East Mission Flats Repository 2013 Annual Water Quality Report

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Acronyms and Abbreviations

bgs	below ground surface
BPRP	Basin Property Remediation Program
BHSS	Bunker Hill Mining and Metallurgical Complex Superfund Site
CDA River	Coeur d'Alene River
cfs	cubic feet per second
CLP	Contract Laboratory Program
COC	contaminant(s) of concern
CRQL	contract required quantitation limit
DEQ	Idaho Department of Environmental Quality
DI	deionized
DO	dissolved oxygen
EMFR	East Mission Flats Repository
I-90	Interstate-90
ICP	Institutional Controls Program
ICP-MS	Inductively Coupled Plasma – Mass Spectrometry
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS	matrix spike
mV	millivolts
MW	monitoring well
North Wind	North Wind Construction Services
OIG	Office of the Inspector General
ORP	oxidation reduction potential
OU	operable unit
PZ	piezometers
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
Ralston	Ralston Hydrologic Services, Inc.
RPD	relative percent difference
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SCM	site conceptual model
SVL	SVL Analytical, Inc.
TerraGraphics	TerraGraphics Environmental Engineering, Inc.
Troll	In-Situ Troll®
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

1 Introduction and Purpose

During implementation of the 2013 remedial actions approximately 19,500 cubic yards of metals contaminated soils were placed at the East Mission Flats Repository (EMFR) (North Wind 2014). Consolidation of contaminated soils, sediments, and source materials into controlled repositories is a critical component of the human health remedy for the Bunker Hill Mining and Metallurgical Complex Superfund Site (BHSS), as described in the Records of Decision (RODs; USEPA 1991, 1992, 2002). As part of ongoing repository operations, routine monitoring and evaluation of surrounding environmental conditions is conducted to evaluate repository performance. The purpose of this annual report is to provide a summary and interpretation of monitoring data collected at the EMFR through 2013.

Water monitoring activities have been conducted at EMFR since the fall of 2007. The contaminants of concern (COCs) include the metals antimony, arsenic, cadmium, lead, and zinc. Groundwater, floodwater, and repository pore water are monitored for COCs to evaluate the EMFR's potential impacts on the surrounding water quality. Ongoing water monitoring is conducted to meet the following goals: 1) evaluate water levels and water quality parameters of pore water within the repository waste; 2) evaluate the influence of surface water elevation on groundwater levels at the site; 3) evaluate the quality of floodwater entering and leaving the site; 4) evaluate hydraulic gradients and groundwater flow direction over time, both vertically and horizontally at the EMFR site; and 5) evaluate the potential effects of the repository on groundwater.

1.1 Location

The EMFR is located on a 23-acre parcel in Kootenai County approximately three-quarters of a mile west of Cataldo. The site is bounded to the northeast by Canyon Road, to the southwest by Interstate 90 (I-90) and exit 39, and to the north and northwest by private property. The site is located in the 100 year floodplain of the Coeur d'Alene (CDA) River. The river flows in an approximate arc around the site approximately three-quarters of a mile to the east, south, and west. The EMFR site is north of I-90, across the freeway from the Old Mission State Park and the Cataldo Mission (Figure 1).

1.2 Report Organization

This annual water quality report for the EMFR is structured as follows:

Section 1.0 – Introduction and Purpose provides a brief description of the EMFR, its location, and the purpose of the report.

Section 2.0 – Background and Site Conceptual Model describes the EMFR history, regional and site-specific conditions, and existing water quality conditions in the area.

Section 3.0 – Methods briefly summarizes the field sampling and monitoring activities, quality assurance/quality control (QA/QC) procedures, and data analysis conducted for this report.

Section 4.0 – Results and Discussion presents dissolved metals data through 2013, summarizes data analyses, and discusses the data and results as they relate to the sampling and monitoring objectives.

Section 5.0 – Conclusions and Recommendations summarizes the conclusions drawn from the data and analyses and recommends future actions for the project.

Section 6.0 – **References** lists those used to develop the information presented in this annual report.

