at 7 and 4 RPD, respectively.

All **surrogate compound recoveries** for HCID analyses were in compliance with laboratory-specified limits (50-150%). No petroleum hydrocarbons were detected in project samples. Surrogate recoveries are determined to be within acceptable limits.

Lower reporting limits for all parameters in all samples were significantly less than the project action thresholds in order to allow a comparison to applicable criteria. However, an exception to meeting the EFMP work plan detection limit goal is noted. Lower reporting limits for all total and dissolved mercury (Hg) is elevated from the goal of 0.1 U to 0.15 U due to statistics associated with procedural/method blanks. All other reporting limits meet the specifications of EFMP work plans.

The overall **data quality** is within the criteria set forth and specifications outlined in the EFMP work plans and respective analytical methodologies. The reported data as presented in the attached results table are determined to be usable for the intended purposes of the project.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, April 2012

Field I.D.	Collection		Lab I.D.	Method:	TSS	TOC	HCID		
	Date	Matrix					Gasoline	Diesel	Lube Oil
				units:	mg/L	mg/L	NWTPH-HCID		
							ARI		
							mg/L		
MW-1A	4/23/2012	grd water, total	127145-UR48A		1.1 U	2.22	0.25 U	0.50 U	0.50 U
MW-1A	4/23/2012	grd water, dissolved	127155-UR48K						
MW-2A	4/23/2012	grd water, total	127146-UR48B		1.0 U	5.95	0.25 U	0.50 U	0.50 U
MW-2A	4/23/2012	grd water, dissolved	127156-UR48L						
MW-4A	4/23/2012	grd water, total	127147-UR48C		1.1 U	2.51	0.25 U	0.50 U	0.50 U
MW-4A	4/23/2012	grd water, dissolved	127157-UR48M						
MW-4A (dup)	4/23/2012	grd water, total	127148-UR48D		6.4	2.32	0.25 U	0.50 U	0.50 U
MW-4A (dup)	4/23/2012	grd water, dissolved	127158-UR48N						
MW-5	4/23/2012	grd water, total	127149-UR48E		1.1 U	7.36	0.25 U	0.50 U	0.50 U
MW-5	4/23/2012	grd water, dissolved	127159-UR48O						
MW-6	4/23/2012	grd water, total	127150-UR48F		9.3	1.5 U	0.25 U	0.50 U	0.50 U
MW-6	4/23/2012	grd water, dissolved	127160-UR48P						
MW-7	4/23/2012	grd water, total	127151-UR48G		1.1 U	4.24	0.25 U	0.50 U	0.50 U
MW-7	4/23/2012	grd water, dissolved	127161-UR48Q						
MW-8A	4/24/2012	grd water, total	127306-UR75A		1.1 U	6.04	0.25 U	0.50 U	0.50 U
MW-8A	4/24/2012	grd water, dissolved	127315-UR75H						
MW-8A, dnstrm	4/23/2012	surface water, total	127152-UR48H		3.4	6.88			
MW-8A, dnstrm	4/23/2012	surface water, dissolved	127162-UR48R						
MW-8A, upstrm	4/23/2012	surface water, total	127153-UR48I		3.7	7.08			
MW-8A, upstrm (dup)	4/23/2012	surface water, total	127154-UR48J						
MW-8A, upstrm	4/23/2012	surface water, dissolved	127163-UR48S						

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, April 2012

Field I.D.	Collection		Lab I.D.	Method:	TSS	TOC	HCID		
	Date	Matrix					Gasoline	Diesel	Lube Oil
				units:	mg/L	mg/L	NWTPH-HCID		
							ARI		
							mg/L		
MW-9A	4/24/2012	grd water, total	127307-UR75B		3.3	4.70	0.25 U	0.50 U	0.50 U
MW-9A	4/24/2012	grd water, dissolved	127316-UR75K						
MW-10	4/24/2012	grd water, total	127308-UR75C		1.1 U	4.39	0.25 U	0.50 U	0.50 U
MW-10	4/24/2012	grd water, dissolved	127317-UR75L						
MW-11	4/24/2012	grd water, total	127309-UR75D		1.0 U	2.12	0.25 U	0.50 U	0.50 U
MW-11	4/24/2012	grd water, dissolved	127318-UR75M						
MW-12	4/24/2012	grd water, total	127310-UR75E		1.1 U	4.04	0.25 U	0.50 U	0.50 U
MW-12	4/24/2012	grd water, dissolved	127319-UR75N						
MW-13B	4/25/2012	grd water, total	127313-UR75H		1.3 U	8.97	0.25 U	0.50 U	0.50 U
MW-13B	4/25/2012	grd water, dissolved	127322-UR75Q						
S-102K	4/24/2012	seep water, total	127311-UR75F		2.9	5.04	0.25 U	0.50 U	0.50 U
S-102K	4/24/2012	seep water, dissolved	127320-UR75O						
S-102K (dup)	4/24/2012	seep water, total	127312-UR75G		3.2	4.93	0.25 U	0.50 U	0.50 U
S-102K (dup)	4/24/2012	seep water, dissolved	127321-UR75P						
S-105	4/25/2012	seep water, total	127314-UR75I		1.0 U	4.44	0.25 U	0.50 U	0.50 U
S-105	4/25/2012	seep water, dissolved	127323-UR75R						
<i>Ground water action level</i>							<i>0.27</i>	<i>0.67</i>	<i>0.67</i>
<i>Seep water action level</i>							<i>0.27</i>	<i>0.67</i>	<i>0.67</i>

U qualifier - nondetected at the associated lower reporting limit

B qualifier - associated value may not be significantly different
from [blank] background.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, April 2012

Field I.D.	Collection		<u>Sb</u>	<u>As</u>	<u>Ba</u>	<u>Be</u>	<u>Cd</u>	<u>Cr</u>	<u>Cu</u>	<u>Pb</u>	<u>Ni</u>
	<u>Date</u>	<u>Matrix</u>	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L
MW-1A	4/23/2012	grd water, total	0.2 U	12.5	38.1	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	0.5 U
MW-1A	4/23/2012	grd water, dissolved	0.2 U	12.4	35.9	0.2 U	0.1 U	0.5 U	0.5 U	0.1 U	0.6
MW-2A	4/23/2012	grd water, total	0.2 U	2.4	49.1	0.2 U	0.1 U	0.5 U	3.3	0.1 U	4.1
MW-2A	4/23/2012	grd water, dissolved	0.2 U	2.5	46.3	0.2 U	0.1 U	0.5 U	0.6	0.1 U	4.1
MW-4A	4/23/2012	grd water, total	0.2 U	0.2	9.8	0.2 U	0.1 U	0.5 U	1.0	0.1 U	0.5 U
MW-4A	4/23/2012	grd water, dissolved	0.2 U	0.2	9.8	0.2 U	0.1 U	0.5 U	0.9	0.1 U	0.5 U
MW-4A (dup)	4/23/2012	grd water, total	0.2 U	0.3	9.7	0.2 U	0.1 U	0.5 U	1.0	0.1 U	0.5 U
MW-4A (dup)	4/23/2012	grd water, dissolved	0.2 U	0.3	9.2	0.2 U	0.1 U	0.5 U	1.0	0.1 U	0.5 U
MW-5	4/23/2012	grd water, total	0.2 U	2.6	47.3	0.2 U	0.1 U	0.5 U	1.0	0.1 U	4.5
MW-5	4/23/2012	grd water, dissolved	0.2 U	2.3	46.0	0.2 U	0.1 U	0.5 U	0.7	0.1 U	4.3
MW-6	4/23/2012	grd water, total	0.2 U	18.7	16.5	0.2 U	0.1 U	1 U	0.5 U	0.1 U	0.5 U
MW-6	4/23/2012	grd water, dissolved	0.2 U	12.1	10.4	0.2 U	0.1 U	1 U	1.1	0.1 U	0.5 U
MW-7	4/23/2012	grd water, total	0.2	0.7	10.6	0.2 U	0.1 U	0.5 U	1.2	0.1 U	2.4
MW-7	4/23/2012	grd water, dissolved	0.2	0.7	10.4	0.2 U	0.1 U	0.5 U	1.1	0.1 U	2.4
MW-8A	4/24/2012	grd water, total	0.2 U	2.8	25.6	0.2 U	0.1 U	0.5 U	1.3	0.1 U	29.7
MW-8A	4/24/2012	grd water, dissolved	0.2 U	2.4	25.2	0.2 U	0.1	1 U	1.2	0.1 U	30.9
MW-8A, dnstrm	4/23/2012	surface water, total	0.3	1.4	11.7	0.2 U	0.1 U	0.5 U	2.7	0.7	1.8
MW-8A, dnstrm	4/23/2012	surface water, dissolved	0.2	1.1	10.0	0.2 U	0.1 U	0.5 U	2.2	0.2	2.2
MW-8A, upstrm	4/23/2012	surface water, total	0.3	1.4	11.9	0.2 U	0.1 U	0.5 U	2.7	0.8	2.3
MW-8A, upstrm (dup)	4/23/2012	surface water, total									
MW-8A, upstrm	4/23/2012	surface water, dissolved	0.3	1.1	11.2	0.2 U	0.1 U	0.5 U	2.8	0.3	2.2