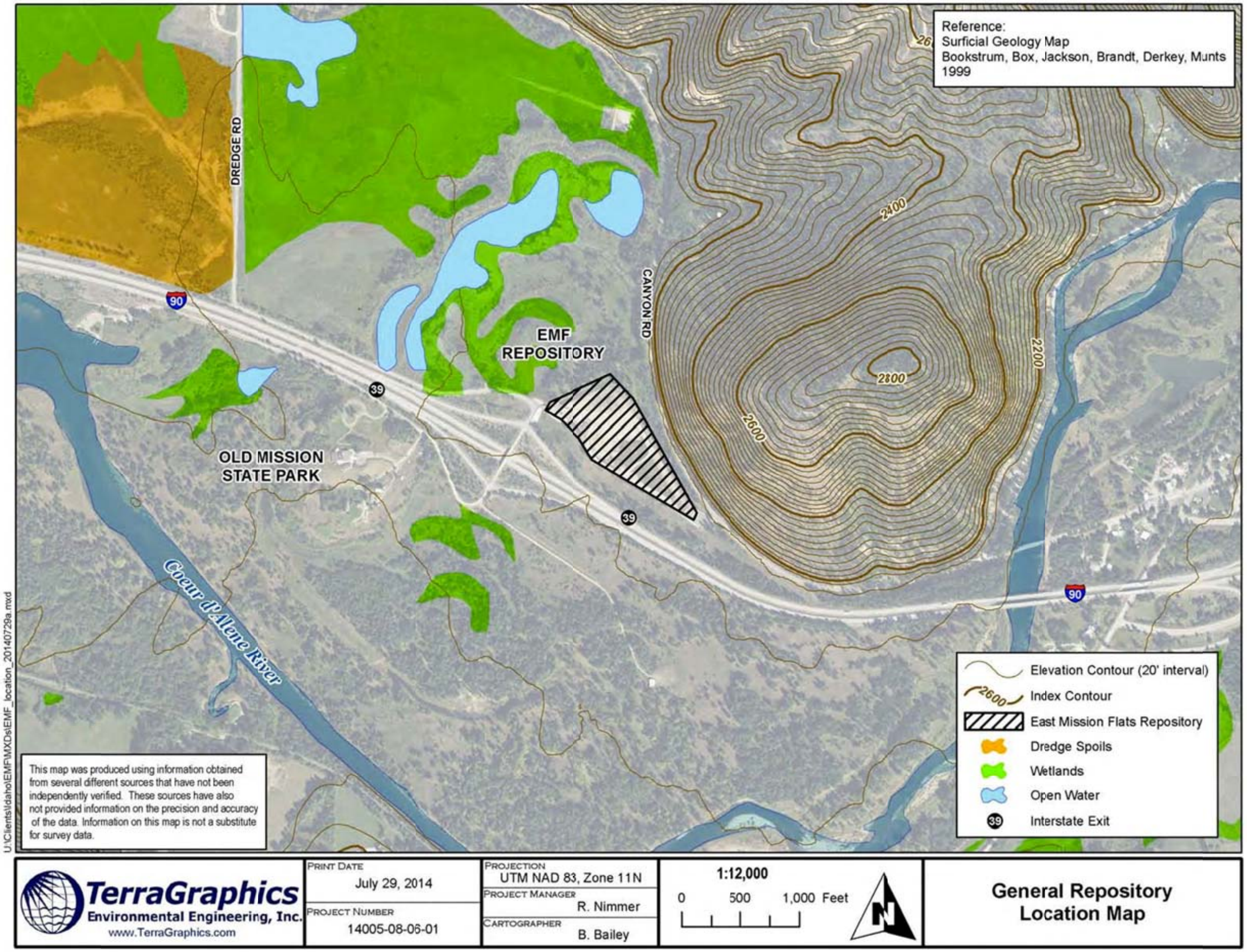

Figure 1. East Mission Flats Repository Location - Cataldo Idaho.

2 Background and Site Conceptual Model

This section summarizes past information and data in terms of a site conceptual model (SCM) to describe: the site background (Section 2.1), regional conditions (Section 2.2), site specific conditions (Section 2.3), and groundwater quality surrounding the EMFR Repository (Section 2.4).

This SCM is considered a living document and will be updated as additional site characterization information and data are gathered. In future annual reports, the purpose of updating the SCM will be to capture new information that improves our current understanding of site knowledge.

2.1 Site Background

Prior to EMFR construction activities, there is no history of development in the EMFR footprint, with the exception of utilities construction. From the 1930's through the 1960's dredging operations removed mining contaminated sediments from the CDA River. The dredge spoils were deposited on property the Mine Owners Association purchased on nearby Cataldo Mission Flats for the purpose of impounding the waste. The dredge spoils are located west of the EMFR site and are not thought to occur below the repository site (Bookstrom et. al, 1999).

Since August, 2009, the EMFR has been used as a disposal site in support of the BHSS Operable Unit (OU) 3 ROD (USEPA 2002). Waste materials from a variety of sources in OU3 including the Basin Property Remediation Program (BPRP), Institutional Controls Program (ICP), and commercial and infrastructure development projects are placed at the EMFR (TerraGraphics 2009). Waste is added to the repository primarily during the construction season from approximately May to November.

Waste placement occurs in thin lifts that are compacted to 90 to 95% maximum density. Successive thin lifts of waste are placed until the desired interim or final elevation is achieved. Repository construction began by filling the western third of the final repository footprint to an interim elevation through the 2010 season. During the 2011 and 2012 construction season the footprint was extended east at the interim elevation to encompass approximately two-thirds of the final footprint. During 2013, waste placement was expanded to the east at the interim elevation to encompass the entire final footprint. Waste will continue to be placed in the repository until the final design elevation is achieved.

2.2 Regional Conditions

The BHSS facility includes mining contaminated areas in the CDA River corridor, adjacent floodplains, downstream water bodies, tributaries, and fill areas, as well as the 21-square mile Bunker Hill "Box" located in the area surrounding the historic smelting operations. As much as 100 million tons of contaminated sediment is dispersed over thousands of acres throughout the area. The contaminants are primarily metals, including arsenic, cadmium, lead, and zinc.

Regional deposition of contaminated sediments surrounding the repository is related to historical dredging operations and the historical and ongoing deposition of contaminated floodwater sediments on the floodplain. Lead concentrations as high as 8,000 milligrams per kilogram (mg/kg) have been measured in dredge spoils (Brookstrom et al. 2001). The dredge spoils were deposited just over half a mile northwest of the repository site covering more than 130 acres at depths of up to 36 feet thick. The wetlands to the east of the dredge spoils and north of the repository site and the surrounding floodplain contain contaminated floodwater deposits greater than two feet thick. Lead concentrations greater than 10,000 mg/kg were found in these floodplain deposits (Box et al. 2001).

2.3 Site-Specific Conditions

The EMFR is set within the low relief, wide floodplain valley of the CDA River within the Middle Proterozoic depositional basin of the Belt Supergroup. The repository site lies about 2,135 feet above sea level, and slopes gently from north to south. The local vegetation is a mix of Ponderosa pine, cottonwood, alder and Rocky Mountain maple trees interspersed with open meadows. Wetlands are located nearby to the east, northeast, and northwest of the EMFR footprint.

The EMFR location was previously impacted by metals-contaminated sediments from historical mining and milling activities occurring upstream (Bookstrom et al. 2001). Contaminated sediments are deposited at the site by frequent flooding during spring runoff events. Soil samples collected from 23 borings at the site show concentrations that exceed 8,700 mg/kg lead, 2,800 mg/kg zinc, 114 mg/kg arsenic, and 20 mg/kg cadmium from the top two to four feet of soil. The soil metals concentrations decrease sharply at two to four feet below ground surface (bgs), interpreted as the native soil horizon (TerraGraphics 2009).

2.3.1 Geology

The footprint of the EMFR is on unconsolidated alluvial sediments that overlie metamorphic rocks of the Belt Supergroup, most likely the Prichard Formation (Browne 2006). The underlying Quaternary alluvial sediments comprise gravel, sand, and silt from the ancestral flood channel of the CDA River (CH2M Hill 2009).

Extensive ancient faulting occurred in the vicinity of the EMFR, predominantly in the northwest to southeast orientation associated with the Lewis and Clark Shear Zone (Browne 2006). However, the U.S. Geological Survey (USGS) indicates no earthquakes of Richter Scale magnitude 6.0 or greater occurred in the local area during the current Quaternary period (USGS 2005).

2.3.2 Hydrology

Frequent flooding of the area surrounding the repository occurs during spring runoff events. The area surrounding EMFR is inundated by CDA River floodwater when discharge exceeds approximately 20,000 cubic feet per second (cfs). Floods of this magnitude have approximately a 50% chance of occurring during any given year (CH2M Hill 2010). When discharge remains between approximately 20,000 and 30,000 cfs, floodwater enters the area surrounding EMFR through culverts under I-90 to the south and west of the repository. When discharge exceeds approximately 30,000 cfs, floodwater may enter the area through the culverts and from the southeast through the channel along the north embankment of I-90. Contributions of likely uncontaminated tributary water to the wetlands north of the site also occur but these flows are thought to be minimal in comparison to contributions from flooding of the CDA River. Local groundwater levels rise in response to high river stages and may also contribute to the presence of surface water surrounding the repository during flood events.

Sediment contaminated with metals is carried by the CDA River floodwater and deposited on the floodplain surrounding EMFR (TerraGraphics 2009). Evidence of the ongoing depositional process is suggested through the results of floodwater sampling. Historical sampling results show that in general, floodwater draining from the site has lower total metals concentrations when compared to the incoming floodwater.

2.3.3 Hydrogeology

The hydrogeology underlying the EMFR consists of a four-layered sequence from top to bottom as follows (Figure 2):

1) Low-permeability silt and clay from the ground surface to approximately 15 feet bgs.
2) An upper aquifer of alluvial sand and gravel from approximately 15 to 105 feet bgs
3) A silt layer from 105 to 116 feet bgs that likely forms a confining layer.
4) A lower aquifer composed of fine sand and clay lenses below 116 feet bgs

Groundwater in the upper alluvial sand and gravel aquifer is confined by the low permeability silt and clay above and the underlying silt layer. The low permeability layer above the upper aquifer was found to be ubiquitous throughout the site during pre-design investigations and is thought to prevent groundwater from migrating into the repository contaminants (TerraGraphics 2009). The properties of the lower confining layer have not been well characterized but it likely isolates the lower aquifer from the contaminants found within the upper aquifer. The characteristics of the lower aquifer are also not well characterized but not considered to influence conditions in the upper aquifer.

The repository site is located in an apparent transitional area forming two distinct hydrologic units moving from east to west through the area as noted by well logs (Ralston 2008):

1. The upper sand and gravel aquifer is encountered below and to the east of the repository site.
2. Sand and clay zones are encountered approximately 1,750 feet northwest of the repository site.

This may be explained by the transitional zone which is apparent locally at the surface in the current river channel as the transition from a higher gradient gravel and cobble floored channel to a low-gradient sand floored channel (Ralston 2008). The historical location of the gradient transition is controlled by the elevation of Lake Coeur d'Alene which is regulated by the elevation of the bedrock outfall in Post Falls and the Post Falls Dam. The gravels present in the upper aquifer below the repository site were likely deposited by former channels that migrated through the area. These gravels are absent and transitions into sand and clay bands to the west. The implications of this transition on groundwater flow are not fully understood but should be considered during evaluation of monitoring results.

In general, during low flow periods, the groundwater in the upper aquifer has a downward vertical gradient and a horizontal gradient toward the south-southwest. This suggests that the upper aquifer is recharged locally through the wetlands located to the north of the site. During flood events, changes in river stage cause a rapid response in groundwater elevations. This suggests that the sand and gravel aquifer may extend to the CDA River which in turn likely contributes to aquifer recharge. Monitoring data indicates the horizontal gradient shifts to the west-northwest during flood events. In addition an upward vertical gradient occurs during flooding and water was observed discharging from a monitoring well completed in the lower portion of the upper aquifer.

After passing below the repository site groundwater in the upper aquifer is thought to travel toward the south or southwest around the east side of the bedrock outcrop that forms the topographic high at the Old Mission State Park and toward the CDA River. Gain/loss studies may not be possible in the low gradient section of the River to the west and have not been conducted to date so the amount of groundwater that discharges to the river is unknown. Under high flow conditions, discharge to the river west of the bedrock outcrop may occur.

2.4 Groundwater Quality

Historical analytical results from groundwater sampling for the COCs in the Mission Flats area are summarized in Ralston (2008). Additional impacts to the CDA River originating from groundwater in the Mission Flats area and the dredge spoils have not been detected in previous assessments. Average zinc concentrations measured from piezometers throughout the Cataldo Mission Flats prior to the start of repository construction range from less than 0.1 milligrams per liter (mg/L) to more than 140 mg/L (Gill 2003). The historical results indicate widespread contamination unrelated to the repository and the potential for high spatial variability in groundwater metals concentration in the vicinity.

The potential for high spatial variability in field parameters within the local repository monitoring network is suggested by the transitional fluvial setting, multiple sources of recharge to the upper aquifer, and the results of monitoring. The sand and clay zone west of the repository site shows elevated pH, specific conductance, and groundwater elevations compared to the upper sand and gravel aquifer located below the repository site. This suggests that the monitoring well completed in the sand and clay zone to the west is not appropriate for evaluating potential repository impacts. The potential influence of groundwater in the sand and clay zone on conditions found in the sand and gravel aquifer below the repository is not well understood because groundwater flow within the sand and clay zone has not been fully characterized.

The COC concentrations (Appendix A) also differ between the two hydrologic units. The sand and clay zone to the west shows the greatest arsenic concentrations with frequent exceedances of the regulatory threshold of 0.01 mg/L. Although all COC concentrations in the upper sand and gravel aquifer have remained below the regulatory threshold, elevated concentrations of cadmium and zinc occur when compared to the sand and clay zone to the west.