Embankment Fill Monitoring Program Groundwater & Seeps Monitoring, April 2012

<u>Field I.D.</u>	<u>Collection</u>		<u>Sb</u>	<u>As</u>	<u>Ba</u>	<u>Be</u>	<u>Cd</u>	<u>Cr</u>	<u>Cu</u>	<u>Pb</u>	<u>Ni</u>
	<u>Date</u>	<u>Matrix</u>	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L
MW-9A	4/24/2012	grd water, total	0.2 U	1.4	84.8	0.2 U	0.1 U	0.5 U	0.5	0.1 U	0.5 U
MW-9A	4/24/2012	grd water, dissolved	0.2 U	1.4	82.8	0.2 U	0.1 U	1 U	0.5 U	0.1 U	0.5
MW-10	4/24/2012	grd water, total	0.2 U	0.2	10.3	0.2 U	0.1 U	0.5 U	1.7	0.1 U	2.8
MW-10	4/24/2012	grd water, dissolved	0.2 U	0.2	10.7	0.2 U	0.1 U	0.5 U	1.9	0.1 U	2.3
MW-11	4/24/2012	grd water, total	0.2 U	0.5	9.6	0.2 U	0.1 U	0.7	0.8	0.1 U	4.2
MW-11	4/24/2012	grd water, dissolved	0.2 U	0.5	9.5	0.2 U	0.1 U	0.7	0.7	0.1 U	3.9
MW-12	4/24/2012	grd water, total	0.2 U	0.5	11.0	0.2 U	0.1 U	0.5 U	0.9	0.1 U	3.7
MW-12	4/24/2012	grd water, dissolved	0.2 U	0.5 U	11.3	0.2 U	0.1 U	0.5 U	0.8	0.1 U	3.2
MW-13B	4/25/2012	grd water, total	0.2 U	0.5	34.2	0.2 U	0.1 U	0.6	1.4	0.1 U	3.2
MW-13B	4/25/2012	grd water, dissolved	0.2 U	0.5	32.4	0.2 U	0.1 U	0.7	2.4	0.1 U	1.9
S-102K	4/24/2012	seep water, total	0.2 U	2.2	22.9	0.2 U	0.1 U	0.5 U	0.5	0.1 U	2.6
S-102K	4/24/2012	seep water, dissolved	0.2 U	2.1	22.7	0.2 U	0.1 U	1 U	0.7	0.1 U	1.8
S-102K (dup)	4/24/2012	seep water, total	0.2 U	2.3	23.0	0.2 U	0.1 U	0.5 U	0.5	0.1 U	2.7
S-102K (dup)	4/24/2012	seep water, dissolved	0.2 U	2.1	21.9	0.2 U	0.1 U	1 U	0.5	0.1 U	1.8
S-105	4/25/2012	seep water, total	0.2 U	0.9	14.4	0.2 U	0.1 U	0.5 U	1.3	0.1 U	10.2
S-105	4/25/2012	seep water, dissolved	0.2 U	0.9	14.6	0.2 U	0.1 U	1 U	1.0	0.1 U	9.2
<i>Ground water action level</i>			<i>6</i>	<i>17.4</i>	<i>1000</i>	<i>4</i>	<i>5</i>	<i>50</i>	<i>1000</i>	<i>15</i>	<i>100</i>
<i>Seep water action level</i>			<i>30</i>	<i>190</i>	<i>1450</i>	<i>51</i>	<i>1.2</i>	<i>205</i>	<i>13</i>	<i>3</i>	<i>182</i>

U qualifier - nondetected at the associated lower reporting limit
 B qualifier - associated value may not be significantly different
 from [blank] background.

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, April 2012

Field I.D.	Collection		<u>Se</u>	<u>Ag</u>	<u>Tl</u>	<u>Zn</u>	<u>Ca</u>	<u>Fe</u>	<u>Mg</u>	<u>Mn</u>	<u>Hg</u>	<u>Me-Hg</u>
	<u>Date</u>	<u>Matrix</u>	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	1631 B-R ng/L	1630 B-R ng/L
MW-1A	4/23/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	57,800	70	26,900	210	0.45	
MW-1A	4/23/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	57,900	50	27,000	204	0.62	
MW-2A	4/23/2012	grd water, total	0.7	0.2 U	0.2 U	4 U	91,100	2330	40,600	2390	0.57	
MW-2A	4/23/2012	grd water, dissolved	0.9	0.2 U	0.2 U	4 U	92,300	2350	41,200	2380	1.22	
MW-4A	4/23/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	31,100	50 U	8510	1 U	2.29	
MW-4A	4/23/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	31,800	50 U	8610	1 U	1.94	
MW-4A (dup)	4/23/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	31,300	50 U	8580	1 U	1.52	
MW-4A (dup)	4/23/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	31,600	50 U	8620	1 U	1.97	
MW-5	4/23/2012	grd water, total	2 U	0.2 U	0.2 U	4 U	88,000	1190	26,900	6730	7.12	
MW-5	4/23/2012	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	88,400	1070	27,200	6620	2.80	
MW-6	4/23/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	25,700	1930	12,300	763	0.45	
MW-6	4/23/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	25,500	730	12,400	417	1.39	
MW-7	4/23/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	40,000	70	13,600	225	1.77	
MW-7	4/23/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	40,100	50 U	13,600	220	1.09	
MW-8A	4/24/2012	grd water, total	0.6	0.2 U	0.2 U	4 U	82,400	200	54,100	121	6.59	0.012 B
MW-8A	4/24/2012	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	82,900	140	54,500	119	5.32	
MW-8A, dnstrm	4/23/2012	surface water, total	0.5 U	0.2 U	0.2 U	7	22,500	550	10,800	83	4.01	0.148
MW-8A, dnstrm	4/23/2012	surface water, dissolved	0.5 U	0.2 U	0.2 U	4	22,600	190	10,800	46	1.59	
MW-8A, upstrm	4/23/2012	surface water, total	0.5 U	0.2 U	0.2 U	7	22,100	550	10,500	89	3.64	0.133
MW-8A, upstrm (dup)	4/23/2012	surface water, total										0.128
MW-8A, upstrm	4/23/2012	surface water, dissolved	0.5 U	0.2 U	0.2 U	4	22,400	200	10,600	50	1.64	

Embankment Fill Monitoring Program Groundwater & Seeps Monitoring, April 2012

Field I.D.	Collection		<u>Se</u>	<u>Ag</u>	<u>Tl</u>	<u>Zn</u>	<u>Ca</u>	<u>Fe</u>	<u>Mg</u>	<u>Mn</u>	<u>Hg</u>	<u>Me-Hg</u>
	<u>Date</u>	<u>Matrix</u>	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	200.8 ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	6010B ARI ug/L	1631 B-R ng/L	1630 B-R ng/L
MW-9A	4/24/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	106,000	1410	54,300	561	0.15 U	
MW-9A	4/24/2012	grd water, dissolved	0.9	0.2 U	0.2 U	4 U	109,000	1270	56,300	555	0.20 B	
MW-10	4/24/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	36,800	230	17,800	671	2.39	
MW-10	4/24/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	37,400	130	17,800	659	2.06	
MW-11	4/24/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	44,500	50 U	23,800	4	0.57	
MW-11	4/24/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	46,000	50 U	24,600	4	0.76	
MW-12	4/24/2012	grd water, total	0.6	0.2 U	0.2 U	4 U	30,600	50 U	19,200	59	453	
MW-12	4/24/2012	grd water, dissolved	2 U	0.2 U	0.2 U	4 U	30,700	50 U	19,200	58	115	
MW-13B	4/25/2012	grd water, total	0.5 U	0.2 U	0.2 U	4 U	85,800	50 U	20,100	5	12.3	
MW-13B	4/25/2012	grd water, dissolved	0.5 U	0.2 U	0.2 U	4 U	87,700	50 U	20,500	4	10.8	
S-102K	4/24/2012	seep water, total	0.5 U	0.2 U	0.2 U	4 U	73,500	4850	23,800	6820	2.30	
S-102K	4/24/2012	seep water, dissolved	0.9	0.2 U	0.2 U	4 U	74,200	4550	23,900	6750	0.35 B	
S-102K (dup)	4/24/2012	seep water, total	0.5 U	0.2 U	0.2 U	4 U	73,200	4840	23,900	6820	0.89	
S-102K (dup)	4/24/2012	seep water, dissolved	1.0	0.2 U	0.2 U	4 U	74,200	4620	24,100	6810	0.38 B	
S-105	4/25/2012	seep water, total	0.5 U	0.2 U	0.2 U	4 U	64,100	50 U	38,000	660	2.82	
S-105	4/25/2012	seep water, dissolved	0.5 U	0.2 U	0.2 U	4 U	62,800	50 U	37,500	666	2.53	
<i>Ground water action level</i>			<i>10</i>	<i>50</i>	<i>2</i>	<i>5000</i>					<i>2000</i>	
<i>Seep water action level</i>			<i>5</i>	<i>1.0</i>	<i>40</i>	<i>121</i>					<i>12</i>	

U qualifier - nondetected at the associated lower reporting limit

B qualifier - associated value may not be significantly different
from [blank] background.