Despite the spatial variability, both hydrologic units share a few similarities. Field parameters indicate conditions approaching a reduced environment with dissolved oxygen (DO) concentrations less than 0.5 mg/L and oxidation reduction potential (ORP) values less than

200 millivolts (mV). While the upper sand and gravel aquifer shows ORP values greater than zero, the sand and clay zone to the west has occasional values that are slightly negative.

Although the influence of the sand and clay zone to the west is not fully understood, monitoring conducted within the sand and gravel aquifer provides the best assessment of potential repository impacts. The historical metal concentrations measured within the sand and gravel aquifer are below water quality standards. In general, zinc is the COC with the greatest frequency of detection within the upper sand and gravel aquifer, followed by cadmium, arsenic, and lead.

Spatial variability in COC concentrations is most evident in dissolved zinc and dissolved cadmium concentrations, as other constituents are only detected infrequently. Downgradient wells located within the sand and gravel aquifer furthest south and west of the repository have historically had the greatest concentrations of cadmium and zinc with average concentrations less than 0.002 mg/L and 2 mg/L, respectively. The elevated constituent concentrations occurring in these wells are likely related to the larger area of historical contamination that is located upgradient of this location compared to other wells monitoring the site.

Cadmium and zinc concentrations up/cross gradient and east of the repository also show evidence of the ubiquitous contamination in the area. Although concentrations are below those observed in the downgradient wells, elevated concentrations are measured when compared to upgradient concentrations entering the site from the north. Based on data collected from December 2007 through October 2012, a statistically significant increase in zinc was detected east of the repository (TerraGraphics 2014a). This is the only detected increase in COC concentration at this time. It is unlikely that the increase in zinc concentration is related to repository operations because this is an up/cross gradient location. These results indicate that sources unrelated to the repository are contributing to increased contaminant concentrations in groundwater. Results of repository monitoring must be carefully interpreted and fully vetted prior to committing resources to any potential corrective action.

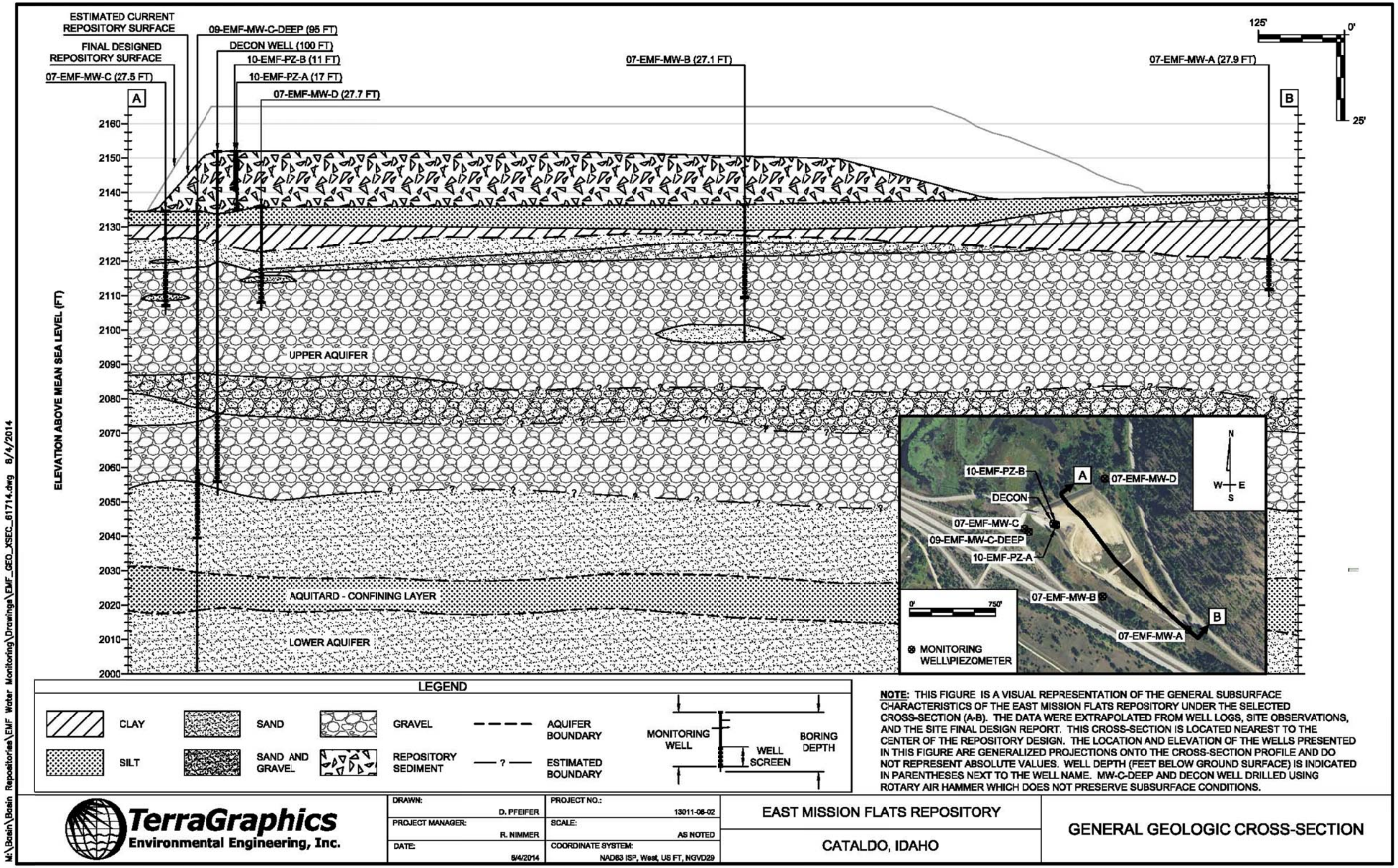

Figure 2. East Mission Flats Repository geologic cross section.

3 Methods

This section summarizes the monitoring network; monitoring methods for groundwater, floodwater, and repository pore water; and data analysis and statistical methods. The EMFR Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) provides further detail on the monitoring, sampling, documentation, analytical, and data-review procedures for the groundwater monitoring (TerraGraphics 2010a).

3.1 Monitoring Network

The current monitoring network is displayed in Figure 3 and consists of the following:

- Seven groundwater monitoring wells (MW) plus the Decon well:
    - MW-A, MW-B, MW-C, MW-D and MW-F are screened in the upper alluvial aquifer.
    - MW-C-Deep and the Decon well are screened deeper in the upper alluvial aquifer.
    - MW-E is screened in a different hydrologic unit from the other monitoring wells based on a comparison of water levels and groundwater chemistry and drill logs.
- Two surface water (i.e., floodwater) level sites: LL-1 and LL-2 monitor floodwater levels adjacent to the EMFR.
- Four floodwater sampling sites: SW-A, SW-B, SW-C, and SW-D are sampled opportunistically during floodplain inundation.
- Two piezometers (PZ): PZ-A and PZ-B are screened in the repository waste mass to monitor for the presence of water in the waste (and in the event of sufficient water, water chemistry) and are set approximately 0.5 feet and 6.5 feet, respectively, above the native topographic surface.

Additional details about these monitoring sites, their position with respect to the EMFR, and monitoring frequency are included in Table 1.

3.2 Groundwater Monitoring and Sampling

Quarterly groundwater monitoring and sampling occurred in January, April, July, and October 2013. The field crew collected groundwater samples using dedicated low-flow pumps at the seven monitoring wells and the production pump in the Decon well. The Decon well was not sampled in the first, second, and fourth quarters of 2013 because it was winterized during the off-season. Groundwater samples were shipped to:

- The U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) designated laboratory and analyzed for total and dissolved metals (antimony, arsenic, cadmium, lead, and zinc), hardness, total phosphorus, and dissolved cations (calcium, magnesium, potassium, and sodium), and

- Idaho Department of Environmental Quality's (DEQ's) contracted local laboratory (SVL Analytical, Inc. [SVL]) and analyzed for dissolved anions (chloride, nitrate and nitrogen, and sulfate) and alkalinity.

Dataloggers are deployed in select wells and record water level measurements every half hour or hour. Dataloggers in the monitoring wells were downloaded quarterly during the sampling events and the water-level data were compensated for barometric pressure. Water levels were measured by hand at the seven monitoring wells.

Groundwater field parameters were measured prior to sample collection. Field parameters include temperature, pH, specific conductance, DO, and ORP.

Total depths were measured in the groundwater monitoring wells using an E-tape during the fourth quarter 2013 sampling event to determine if sediment accumulation is occurring that may cause clogging of the well screen.

3.3 Floodwater Monitoring and Sampling

Dataloggers deployed at LL-1 and LL-2 record water-level measurements every half hour and were downloaded quarterly during the sampling events.

Floodwater sampling is conducted opportunistically at the direction of USEPA. The area surrounding the repository did not flood in 2013; consequently, floodwater samples were not collected.

3.4 Piezometer Monitoring and Sampling

A water quality probe, In-Situ Troll® 9500 (Troll), is installed in PZ-A and records water level, temperature, pH, DO, conductivity, and ORP. A datalogger that records water levels is deployed in PZ-B. Both devices record hourly measurements. Water levels are also measured by hand at these sites when water is present.

Water was not detected in PZ-A or PZ-B in 2013, and consequently no samples were collected.

3.5 Data Analysis and Statistical Methods

The following subsections describe how data were reviewed and/or analyzed for this annual report.

3.5.1 Water Levels and Hydraulic Gradient

Water levels were used to evaluate the hydrogeologic conceptual model of the EMFR area, horizontal and vertical hydraulic gradients, and groundwater flow direction. Groundwater fluctuations were compared to the CDA River stage elevation at the USGS gage station at Cataldo (Site #12413500, *http://waterdata.usgs.gov/usa/nwis/uv?site_no=12413500*).

3.5.2 Regulatory Thresholds

Dissolved metals data collected in 2013 were compared to regulatory thresholds (Table 2). Regulatory thresholds for antimony, arsenic, cadmium, and lead in groundwater are the National Primary Drinking Water Standards (i.e., maximum contaminant levels) and the regulatory threshold for zinc is the National Secondary Drinking Water Standard. These standards are based on total concentrations; however, the dissolved metals concentrations in the groundwater are compared to the regulatory thresholds because it is assumed that dissolved concentrations are indicators of contamination in groundwater under all conditions (CH2M Hill 2006).

3.5.3 Exploratory Analysis

To evaluate the potential effects of the repository on groundwater, dissolved metals are the focus of this report. Dissolved metals data for each well were evaluated for the frequency of detected results and frequency above the regulatory threshold. The metals with at least one well having a greater than 50% detection frequency were graphed on time-series plots. For those data where dissolved metals were not detected, a value of half the detection limit was used to display in the figures. Some detected analytes were also detected in the associated field blank and results were qualified as estimates based on the data validation and verification procedures. These dissolved metals data were shown in the time-series plots and discussed only if they affected data patterns or trends.

3.5.4 Statistics

Statistical analyses were conducted to further evaluate for trends in dissolved metals concentrations measured in the upper most portion of the upper aquifer. Non-parametric statistical tests were used for these analyses because they do not require the data to be normally distributed. The Mann-Kendall statistical analysis was used to evaluate if trends in dissolved metals have occurred in groundwater over time at the EMFR (using $\alpha=0.01$). The Kruskal-Wallis rank sum test was first conducted prior to the Mann-Kendall to test for significant differences between seasons (using $\alpha=0.01$). If significant seasonal bias was observed, then the seasonal Mann-Kendall analysis was used.

Some data were excluded from the statistical analyses. Monitoring wells MW-E, MW-C Deep and the Decon Well provide insight into surrounding conditions but are not directly associated with the detection monitoring program and related trend analysis. Statistical analysis was not conducted on data from these wells.