Embankment Fill Monitoring Program Groundwater & Seeps Monitoring, April 2012

<u>Field I.D.</u>	<u>Collection</u>		<u>Alkalinity</u>	<u>NO₂</u>	<u>NO₃</u>	<u>Cl</u>	<u>SO₄</u>	<u>total Phosphorus</u>	<u>total Sulfides</u>
	<u>Date</u>	<u>Matrix</u>	SM.2320 ARI mg/L CaCO ₃	300.0 ARI mg-N/L	300.0 ARI mg-N/L	300.0 ARI mg/L	300.0 ARI mg/L	365.2 ARI mg-P/L	376.2 ARI mg/L
MW-1A	4/23/2012	grd water, total	261	0.1 U	0.1	4.9	22.1	0.175	0.05 U
MW-1A	4/23/2012	grd water, dissolved							
MW-2A	4/23/2012	grd water, total	382	0.1 U	0.1 U	8.1	32.7	0.028	0.05 U
MW-2A	4/23/2012	grd water, dissolved							
MW-4A	4/23/2012	grd water, total	103	0.1 U	0.6	4.1	18.1	0.013	0.05 U
MW-4A	4/23/2012	grd water, dissolved							
MW-4A (dup)	4/23/2012	grd water, total	102	0.1 U	0.6	4.2	18.2	0.012	0.05 U
MW-4A (dup)	4/23/2012	grd water, dissolved							
MW-5	4/23/2012	grd water, total	304	0.1 U	0.1	3.3	51.8	0.026	0.05 U
MW-5	4/23/2012	grd water, dissolved							
MW-6	4/23/2012	grd water, total	104	0.1 U	0.1 U	4.5	16.7	0.267	0.05 U
MW-6	4/23/2012	grd water, dissolved							
MW-7	4/23/2012	grd water, total	158	0.1 U	0.1 U	1.8	9.4	0.008	0.05 U
MW-7	4/23/2012	grd water, dissolved							
MW-8A	4/24/2012	grd water, total	433	0.1 U	0.1 U	8.2	16.6	0.046	0.05 U
MW-8A	4/24/2012	grd water, dissolved							
MW-8A, dnstrm	4/23/2012	surface water, total	93.4	0.1 U	0.6	8.2	11.2	0.065	0.05 U
MW-8A, dnstrm	4/23/2012	surface water, dissolved							
MW-8A, upstrm	4/23/2012	surface water, total	91.7	0.1 U	0.6	8.3	11.4	0.063	0.05 U
MW-8A, upstrm (dup)	4/23/2012	surface water, total							
MW-8A, upstrm	4/23/2012	surface water, dissolved							

Embankment Fill Monitoring Program
Groundwater & Seeps Monitoring, April 2012

<u>Field I.D.</u>	<u>Collection</u>		<u>Alkalinity</u>	<u>NO₂</u>	<u>NO₃</u>	<u>Cl</u>	<u>SO₄</u>	total	total
	<u>Date</u>	<u>Matrix</u>	SM.2320 ARI mg/L CaCO ₃	300.0 ARI mg-N/L	300.0 ARI mg-N/L	300.0 ARI mg/L	300.0 ARI mg/L	Phosphorus ARI mg-P/L	Sulfides ARI mg/L
MW-9A	4/24/2012	grd water, total	518	0.1 U	0.1 U	5.9	3.3	0.102	0.054
MW-9A	4/24/2012	grd water, dissolved							
MW-10	4/24/2012	grd water, total	153	0.1 U	0.2	4.3	32.8	0.008 U	0.05 U
MW-10	4/24/2012	grd water, dissolved							
MW-11	4/24/2012	grd water, total	195	0.1 U	0.2	5.4	24.5	0.023	0.05 U
MW-11	4/24/2012	grd water, dissolved							
MW-12	4/24/2012	grd water, total	130	0.1 U	0.1	5.4	32.4	0.008 U	0.05 U
MW-12	4/24/2012	grd water, dissolved							
MW-13B	4/25/2012	grd water, total	245	0.1 U	13.1	3.6	66.6	0.018	0.05 U
MW-13B	4/25/2012	grd water, dissolved							
S-102K	4/24/2012	seep water, total	295	0.1 U	0.1 U	5.6	12.3	0.008 U	0.05 U
S-102K	4/24/2012	seep water, dissolved							
S-102K (dup)	4/24/2012	seep water, total	295	0.1 U	0.1 U	6.2	12.4	0.008 U	0.05 U
S-102K (dup)	4/24/2012	seep water, dissolved							
S-105	4/25/2012	seep water, total	290	0.1 U	0.1	4.6	24.3	0.008 U	0.05 U
S-105	4/25/2012	seep water, dissolved							

Ground water action level

Seep water action level

U qualifier - nondetected at the associated lower reporting limit

B qualifier - associated value may not be significantly different
from [blank] background.

APPENDIX B
DATA SUMMARY TABLES

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream
Conventionals																			
Alkalinity, Total (as CaCO3), mg/L			243	298	110	115	294	134	151	387	452	139	193	79.5	221			81	81.9
Chloride, mg/L			5	6.3	3.8	3.9	4.1	4.6	1.8	8	5.8	3.8	5.7	3.7	5.8			6.9	7
Nitrate, mg/L as N			0.1U	0.1U	0.5	0.5	0.1U	0.1U	0.1U	0.1U	0.1U	0.1	0.2	0.1U	3			0.8	0.7
Nitrite, mg/L as N			0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U			0.1U	0.1U
Phosphorus (as P), mg/L			0.095	0.021	0.028	0.022	0.008	0.113	0.017	0.036	0.043	0.017	0.017	0.027	0.03			0.064	0.063
Sulfate, mg/L			23.2	33.1	21.4	21.5	42.5	21.3	8.7	19.3	4.9	33.7	22.5	23.4	63.8			10.5	10.6
Sulfide, mg/L			0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U			0.05U	0.05U
Total Organic Carbon, mg/L			1.83	4.99	2.24	2.44	5.86	1.5U	4.29	6.04	4.64	4.62	2.06	3.39	9.3			6.67	6.25
Total Suspended Solids, mg/L			1.1U	2.2	1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.8	1U	1U	1U	1.1U			1.9	1.8
Field Parameters																			
Dissolved Oxygen, mg/L			0.12	0.24	3.43		0.15	0.16	0.26	0.11	0.13	0.17	0.23	0.52	0.55			15.15	15.05
Oxidation reduction-field, mVolts			-81.7	-11.3	101.6		86.5	-91.9	-33.2	99.7	-113.1	117.2	-17.6	87.9	206.9			121.7	122.4
Ph, S.U.			8.36	6.84	6.77		6.45	7.88	7	6.3	7.1	6.23	6.41	6.03	5.77			7.67	7.71
Specific conductivity, umhos/cm			479	581	250		578	268	276	715	799	329	387	202	543			200	201
Temperature Celsius, deg c			9.86	10.56	9.71		10.39	11.2	9.3	9.42	9.7	13.22	11.11	11.77	10.06			10.41	10.69
Turbidity, NTU			2	2	1.7		2.6	3.1	0.9	1.5	3.8	1.4	1.3	1.7	0.9			2.2	2.2
Water Level, Ft			1.95	6.64	9.98		8.34	6.32	3.85	1.61	2.55	11.32	7.68	3.6	7.49	17.17	23.15		
Metals																			
Antimony, dissolved, ug/L	30		0.2UM	0.04JL	0.11JL	0.13JL	0.2	0.2UM	0.2JL	0.07JL	0.02JL	0.13JL	0.04JL	0.1JL	0.12JL			0.3	0.3
Antimony, total, ug/L		6	0.2UM	0.05JL	0.11JL	0.11JL	0.2	0.2UM	0.2	0.09JL	0.04JL	0.12JL	0.04JL	0.11JL	0.12JL			0.3	0.3
Arsenic, dissolved, ug/L	190		12.7	3.5	0.2	0.2	0.7	9.8	0.7	2.6	1.8	0.3	0.6	0.16JL	0.6			1	1
Arsenic, total, ug/L		17.4	12.9	3.7	0.3	0.2	1.2	10.9	0.7	2.8	1.8	0.2	0.7	0.6	0.6			1.2	1.2
Barium, dissolved, ug/L	1450		30.3	36.5	10.5	10.4	44.6	12.6	9.8	22.5	75.2	10.3	9.6	7.2	31			9.9	9.7
Barium, total, ug/L		1000	31.4	36.5	10.7	10.4	42.9	13.4	9.7	23.6	74.1	10.5	9.8	8.3	31.4			10.6	10.6
Beryllium, dissolved, ug/L	51		0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM			0.2UM	0.2UM
Cadmium, dissolved, ug/L	1.2		0.1UM	0.02JL	0.02JL	0.02JL	0.05JL	0.1UM	0.02JL	0.04JL	0.1UM	0.1UM	0.1UM	0.1UM	0.02JL			0.1UM	0.1UM
Cadmium, total, ug/L		5	0.02JL	0.02JL	0.02JL	0.02JL	0.06JL	0.1UM	0.03JL	0.07JL	0.1UM	0.1UM	0.1UM	0.02JL	0.02JL			0.1UM	0.1UM
Calcium, dissolved, mg/L			49.6	67	31.7	31.5	77.9	30.5	35.4	71.7	96.4	33.5	41.2	18.3	62.9			20	20.3
Calcium, total, mg/L			50.3	63.8	32.1	31	76.4	30.4	35.3	73.2	96.7	33	40.7	18.9	60.9			19.8	19.6
Chromium, dissolved, ug/L	205		0.5UM	0.1JL	0.16JL	0.25JL	0.19JL	0.5UM	0.06JL	0.5UM	0.5UM	0.17JL	0.39JL	0.06JL	0.32JL			0.48JL	0.48JL
Chromium, total, ug/L		50	0.5UM	0.08JL	0.21JL	0.17JL	0.11JL	0.5UM	0.09JL	1UM	0.5UM	0.5UM	0.5	0.08JL	0.35JL			0.6	0.6
Copper, dissolved, ug/L	13		0.25JL	0.43JL	1.1	1	0.7	0.18JL	0.8	1	0.3JL	1.8	0.5	0.6	1.6			2.3	2.3
Copper, total, ug/L		1000	0.29JL	0.44JL	1.1	1	0.7	0.18JL	0.9	1	0.3JL	1.8	0.6	0.6	1.7			3	2.7
Iron, dissolved, ug/L			17.9JL	2140	50UM	50UM	200	180	43.8JL	120	950	41.7JL	100	180	50UM			200	210