In addition, it was not possible to conduct statistical analyses for those wells and analytes where all sample results were not detected because there was zero variation in analyte concentration measurements during the monitoring period. Statistical trend analyses were also not conducted for those wells and results with less than 50% detection frequency and/or a sample size of less than eight ($n \leq 8$). For non-detect data included in the trend analysis, one half the lowest non-detect value was substituted as the analyte concentration to ensure all non-detect values were lower than the lowest detected value for each well (USEPA 2009b). Some detected sample results were within five times the concentration detected in the field blank and were withheld from the statistical analysis because the measured concentrations may be biased due to sources other than in-situ groundwater conditions (USEPA 1989).

3.5.5 Data Quality Review

A data quality review was conducted to ensure compliance with the SAP/QAPP (TerraGraphics 2010a). Information was reviewed for holding times, appropriate preservation, field quality control (QC) sample frequency and results, laboratory verification and validation, and data completeness. The data quality review included Stage 2A validation review of the SVL data (USEPA 2009a, 2010). The USEPA chemist conducted Stage 4 data verification and validation on 100% of the CLP-analyzed data (USEPA 2009a, 2010). The USEPA data validation reports are included and summarized as part of the data-quality review.

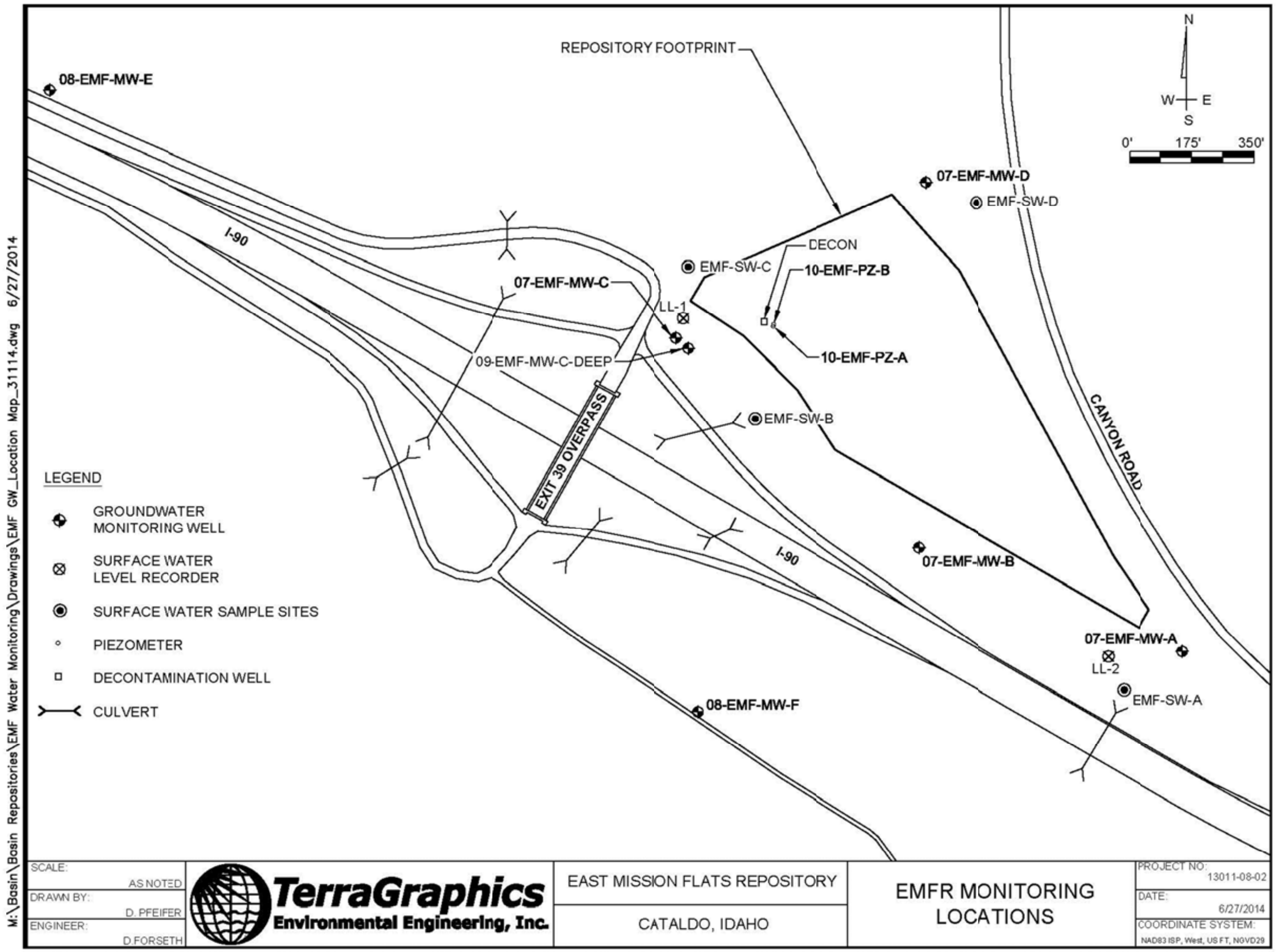

Figure 3. East Mission Flats Repository groundwater and surface water monitoring location.

Table 1. Summary of East Mission Flats Repository water quality monitoring program.

Site	Media	Monitoring		Position with Respect to Groundwater at the EMFR				Period of Record	Purpose
		Frequency	Datalogger[a]	Upgradient	Downgradient	Cross-gradient	Other		
07-EMF-MW-A 07-EMF-MW-B 07-EMF-MW-C 07-EMF-MW-D	Groundwater Groundwater Groundwater Groundwater	Q Q Q Q	Y Y Y Y	X X	X X	X		Oct 2007 – present Oct 2007 – present Oct 2007 – present Oct 2007 – present	Horizontal groundwater gradients and groundwater quality in the uppermost portion of the upper aquifer
09-DMF-MW-C-DEEP	Deep groundwater	Q	Y		X			Dec 2009 – present	Evaluate the vertical hydraulic gradient and groundwater quality in lower portion of the upper aquifer
08-EMF-MW-E	Groundwater	Q					X	Oct 2008 – present	Hydraulic gradients, flow directions, and water quality in uppermost portion of the upper aquifer
08-EMF-MW-F	Groundwater	Q			X			Oct 2008 – present	
Decon Well	Deep groundwater	Q			X			June 2010 – present	Decontamination well water quality
10-EMF-PZ-A	Waste mass pore water	O	Y				X	Oct 2010 – present	Waste mass pore water quality and saturation
10-EMF-PZ-B	Waste mass pore water	O	Y				X	Oct 2010 – present	
LL-1 LL-2	Surface water – floodwater Surface water – floodwater	O O	Y Y					Aug 2009 – present Jan 2009 – present	Monitor floodwater timing and depth
EMF-SW-A EMF-SW-B EMF-SW-C EMF-SW-D	Surface water – floodwater Surface water – floodwater Surface water – floodwater Surface water – floodwater	O O O O						May 2008 – present May 2011 – present May 2008 – present May 2011 – present	Evaluate the quality of floodwater entering and leaving the site