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream
Iron, total, ug/L			40.5JL	2100	15.9JL	9.62JL	220	370	70	220	1180	100	190	230	42.7JL			390	380
Lead, dissolved, ug/L	3		0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.2	0.3
Lead, total, ug/L		15	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.7	0.6
Magnesium, dissolved, mg/L			22.5	29	8.3	8.27	24.3	14.3	11.2	49.1	47.3	16.7	22.2	10.1	16.8			8.81	9.27
Manganese, dissolved, ug/L			165	2020	0.82JL	1	2470	406	287	99	489	888	43	208	34			49	49
Manganese, total, ug/L			189	1980	0.92JL	2	2470	401	300	103	508	873	41	207	34			64	58
Mercury, dissolved, ng/L			0.4U	0.79	1.82	1.88	2.68	0.22B	0.73	4.56	0.97	1.9	0.63	30.6	47.7			1.72	1.55
Mercury, total, ng/L	12	2000	0.4U	0.4B	1.54	1.68	7.23	0.4U	1.66	5.1	0.41U	3.47	2.41	96.2	74			2.47	2.85
Methylmercury, ng/L										0.03U								0.119	0.119
Nickel, dissolved, ug/L	182		0.45JL	3.1	0.36JL	0.37JL	5.7	0.32JL	2.5	26.8	0.35JL	2.3	4.1	2.4	2.6			2.2	2.2
Selenium, dissolved, ug/L			0.31JL	1.1	0.5UM	0.28JL	2UM	0.16JL	0.42JL	0.59JL	1	0.36JL	0.17JL	2UM	0.8			0.21JL	0.21JL
Selenium, total, ug/L	5	10	0.34JL	1.1	0.25JL	0.19JL	1.9	0.17JL	0.45JL	2UM	0.9	0.43JL	0.24JL	0.63JL	1			0.25JL	0.2JL
Silver, dissolved, ug/L	1		0.2UM	0.2UM	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.03JL	0.2UM
Silver, total, ug/L		50	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM
Thallium, dissolved, ug/L	40		0.2UM	0.2UM	0.2UM	0.2UM	0.04JL	0.2UM	0.2UM	0.01JL	0.2UM	0.01JL	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM
Thallium, total, ug/L		2	0.2UM	0.2UM	0.2UM	0.2UM	0.03JL	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM
Zinc, dissolved, ug/L	121		4UM	4UM	4UM	4UM	4UM	4UM	4UM	4UM	4UM	4UM	4UM	4UM	4UM	4UM	4UM	3.62JL	3.32JL
Zinc, total, ug/L		5000	4UM	4UM	4UM	4UM	1.27JL	4UM	4UM	4UM	4UM	4UM	4UM	4UM	4UM	4UM	4UM	6	5
Total Petroleum Hydrocarbons (TPH)																			
Diesel Range Organics, ug/L	670	670	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U
Gasoline Range Organics, ug/L	270	270	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U
Residual Range Organics, ug/L	670	670	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream
Conventionals																			
Alkalinity, Total (as CaCO3), mg/L			213	397	152	153	257	108	243	444	491	152	195	217	149			126	127
Chloride, mg/L			4.8	8.1	2.5	2.5	3.8	4.5	4.6	8.8	6.2	5.4	8.3	5.9	4.3			7.7	7.7
Nitrate, mg/L as N			0.1U	0.1U	0.4	0.4	0.1U	0.1U	0.1U	0.5	0.2	1	1.2	0.1U	3			1	1
Nitrite, mg/L as N			0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.5U	0.2U	1U	1U	0.1U	0.1U			0.1U	0.1U
Phosphorus (as P), mg/L			0.211	0.069	0.116	0.09	0.038	0.212	0.09	0.029	0.072	0.021	0.095	0.038	0.044			0.112	0.126
Sulfate, mg/L			19.5	23.6	16.1	15.8	45.9	15.9	16	18	3.6	32.3	29.3	37.3	48.6			14.3	14.3
Sulfide, mg/L			0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.161	0.05U	0.092	0.05U	0.05U	0.05U	0.05U			0.05U	0.05U
Total Organic Carbon, mg/L			1.5U	4.72	1.59	1.68	5.42	1.5U	4.98	5.61	5.21	3.21	1.52	3.82	5.21			4.8	4.87
Total Suspended Solids, mg/L			1.1U	2.7	1.1U	1.1U	1.9	2.3	4.8	1.1U	4.4	1.1U	1.1U	3.2				2.8	2.2
Field Parameters																			
Dissolved Oxygen, mg/L			0.43	0.42	1.55		0.32	0.44	0.29	0.31	0.4	0.25	0.76	0.29	1.3			10.64	8.58
Oxidation reduction-field, mVolts			-11.6	-2.7	93.3		44.9	0.4	-103.6	83.4	18.5	121.8	69.8	70.2	85.5			13.4	5.1
Ph, S.U.			7.83	6.56	6.49		6.29	7.33	6.53	6.29	6.33	6.07	6.34	6.18	5.87			7.7	7.65
Specific Conductivity, umhos/cm			411	721	302		520	225	439	750	697	327	407	464	394			287	288
Temperature Celsius, deg c			11.56	12.27	12.78		13.45	14.22	11.9	12.9	13.9	17	15.3	16.39	16.9			15.5	15.3
Water Level, Ft			2.06	9.1	12.06		12.38	7.75	7.58	1.67	2.63	12.31	10.64	6.51	12.08	17.45U	23.86		
Metals																			
Antimony, dissolved, ug/L	30		0.02JL	0.05JL	0.1JL	0.1JL	0.15JL	0.2UM	0.16JL	0.1JL	0.05JL	0.09JL	0.05JL	0.11JL	0.09JL			0.15JL	0.14JL
Antimony, total, ug/L		6	0.02JL	0.05JL	0.1JL	0.1JL	0.14JL	0.2UM	0.17JL	0.1JL	0.04JL	0.09JL	0.06JL	0.12JL	0.09JL			0.17JL	0.17JL
Arsenic, dissolved, ug/L	190		12.2	0.9	0.6	0.6	3.1	13.6	3	2.8	3	0.2	1.1	0.5	0.5			1.4	1.3
Arsenic, total, ug/L		17.4	12.9	1.7	0.7	0.6	2.9	14.9	3.1	2.9	2.8	0.3	1.2	0.18JL	0.5			1.7	1.7
Barium, dissolved, ug/L	1450		25	47	16.5	17.6	36.2	12.4	22.4	26.7	78.1	9.6	12	18.7	25			8.7	8.4
Barium, total, ug/L		1000	27.3	47	17.5	17.4	37	13.2	22.5	25.5	76	9.5	12.3	20.1	24.1			10.5	10.6
Beryllium, dissolved, ug/L	51		0.2UM	0.03JL	0.2UM	0.2UM	0.03JL	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM			0.2UM	0.2UM
Cadmium, dissolved, ug/L	1.2		0.1UM	0.03JL	0.02JL	0.02JL	0.03JL	0.1UM	0.1UM	0.06JL	0.02JL	0.03JL	0.1UM	0.03JL	0.02JL			0.1UM	0.1UM
Cadmium, total, ug/L		5	0.1UM	0.03JL	0.02JL	0.02JL	0.07JL	0.1UM	0.02JL	0.07JL	0.1UM	0.02JL	0.02JL	0.06JL	0.02JL			0.03JL	0.03JL
Calcium, dissolved, mg/L			44.2	83.9	42.2	41.8	66.8	25.7	51.7	84.4	105	30.8	36	42.5	43.3			24.4	24.5
Calcium, total, mg/L			43.1	85.7	41.8	41.1	69.4	25	50	81.8	99.9	30.3	36.8	41.4	41.4			24.1	24
Chromium, dissolved, ug/L	205		0.5UM	0.06JL	0.1JL	0.17JL	0.13JL	0.5UM	0.5UM	0.5UM	0.08JL	0.07JL	1	0.5UM	0.47JL			0.29JL	0.27JL
Chromium, total, ug/L		50	0.5UM	0.09JL	0.13JL	0.15JL	0.15JL	0.5UM	0.5UM	0.5UM	1UM	0.06JL	1	0.11JL	0.4JL			0.42JL	0.41JL
Copper, dissolved, ug/L	13		0.3JL	0.37JL	0.9	1	0.6	0.17JL	0.8	1.1	0.35JL	1.4	0.6	0.6	1.2			0.9	1
Copper, total, ug/L		1000	0.28JL	0.36JL	1	1	1	0.18JL	0.24JL	1.1	0.37JL	1.4	0.6	0.7	1			1	1
Iron, dissolved, ug/L			17.1JL	2890	50UM	50UM	1340	710	1720	160	2390	42.1JL	50UM	22.2JL	50UM			60	60
Iron, total, ug/L			50	3290	17JL	17.6JL	1250	980	1850	180	2230	130	20.1JL	130	41.8JL			460	440

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream
Lead, dissolved, ug/L	3		0.1UM	0.1UM	0.1UM	0.1UM	0.08JL	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM			0.05JL	0.06JL
Lead, total, ug/L		15	0.1UM	0.1UM	0.1UM	0.1UM	0.07JL	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1	0.1UM			0.7	0.6
Magnesium, dissolved, mg/L			20.4	43.1	12.4	12.4	25	12.2	24.4	58.5	52.4	19.5	27.3	29.6	11.6			15.5	15.3
Manganese, dissolved, ug/L			150	2250	13	14	2740	417	647	119	1520	1100	17	244	8			43	48
Manganese, total, ug/L			159	2370	16	14	2940	405	639	114	1370	1150	20	255	9			81	76
Mercury, dissolved, ng/L			0.25B	0.26B	1.13	1.22	5.23	0.4U	0.83	6.47	0.41U	1.19	0.93	49.7	28			0.57	0.74
Mercury, total, ng/L	12	2000	0.16B	0.23B	1.26	1.32	17.2	0.41U	1.39	6.98	0.41U	1.41	0.96	146	34			1.75	1.42
Methylmercury, ng/L										0.012B								0.083	0.074
Nickel, dissolved, ug/L	182		0.37JL	3.3	1	1.1	16.2	0.7	7	30.5	0.5	3.5	7.5	8.1	1.9			1.8	1.9
Selenium, dissolved, ug/L			0.19JL	2UM	0.22JL	0.18JL	2UM	0.5UM	1	2UM	0.19JL	0.48JL	0.27JL	0.28JL	0.43JL			0.5UM	0.2JL
Selenium, total, ug/L	5	10	0.16JL	0.98JL	0.26JL	0.24JL	2UM	0.5UM	2UM	2UM	2UM	0.42JL	0.29JL	2UM	0.6			0.29JL	0.3JL
Silver, dissolved, ug/L	1		0.2UM	0.01JL	0.01JL	0.2UM	0.01JL	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM			0.2UM	0.2UM
Silver, total, ug/L		50	0.2UM	0.2UM	0.01JL	0.2UM	0.02JL	0.2UM	0.01JL	0.01JL	0.2UM	0.2UM	0.01JL	0.01JL	0.2UM			0.01JL	0.01JL
Thallium, dissolved, ug/L	40		0.2UM	0.01JL	0.01JL	0.01JL	0.03JL	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.01JL	0.2UM			0.2UM	0.2UM
Thallium, total, ug/L		2	0.2UM	0.2UM	0.01JL	0.01JL	0.03JL	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.01JL	0.2UM			0.2UM	0.01JL
Zinc, dissolved, ug/L	121		0.72JL	1JL	4UM	1.18JL	2.15JL	0.56JL	1.18JL	1.04JL	0.59JL	1.38JL	0.87JL	1.24JL	1.4JL			5	5
Zinc, total, ug/L		5000	0.85JL	0.93JL	0.79JL	1.12JL	6	1.05JL	4UM	6	2.51JL	2.53JL	1.07JL	3.9JL	1.48JL			9	7
Total Petroleum Hydrocarbons (TPH)																			
Diesel Range Organics, ug/L	670	670	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U				
Gasoline Range Organics, ug/L	270	270	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U				
Residual Range Organics, ug/L	670	670	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U				

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream
Conventionals																			
Alkalinity, Total (as CaCO3), mg/L							252												
Chloride, mg/L							6.1												
Nitrate, mg/L as N							0.1B												
Nitrite, mg/L as N							2.8												
Phosphorus (as P), mg/L							0.073												
Sulfate, mg/L							48.8												
Sulfide, mg/L							0.05U												
Total Organic Carbon, mg/L							7.34												
Total Suspended Solids, mg/L							6.5												
Field Parameters																			
Dissolved Oxygen, mg/L							0.82												
Oxidation reduction-field, mVolts							47												
Ph, S.U.							5.71												
Specific Conductivity, umhos/cm							596												
Temperature Celsius, deg c							15.1												
Turbidity, NTU							45.6												
Water Level, Ft							16.13												
Metals																			
Antimony, dissolved, ug/L	30						0.13JL												
Antimony, total, ug/L		6					0.12JL												
Arsenic, dissolved, ug/L	190						5.2												
Arsenic, total, ug/L		17.4					5.1												
Barium, dissolved, ug/L	1450						37.1												
Barium, total, ug/L		1000					36.6												
Beryllium, dissolved, ug/L	51						0.2UM												
Cadmium, dissolved, ug/L	1.2						0.06JL												
Cadmium, total, ug/L		5					0.07JL												
Calcium, dissolved, mg/L							65.8												
Calcium, total, mg/L							66.4												
Chromium, dissolved, ug/L	205						0.11JL												
Chromium, total, ug/L		50					0.12JL												
Copper, dissolved, ug/L	13						0.48JL												
Copper, total, ug/L		1000					0.8												
Iron, dissolved, ug/L							4140												

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A- Upstream	MW-8A- Downstream
Iron, total, ug/L							4260												
Lead, dissolved, ug/L	3						0.05JL												
Lead, total, ug/L		15					0.05JL												
Magnesium, dissolved, mg/L							25.1												
Manganese, dissolved, ug/L							2260												
Manganese, total, ug/L							2280												
Mercury, dissolved, ng/L							4.09												
Mercury, total, ng/L	12	2000					9.72												
Nickel, dissolved, ug/L	182						21.6												
Selenium, dissolved, ug/L							2UM												
Selenium, total, ug/L	5	10					2UM												
Silver, dissolved, ug/L	1						0.2UM												
Silver, total, ug/L		50					0.01JL												
Thallium, dissolved, ug/L	40						0.03JL												
Thallium, total, ug/L		2					0.03JL												
Zinc, dissolved, ug/L	121						3.15JL												
Zinc, total, ug/L		5000					2.63JL												

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

EFMP201110

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream	
Conventionals																				
Alkalinity, Total (as CaCO3), mg/L				347	179	184	260	115	327	470	535	164	162	119					131	131
Chloride, mg/L				7.9	4.5	4.5	3.5	4.6	6.6	7.7	5.9	5.5	9.5	5.8					8	8
Nitrate, mg/L as N				0.1U	0.3	0.3	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	1	0.2					0.9	0.9
Nitrite, mg/L as N				0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U					0.1U	0.1U
Phosphorus (as P), mg/L				0.115	0.014	0.489	0.178	0.061	0.261	0.206	0.035	0.179	0.228	0.021					0.081	0.076
Sulfate, mg/L				36	31.3	34.3	84.6	18.4	25	14.7	3	30.8	29.6	36.4					16.8	16.8
Sulfide, mg/L				0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.053	0.05U	0.05U	0.05U					0.05U	0.05U
Total Organic Carbon, mg/L				5.82	2.32	2.3	8.15	1.5U	4.57	7.36	7.08	3.97	1.65	3.93					4.64	4.87
Total Suspended Solids, mg/L				2.5	1.1U	1U	8.1	4.2	1.1U	1.1U	9.2	1.1U	1.2	4.1					1.1	1U
Field Parameters																				
Dissolved Oxygen, mg/L				0.62	2.71		0.17	1.14	0.6	0.28	0.26	0.21	2.07	4.87					11.48	11.2
Oxidation reduction-field, mVolts				-12.1	29.9		28.7	-34.3	-26.7	31.1	-130.2	8	-1.3	79.8					32.6	48.7
Ph, S.U.				6.82	6.7		6.08	7.5	6.57	6.32	7.14	6.48	6.55	6.04					8.03	7.98
Specific conductivity, umhos/cm				692	388		627	253	606	841	933	390	394	318					299	302
Temperature Celsius, deg c				13.07	13.9		13.48	14.67	12.09	10.59	11.64	11.76	11.74	12.56					8.05	8.09
Turbidity, NTU				0.6	1.1		2.2	18	0.6	0.6	0.9	0.7	2.8	5.3					1.8	1.8
Water Level, Ft				8.83	12.34		17.35	7.21	7.79	1.61	2.66	11.64	12.98	4.53	14.98	16.44U	24.19			
Metals																				
Antimony, dissolved, ug/L	30			0.04JL	0.4	0.4	0.2U	0.2UM	0.4	0.1JL	0.04JL	0.08JL	0.04JL	0.15JL					0.14JL	0.15JL
Antimony, total, ug/L		6		0.04JL	0.3	0.3	0.11JL	0.02JL	0.4	0.09JL	0.05JL	0.11JL	0.2U	0.14JL					0.15JL	0.16JL
Arsenic, dissolved, ug/L	190			5.7	1	1.1	5.1	16.2	1	3	3.9	0.3	0.9	0.5UM					1.1	1.2
Arsenic, total, ug/L		17.4		5.7	1	1	5.3	23.8	1.5	3.3	3.7	0.3	0.9	0.5UM					1.2	1.3
Barium, dissolved, ug/L	1450			39	30.4	31.2	43.9	14.3	27.1	28.7	78.9	9	11.5	11.9					9.3	9.7
Barium, total, ug/L		1000		40.3	29.8	31.1	41.6	25.2	27.4	26.8	78.8	9	11.7	12.4					9.6	9.9
Beryllium, dissolved, ug/L	51			0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM					0.2UM	0.2UM
Cadmium, dissolved, ug/L	1.2			0.02JL	0.1	0.1	0.06JL	0.02JL	0.1	0.07JL	0.03JL	0.02JL	0.1UM	0.08JL					0.1UM	0.1UM
Cadmium, total, ug/L		5		0.03JL	0.1JL	0.1	0.07JL	0.03JL	0.09JL	0.07JL	0.04JL	0.03JL	0.03JL	0.06JL					0.1UM	0.1UM
Calcium, dissolved, mg/L				79.2	48.8	48.5	79.4	23.6	60.6	88.9	111	34.7	31.5	28.5					28.7	29
Calcium, total, mg/L				79.5	47.8	49	73.5	23	59.6	79.5	104	31.2	28	28.6					28.2	29.1
Chromium, dissolved, ug/L	205			0.12JL	1UM	0.5UM	0.12JL	1UM	0.5UM	0.5UM	0.12JL	0.06JL	1.7	0.2JL					0.29JL	0.28JL
Chromium, total, ug/L		50		1UM	0.06JL	0.06JL	0.28JL	0.5UM	0.07JL	0.09JL	1UM	0.09JL	2	0.28JL					0.33JL	0.34JL
Copper, dissolved, ug/L	13			0.6	0.8	0.8	0.6	0.18JL	0.9	1.1	0.22JL	1.3	0.32JL	0.9					1	1.1
Copper, total, ug/L		1000		0.26JL	1	0.9	1.5	0.24JL	1.6	1	0.22JL	1.3	0.37JL	1					1.1	1.1
Iron, dissolved, ug/L				2950	50	60	3480	1260	70	140	4030	60	50UM	7.65JL					70	140