Notes:

a = Dataloggers monitor groundwater level. The datalogger in 10-EMF-PZ-A also monitors water quality field parameters.

O = opportunistic sampling

Q = quarterly sampling

Blank cells are not applicable

Table 2. East Mission Flats Repository Regulatory thresholds for groundwater metals.

Analyte	Regulatory Threshold[a] (mg/L)
Antimony	0.006
Arsenic	0.01
Cadmium	0.005
Lead	0.015[b]
Zinc	5.0[c]

Notes:

a. National Primary Drinking Water Regulations (IDAPA 58.01.08.050 and 40 CFR Part 141.62)

b. Lead is regulated by a treatment technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps (IDAPA 58.01.08.350 and 40 CFR Part 141.80).

c. National Secondary Drinking Water Regulations (IDAPA 58.01.08.400 and 40 CFR Part 143.3)

mg/L – milligrams per liter

4 Results and Discussion

The objectives of water quality monitoring are outlined in the SAP/QAPP and summarized in Section 1.0 of this annual report. The methods used to evaluate applicable data to these objectives are presented in Section 3.0. This section summarizes the evaluation of the 2013 piezometer monitoring data, floodwater sampling data, hydraulic gradients, and groundwater analyte results and field parameter information. Quarterly monitoring memoranda and QA/QC memoranda were prepared after each sampling and monitoring event (TerraGraphics 2013a, 2013b, 2014b, 2014c, 2014d, 2014e, 2014f, and 2014g).

Appendix A contains the groundwater field parameter and analytical data, as well as the hand measured water levels collected from the seven monitoring wells. Appendix B contains information on well maintenance and sediment infilling.

4.1 Piezometer Monitoring Data

Water was not detected in PZ-A or PZ-B in 2013. No field parameter data or water samples were collected.

4.2 Floodwater Data

EMFR floodwater was not detected at the two surface water level logger sites in 2013. No floodwater samples were collected.

4.3 Water Levels and Groundwater Hydraulic Gradients

Hydrographs of the CDA River and groundwater elevations for 2013 show the water level fluctuations at the site (Figure 4). Groundwater levels were highest in the spring and lowest in the fall and closely mimicked the river patterns. In general, the lowest horizontal gradients occurred during periods of low water levels in the fall, and on the rising limb of individual water-level peaks. Well MW-D had the highest water elevations during most of the year; MW-A had the highest water elevations at the water-level peaks due to shifts in the horizontal hydraulic gradient. The piezometers (PZ-A and PZ-B) and floodwater sites (LL-1 and LL-2) were dry; therefore, no 2013 data for these sites are displayed.

Relative to hydrographs, groundwater contour maps provide finer detail of groundwater flow and direction for a snapshot in time. Contour maps developed using water levels from MW-A, MW-B, MW-C, MW-D, and MW-F show that the general flow direction in 2013 was from the north-northeast to south-southwest, with some flow to the south-southeast. Figure 5 represents groundwater contours from the July 2013 quarterly monitoring event showing the general groundwater flow direction. The water-level elevation for MW-E was not included because it is considered to be in a different hydrologic unit. For most of the year, well MW-D is upgradient from EMFR, and wells MW-B, MW-C, MW-C-Deep (screened deeper so not included in the contour map), and MW-F are the downgradient wells. Well MW-A is located cross-gradient to the repository during most of the year. Based on the 2013 quarterly sampling events, the lowest horizontal hydraulic gradient near the repository footprint was 1.8×10^{-4} feet/foot (October) and the highest hydraulic gradient near the repository footprint was 3.4×10^{-4} feet/foot (April).

Figure 6 shows the groundwater contours for April 2, 2013 during the rising limb of increasing groundwater elevations and river stage. During this time, the horizontal hydraulic gradient shifts toward the west, with some variation toward the northwest and southwest. During peak water levels MW-A becomes the upgradient well. This gradient shift occurs frequently during rising water levels on the CDA River as measured at the Cataldo Gaging Station. The observed changes in the gradient are expected based on groundwater and surface water interactions at the site as described in the SCM.

Water levels from MW-C and MW-C-Deep were used to evaluate the vertical hydraulic gradient. These two wells are located less than 50 feet apart and MW-C-Deep is approximately 67.5 feet deeper than MW-C. Generally, there was a slight downward hydraulic gradient during most of the year. However, an upward hydraulic gradient was noted during periods of elevated river discharge and corresponding periods of elevated groundwater levels. The downward gradient returns upon decreases in river discharge and groundwater levels.

4.4 Groundwater Monitoring Data

One of the objectives of quarterly monitoring is to evaluate the potential effects of the repository on groundwater. Applicable data and 2013 monitoring results are presented below.

4.4.1 Dissolved Metals

The following summarizes 2013 regulatory threshold exceedances, exploratory analysis, and statistical evaluation.

- **Regulatory Threshold Exceedances:** None of the 2013 dissolved metals groundwater concentrations exceeded their respective regulatory thresholds. Historical exceedances of regulatory thresholds have occurred and are summarized in Table 3.
- **Frequency of Detected Results:** The historical detection frequency is shown in Table 3.
- **Statistical Trend Analysis:** For the wells and metals with sufficient data to run statistics, no significant increasing or decreasing trends were detected using the Mann-Kendall trend test (Table 4). In addition, seasonal factors were not significant using the Kruskal-Wallis rank sum test (Table 4).