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream
Iron, total, ug/L				2930	50	50	3590	2530	90	180	3830	110	70	110				300	320
Lead, dissolved, ug/L	3			0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM				0.1UM	0.08JL
Lead, total, ug/L		15		0.1UM	0.1UM	0.1UM	0.2	0.1UM	0.09JL	0.07JL	0.1UM	0.1UM	0.1UM	0.2				0.2	0.2
Magnesium, dissolved, mg/L				33.6	16.6	16.6	25.6	11.2	36.7	60.3	54.6	22.1	26.4	16.5				17.3	17.2
Manganese, dissolved, ug/L				2570	104	108	5010	520	153	124	2280	851	1	30				31	43
Manganese, total, ug/L				2590	91	89	4670	1110	158	111	2190	824	3	30				44	50
Mercury, dissolved, ng/L				0.97	1.12	2.18	6.63	0.65	3.13	5.64	R	1.99	1.86	101				0.64	0.77
Mercury, total, ng/L	12	2000		0.25B	1	0.95	10.5	0.27B	2.46	6.64	0.37B	1.88	1.15	158				1.12	0.94
Methylmercury, ng/L										0.025U								0.056	0.055
Nickel, dissolved, ug/L	182			3.4	2.5	2.7	14.6	0.9	14.1	32	0.6	3.3	6.7	3				1.9	1.5
Selenium, dissolved, ug/L				0.8JL	0.35JL	0.34JL	2UM	0.5UM	2UM	2UM	1	0.45JL	0.5UM	2UM				0.18JL	0.19JL
Selenium, total, ug/L	5	10		0.7	0.49JL	0.46JL	0.24JL	0.16JL	1.3	0.5JL	2UM	0.42JL	0.13JL	2UM				0.16JL	0.18JL
Silver, dissolved, ug/L	1			0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM				0.2UM	0.2UM
Silver, total, ug/L		50		0.01JL	0.2UM	0.01JL	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM	0.01JL	0.2UM	0.01JL				0.2UM	0.01JL
Thallium, dissolved, ug/L	40			0.2UM	0.08JL	0.08JL	0.04JL	0.2UM	0.02JL	0.01JL	0.2UM	0.01JL	0.2UM	0.01JL				0.2UM	0.2UM
Thallium, total, ug/L		2		0.01JL	0.06JL	0.07JL	0.03JL	0.2UM	0.01JL	0.01JL	0.2UM	0.01JL	0.2UM	0.01JL				0.2UM	0.01JL
Zinc, dissolved, ug/L	121			1.02JL	0.9JL	0.77JL	2.4JL	1JL	2.05JL	1.52JL	1.16JL	1.29JL	0.73JL	3.24JL				2.08JL	2.4JL
Zinc, total, ug/L		5000		0.74JL	2.8JL	0.97JL	2.6JL	1.4JL	2JL	1.2JL	0.62JL	3.7JL	1.4JL	2.4JL				2.6JL	2.8JL
Total Petroleum Hydrocarbons (TPH)																			
Diesel Range Organics, ug/L	670	670		500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U					
Gasoline Range Organics, ug/L	270	270		250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U					
Residual Range Organics, ug/L	670	670		500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U					

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream
Conventionals																			
Alkalinity, Total (as CaCO3), mg/L							252												
Chloride, mg/L							6.1												
Nitrate, mg/L as N							0.1B												
Nitrite, mg/L as N							2.8												
Phosphorus (as P), mg/L							0.073												
Sulfate, mg/L							48.8												
Sulfide, mg/L							0.05U												
Total Organic Carbon, mg/L							7.34												
Total Suspended Solids, mg/L							6.5												
Field Parameters																			
Dissolved Oxygen, mg/L							0.82												
Oxidation reduction-field, mVolts							47												
Ph, S.U.							5.71												
Specific Conductivity, umhos/cm							596												
Temperature Celsius, deg c							15.1												
Turbidity, NTU							45.6												
Water Level, Ft							16.13												
Metals																			
Antimony, dissolved, ug/L	30						0.13JL												
Antimony, total, ug/L		6					0.12JL												
Arsenic, dissolved, ug/L	190						5.2												
Arsenic, total, ug/L		17.4					5.1												
Barium, dissolved, ug/L	1450						37.1												
Barium, total, ug/L		1000					36.6												
Beryllium, dissolved, ug/L	51						0.2UM												
Cadmium, dissolved, ug/L	1.2						0.06JL												
Cadmium, total, ug/L		5					0.07JL												
Calcium, dissolved, mg/L							65.8												
Calcium, total, mg/L							66.4												
Chromium, dissolved, ug/L	205						0.11JL												
Chromium, total, ug/L		50					0.12JL												
Copper, dissolved, ug/L	13						0.48JL												
Copper, total, ug/L		1000					0.8												
Iron, dissolved, ug/L							4140												

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A- Upstream	MW-8A- Downstream
Iron, total, ug/L							4260												
Lead, dissolved, ug/L	3						0.05JL												
Lead, total, ug/L		15					0.05JL												
Magnesium, dissolved, mg/L							25.1												
Manganese, dissolved, ug/L							2260												
Manganese, total, ug/L							2280												
Mercury, dissolved, ng/L							4.09												
Mercury, total, ng/L	12	2000					9.72												
Nickel, dissolved, ug/L	182						21.6												
Selenium, dissolved, ug/L							2UM												
Selenium, total, ug/L	5	10					2UM												
Silver, dissolved, ug/L	1						0.2UM												
Silver, total, ug/L		50					0.01JL												
Thallium, dissolved, ug/L	40						0.03JL												
Thallium, total, ug/L		2					0.03JL												
Zinc, dissolved, ug/L	121						3.15JL												
Zinc, total, ug/L		5000					2.63JL												

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1a. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream
Conventionals																			
Alkalinity, Total (as CaCO3), mg/L			273	66.1	129	130	209	116	97	438	525	206	216	86	117			92.6	92.6
Chloride, mg/L			5.8	7.2	17.9	18.9	3.5	4.4	2.2	9.3	6.7	3.5	7.9	4.8	4			26.7	25.9
Nitrate, mg/L as N			0.1	6.8	12.3	13.7	0.1U	0.1	0.1U	0.1U	0.1U	0.2	0.3	0.2	3.6			0.5	0.4
Nitrite, mg/L as N			0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U			0.1U	0.1U
Phosphorus (as P), mg/L			0.223	0.17	0.041	0.057	0.052	0.164	0.033	0.085	0.124	0.031	0.043	0.032	0.03			0.067	0.128
Sulfate, mg/L			20.6	73.8	30.1	31	71.8	21.3	17.5	15.6	3.9	21.8	27.9	32.8	47.2			8.7	8.7
Sulfide, mg/L			0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.08	0.05U	0.05U	0.05U	0.05U			0.05U	0.05U
Total Organic Carbon, mg/L			2.74	25.8	5.05	4.73	8.68	1.97	4.9	7.04	5.36	7.19	2.9	4.21	5.73			27	26.7
Total Suspended Solids, mg/L			2.3	1U	1U	1U	1.1	2.3	1.1U	1U	2.6	1.1U	1.1U	4.4	1.6			14.9	15.3
Field Parameters																			
Dissolved Oxygen, mg/L				1.45	6.4		0.38	0.79	2.59	0.78	0.42	1.67	4.79	3.72	4.42			12.06	12.18
Oxidation reduction-field, mVolts				94.1	91.1		-33.1	-94.1	165.4	147.9	-60.6	28.2	83	237.7	102.7			54.5	33.3
Ph, S.U.				5.63	6.28		6.18	7.44	6.47	6.25	7.06	6.34	6.52	6.02	5.95			7.43	7.54
Specific Conductivity, umhos/cm				356	440		493	233	207	735	846	287	438	216	315			252	248
Temperature Celsius, deg c				6.95	11.03		10.07	11.03	4.5	7.89	7.45	6.89	8.07	7.02	8.4			5.56	5.4
Turbidity, NTU				3.9	0.3		1.4	6.7	1.8	0.9	1.2	2.5	1.1	5.7	7			5.8	6.8
Water Level, Ft				5.08	9.01		9.79	4.88	3.52	1.6	2.56	9.6	8.4		5.5				
Metals																			
Antimony, dissolved, ug/L	30		0.2UM	1.3	0.12JL	0.11JL	0.14JL	0.2UM	0.6	0.09JL	0.03JL	0.4	0.05JL	0.09JL	0.06JL			0.4	0.4
Antimony, total, ug/L		6	0.02JL	1.3	0.12JL	0.12JL	0.17JL	0.03JL	0.6	0.09JL	0.02JL	0.4	0.03JL	0.09JL	0.08JL			0.4	0.4
Arsenic, dissolved, ug/L	190		12.4	4.7	0.3	0.3	3.5	12.9	0.4	2.3	1.4	0.3	0.5	0.16JL	0.3			0.8	0.8
Arsenic, total, ug/L		17.4	12.8	5	0.3	0.3	3.7	15.8	0.6	2.8	1.5	0.3	0.6	0.07JL	0.4			0.9	0.9
Barium, dissolved, ug/L	1450		32.4	23.4	35.6	34.4	29.6	11.5	7.1	25.5	80.7	13.5	9.5	7.4	8.4			24.3	21.7
Barium, total, ug/L		1000	34.2	23.5	34.1	34.4	28.4	14.9	7.8	24.6	80.2	14	9.4	8.3	9.1			22.7	23.3
Beryllium, dissolved, ug/L	51		0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM			0.2UM	0.2UM
Cadmium, dissolved, ug/L	1.2		0.1UM	0.2	0.02JL	0.03JL	0.04JL	0.1UM	0.02JL	0.06JL	0.1UM	0.1UM	0.1UM	0.02JL	0.1UM			0.1UM	0.02JL
Cadmium, total, ug/L		5	0.1UM	0.2	0.03JL	0.06JL	0.08JL	0.02JL	0.04JL	0.06JL	0.02JL	0.02JL	0.02JL	0.02JL	0.03JL			0.03JL	0.04JL
Calcium, dissolved, mg/L			50.8	47.2	57.7	57.2	77.5	25.2	27	80.5	107	50.9	50.9	19.7	37.9			17.7	17.9
Calcium, total, mg/L			50.8	47.4	57.4	57.8	75.6	25.6	26.4	80.7	106	50.4	51	19.3	39.6			17.7	17.7
Chromium, dissolved, ug/L	205		0.5UM	0.88JL	0.12JL	0.17JL	0.17JL	1UM	0.5UM	0.5UM	1UM	0.05JL	1	0.29JL	0.2JL			0.39JL	0.36JL
Chromium, total, ug/L		50	0.5UM	0.9JL	0.1JL	0.17JL	0.18JL	1UM	0.07JL	0.05JL	1UM	0.11JL	1.1	0.39JL	0.28JL			0.6	0.7
Copper, dissolved, ug/L	13		0.35JL	5.2	1.3	1.2	0.9	0.42JL	3	1.4	0.29JL	2.7	0.9	1	1.2			3	2.8
Copper, total, ug/L		1000	0.4JL	5.4	1.2	1.2	1.3	0.29JL	3	1.1	0.25JL	2.4	0.7	0.9	1			3.8	3.8
Iron, dissolved, ug/L			22.8JL	170	50UM	50UM	990	680	50UM	130	1280	90	50UM	50UM	50UM			220	210

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream
Iron, total, ug/L			110	320	50UM	50UM	1260	1390	120	270	1340	120	39.7JL	70	48.4JL			500	510
Lead, dissolved, ug/L	3		0.1UM	0.2	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM			0.3	0.3
Lead, total, ug/L		15	0.05JL	0.3	0.1UM	0.1UM	0.1UM	0.1UM	0.1	0.07JL	0.1UM	0.1UM	0.1UM	0.08JL	0.1UM			1.1	1.2
Magnesium, dissolved, mg/L			23.2	14.5	16.4	16	18.2	12.7	8.92	55.4	54.5	17.7	25.8	10.6	8.36			6.27	6.29
Manganese, dissolved, ug/L			184	43	1	1	8130	328	5	121	579	246	5	9	5			99	98
Manganese, total, ug/L			199	42	2	2	7900	519	26	123	605	252	6	11	6			107	104
Mercury, dissolved, ng/L			0.4U	6.32	1.12	0.8	2.78	0.41U	0.74	6.64	0.41U	1.65	0.59	56	3.97			2.41	1.61
Mercury, total, ng/L	12	2000	0.18B	8	1.56	1.4	16.9	0.41U	1.73	6.2	0.4U	1.96	0.8	77.1	6.37			3.9	4.28
Methylmercury, ng/L										0.058								0.104	0.102
Nickel, dissolved, ug/L	182		0.41JL	4.2	0.6	0.5	5.6	0.8	1.3	31.1	0.5	1.6	4	1.6	1			1.8	1.9
Selenium, dissolved, ug/L			0.25JL	0.41JL	0.28JL	0.29JL	0.8	0.5UM	0.3JL	2UM	0.9	0.32JL	0.17JL	2UM	0.21JL			0.5UM	0.5UM
Selenium, total, ug/L	5	10	0.25JL	0.43JL	0.31JL	0.31JL	0.7	0.5UM	0.28JL	2UM	1	0.34JL	0.17JL	2UM	0.23JL			0.5UM	0.5UM
Silver, dissolved, ug/L	1		0.2UM	0.01JL	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM			0.2UM	0.2UM
Silver, total, ug/L		50	0.2UM	0.02JL	0.01JL	0.01JL	0.03JL	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM			0.2UM	0.2UM
Thallium, dissolved, ug/L	40		0.2UM	0.01JL	0.01JL	0.01JL	0.02JL	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM			0.2UM	0.01JL
Thallium, total, ug/L		2	0.2UM	0.01JL	0.01JL	0.01JL	0.03JL	0.2UM	0.2UM	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM			0.2UM	0.2UM
Zinc, dissolved, ug/L	121		1.13JL	24	1.08JL	1.13JL	2.96JL	1.16JL	2.06JL	2.52JL	1.65JL	2.63JL	1.89JL	1.84JL	1.81JL			17	17
Zinc, total, ug/L		5000	1.54JL	24	0.8JL	0.99JL	2.76JL	2.39JL	2.24JL	2.24JL	1.85JL	2.03JL	1.25JL	1.67JL	1.96JL			20	21
Total Petroleum Hydrocarbons (TPH)																			
Diesel Range Organics, ug/L	670	670	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U				
Gasoline Range Organics, ug/L	270	270	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U				
Residual Range Organics, ug/L	670	670	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U				

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream
Conventionals																			
Alkalinity, Total (as CaCO3), mg/L			261	382	103	102	304	104	158	433	518	153	195	130	245			91.7	93.4
Chloride, mg/L			4.9	8.1	4.1	4.2	3.3	4.5	1.8	8.2	5.9	4.3	5.4	5.4	3.6			8.3	8.2
Nitrate, mg/L as N			0.1	0.1U	0.6	0.6	0.1	0.1U	0.1U	0.1U	0.1U	0.2	0.2	0.1	13.1			0.6	0.6
Nitrite, mg/L as N			0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U			0.1U	0.1U
Phosphorus (as P), mg/L			0.175	0.028	0.013	0.012	0.026	0.267	0.008	0.046	0.102	0.008U	0.023	0.008U	0.018			0.063	0.065
Sulfate, mg/L			22.1	32.7	18.1	18.2	51.8	16.7	9.4	16.6	3.3	32.8	24.5	32.4	66.6			11.4	11.2
Sulfide, mg/L			0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.054	0.05U	0.05U	0.05U	0.05U			0.05U	0.05U
Total Organic Carbon, mg/L			2.22	5.95	2.51	2.32	7.36	1.5U	4.24	6.04	4.7	4.39	2.12	4.04	8.97			7.08	6.88
Total Suspended Solids, mg/L			1.1U	1U	1.1U	6.4	1.1U	9.3	1.1U	1.1U	3.3	1.1U	1U	1.1U	1.3U			3.7	3.4
Field Parameters																			
Dissolved Oxygen, mg/L			0.44	0.41	5.7		0.33	0.77	0.81	0.89	0.19	0.29	2.47	0.9	2.2			10.46	9.89
Oxidation reduction-field, mVolts			228	151	208		269.4	256.4	264.9	335.3	218.5	202.1	263.9	334.9	347			323.1	274.8
Ph, S.U.			9	8.3	8.4		7.7	7.2	7.1	6.41	7.16	6.4	6.61	6.26	6.19			7.4	7.6
Specific conductivity, umhos/cm			494	706	235		603	229	288	977	1108	436	499	415	845			215	216
Temperature Celsius, deg c			11.98	12.3	11.8		13.2	11.55	10.23	10.59	10.33	10.44	9.83	11.78	11			15.55	15.65
Turbidity, NTU			0.9	1.1	1.4		1.1	21	1	1.8	3.2	2.6	1.6	1.5	1.3			2.9	2.7
Water Level, Ft			2.68	6.08	10.23		8.78	6.3	4.37	1.6	2.59	11.3	8.27	3.98	7.72	17.16U	23.12		
Metals																			
Antimony, dissolved, ug/L	30		0.2UM	0.02JL	0.09JL	0.08JL	0.1JL	0.2UM	0.2	0.06JL	0.2UM	0.12JL	0.2UM	0.06JL	0.02JL			0.3	0.2
Antimony, total, ug/L		6	0.2UM	0.03JL	0.06JL	0.08JL	0.12JL	0.2UM	0.2	0.07JL	0.2UM	0.12JL	0.2UM	0.08JL	0.04JL			0.3	0.3
Arsenic, dissolved, ug/L	190		12.4	2.5	0.2	0.3	2.3	12.1	0.7	2.4	1.4	0.2	0.5	0.5UM	0.5			1.1	1.1
Arsenic, total, ug/L		17.4	12.5	2.4	0.2	0.2	2.6	18.7	0.7	2.8	1.4	0.2	0.5	0.5	0.5			1.4	1.4
Barium, dissolved, ug/L	1450		35.9	46.3	9.8	9.2	46	10.4	10.4	25.2	82.8	10.7	9.5	11.3	32.4			11.2	10
Barium, total, ug/L		1000	38.1	49.1	9.8	9.7	47.3	16.5	10.6	25.6	84.8	10.3	9.6	11	34.2			11.9	11.7
Beryllium, dissolved, ug/L	51		0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM			0.2UM	0.2UM
Cadmium, dissolved, ug/L	1.2		0.1UM	0.02JL	0.02JL	0.1UM	0.03JL	0.1UM	0.1UM	0.1	0.02JL	0.02JL	0.1UM	0.03JL	0.03JL			0.02JL	0.1UM
Cadmium, total, ug/L		5	0.1UM	0.03JL	0.1UM	0.1UM	0.08JL	0.1UM	0.1UM	0.05JL	0.1UM	0.1UM	0.1UM	0.03JL	0.03JL			0.1UM	0.02JL
Calcium, dissolved, mg/L			57.9	92.3	31.8	31.6	88.4	25.5	40.1	82.9	109	37.4	46	30.7	87.7			22.4	22.6
Calcium, total, mg/L			57.8	91.1	31.1	31.3	88	25.7	40	82.4	106	36.8	44.5	30.6	85.8			22.1	22.5
Chromium, dissolved, ug/L	205		0.5UM	0.5UM	0.06JL	0.13JL	0.11JL	1UM	0.5UM	1UM	1UM	0.18JL	0.7	0.22JL	0.7			0.37JL	0.31JL
Chromium, total, ug/L		50	0.5UM	0.5UM	0.2JL	0.13JL	0.15JL	1UM	0.5UM	0.09JL	0.18JL	0.17JL	0.7	0.24JL	0.6			0.46JL	0.43JL
Copper, dissolved, ug/L	13		0.44JL	0.6	0.9	1	0.7	1.1	1.1	1.2	0.33JL	1.9	0.7	0.8	2.4			2.8	2.2
Copper, total, ug/L		1000	0.31JL	3.3	1	1	1	0.21JL	1.2	1.3	0.5	1.7	0.8	0.9	1.4			2.7	2.7
Iron, dissolved, ug/L			50	2350	50UM	50UM	1070	730	43.1JL	140	1270	130	50UM	50UM	50UM			200	190

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

Table 1. Monitoring Well Event Summary
Port of Seattle SeaTac International Airport Embankment Fill Monitoring Program

Constituent	SWAL	GWAL	MW-1A	MW-2A	MW-4A	MW-4A-Dup	MW-5	MW-6	MW-7	MW-8A	MW-9A	MW-10	MW-11	MW-12	MW-13B	MW-14	MW-15A	MW-8A-Upstream	MW-8A-Downstream
Iron, total, ug/L			70	2330	13.9JL	14JL	1190	1930	70	200	1410	230	22.7JL	48.4JL	28.6JL			550	550
Lead, dissolved, ug/L	3		0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM		0.3	0.2
Lead, total, ug/L		15	0.1UM	0.07JL	0.1UM	0.1UM	0.05JL	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM	0.1UM		0.8	0.7
Magnesium, dissolved, mg/L			27	41.2	8.61	8.62	27.2	12.4	13.6	54.5	56.3	17.8	24.6	19.2	20.5			10.6	10.8
Manganese, dissolved, ug/L			204	2380	0.32JL	0.31JL	6620	417	220	119	555	659	4	58	4			50	46
Manganese, total, ug/L			210	2390	0.56JL	0.5JL	6730	763	225	121	561	671	4	59	5			89	83
Mercury, dissolved, ng/L			0.62	1.22	1.94	1.97	2.8	1.39	1.09	5.32	0.2B	2.06	0.76	115	10.8			1.64	1.59
Mercury, total, ng/L	12	2000	0.45	0.57	2.29	1.52	7.12	0.45	1.77	6.59	0.41U	2.39	0.57	453	12.3			3.64	4.01
Methylmercury, ng/L										0.012B								0.133	0.148
Nickel, dissolved, ug/L	182		0.6	4.1	0.41JL	0.42JL	4.3	0.29JL	2.4	30.9	0.5	2.3	3.9	3.2	1.9			2.2	2.2
Selenium, dissolved, ug/L			0.23JL	0.9	0.5UM	0.15JL	2UM	0.5UM	0.42JL	2UM	0.9	0.3JL	0.14JL	2UM	0.43JL			0.5UM	0.5UM
Selenium, total, ug/L	5	10	0.15JL	0.7	0.14JL	0.5UM	2UM	0.13JL	0.34JL	0.6	0.32JL	0.18JL	0.22JL	0.6	0.24JL			0.17JL	0.13JL
Silver, dissolved, ug/L	1		0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.02JL	0.01JL	0.01JL	0.01JL	0.2UM	0.01JL			0.2UM	0.2UM
Silver, total, ug/L		50	0.01JL	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM			0.2UM	0.01JL
Thallium, dissolved, ug/L	40		0.2UM	0.2UM	0.2UM	0.2UM	0.04JL	0.2UM	0.2UM	0.03JL	0.2UM	0.01JL	0.2UM	0.01JL	0.01JL			0.2UM	0.2UM
Thallium, total, ug/L		2	0.2UM	0.2UM	0.2UM	0.2UM	0.04JL	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.2UM	0.01JL	0.2UM			0.2UM	0.2UM
Zinc, dissolved, ug/L	121		1.13JL	1.73JL	4UM	0.87JL	2.96JL	0.92JL	1.17JL	0.83JL	4UM	1.3JL	4UM	0.79JL	3.24JL			4	4
Zinc, total, ug/L		5000	1.06JL	2.29JL	4UM	4UM	2.59JL	0.51JL	1.1JL	1.18JL	1.67JL	0.95JL	0.72JL	1.17JL	1.43JL			7	7
Total Petroleum Hydrocarbons (TPH)																			
Diesel Range Organics, ug/L	670	670	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U
Gasoline Range Organics, ug/L	270	270	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U	250U
Residual Range Organics, ug/L	670	670	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U	500U

MW-8A-Upstream and MW-8A-Downstream are surface water samples collected from Miller Creek, at locations upstream and downstream from MW-8A.

No result indicates analyte not analyzed for.

U - Not detected above indicated detection limit.

J - Estimated value. B - Compound found in blank.

The Groundwater Quality Criteria for pH is 6.5 to 8.5.

Y - Not detected at raised detection limit.

M - Estimated value - low spectral match parameters.

GWAL is the Groundwater Action Level

H - Estimated value- sample temperature.

** Indicates detected in the trip blank but not qualified.

SWAL is the Surface Water Action Level

L - Detection between the method detection Limit (MDL) and lab reporting limit (RL)

Bold values indicate exceedance of SWAL.

P 206.329.0141 | F 206.329.6968

2377 Eastlake Avenue East | Seattle, WA 98102

P 206.842.3202 | F 206.842.5041

8150 West Port Madison NE | Bainbridge, WA 98110

P 360.570.8244 | F 360.570.0064

1627 Linwood Avenue SW | Tumwater, WA 98512

www.pgwg.com