Based on these analyses using data through 2013 and the lack of visually apparent long-term increases in arsenic, cadmium, lead, and zinc (Appendix A), EMFR is not negatively impacting dissolved metals concentrations in groundwater.

4.4.2 Total Metals

Although dissolved metals data are used as primary indicators of contamination in groundwater, total metals analyses have been performed as identified in the SAP/QAPP (TerraGraphics 2010a). Total metals concentrations do not add significant value to evaluating the objectives of the monitoring program and removal from the suite of analytes is recommended (see Section 5.0). The existing total metals data may be analyzed at a future date if this is deemed beneficial.

4.4.3 Other Constituents and Analytes

In addition to metals data, field parameters were collected and other analytes have been analyzed by the laboratory. These are monitored to provide information on physical and chemical processes occurring at the site and to support ongoing evaluations of floodwater and repository pore water. The additional analytes and field parameter data are included in Appendix A and are maintained electronically for use in future evaluations.

4.5 Data Quality Review Summary

A total of 40 groundwater samples were submitted for laboratory analysis during 2013. Twenty eight (28) samples were collected from eight sites and 12 samples were collected for QA/QC purposes (i.e., field duplicates, field blanks, and a sample for the matrix spike [MS]). All field QA/QC samples were collected at the appropriate frequency. All holding times were met and preservation was confirmed by the laboratories. Laboratory analyses were performed through the USEPA CLP and the local analytical laboratory (SVL). The data validation reports and a detailed record of qualified results can be found in the associated quarterly QA/QC memoranda (TerraGraphics 2013b, 2014c, 2014e, 2014g).

Procedures for sample collection, labeling, handling, and analysis were performed as described in the EMFR SAP/QAPP (TerraGraphics 2010a). Sample results were qualified as estimates (J) by the laboratory, by the USEPA chemist, or as part of the data quality review for the following reasons:

- Reported results were above the method detection limit (MDL) but below the contract required quantitation limit (CRQL).
- Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) serial dilution results had a percent difference greater than 10% and the initial sample concentrations were greater than 50 times the MDLs.
- Detected sample analyte results were less than 10 times the detected field blank concentrations. Detections of metals in field blanks likely resulted from the low contract required quantitation limits and method detection limits used by the CLP, and the potential sources of metals in the field blank may be due to field conditions (i.e., sample collection and equipment, sample bottles, preservative, and/or shipment) and/or the deionized (DI) water used for the field blank sample (TerraGraphics 2013c).
- Calculated relative percent differences (RPDs) exceeded the ±20% acceptable RPD as specified by the lab and the EMFR SAP/QAPP.
- MS samples had percent recoveries in the range of 30% to 74%, and post-digestion spike percent recoveries were greater than 75%.

No laboratory sample results were rejected and the final completeness in 2013 is assessed at 100%.

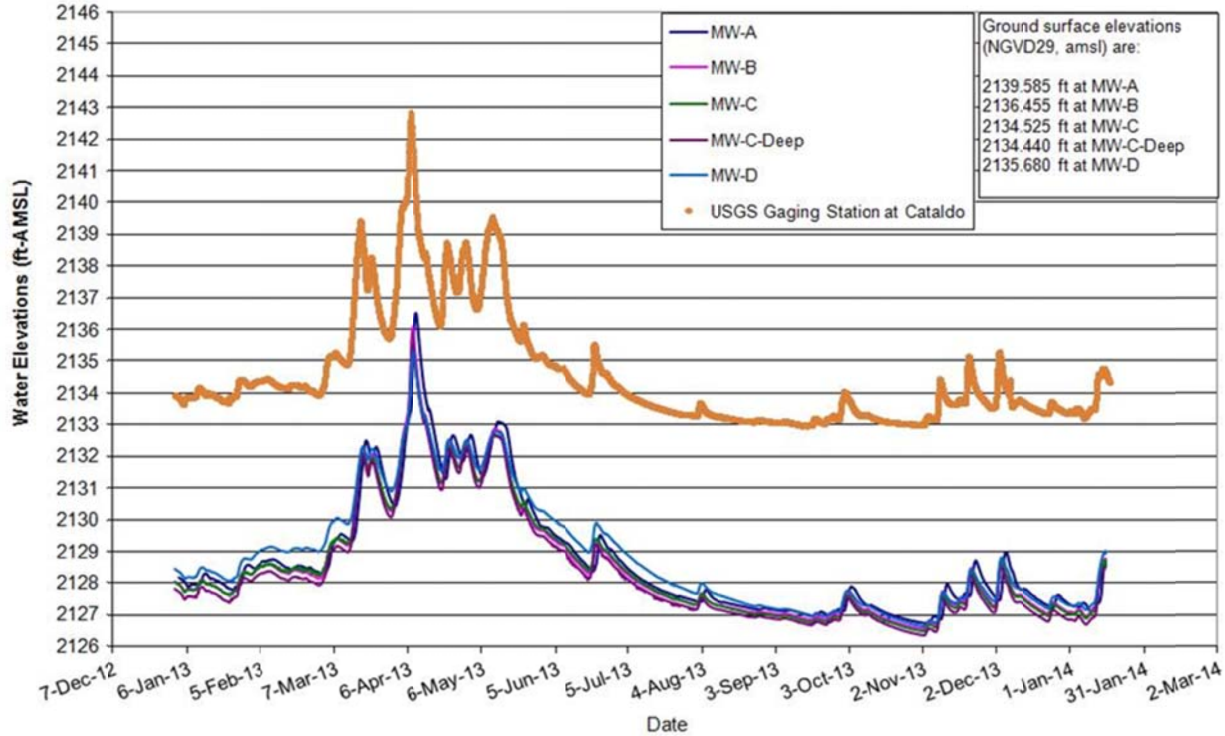

Figure 4. Coeur d'Alene River and groundwater elevations near the East Mission Flats Repository - Cataldo, Idaho.

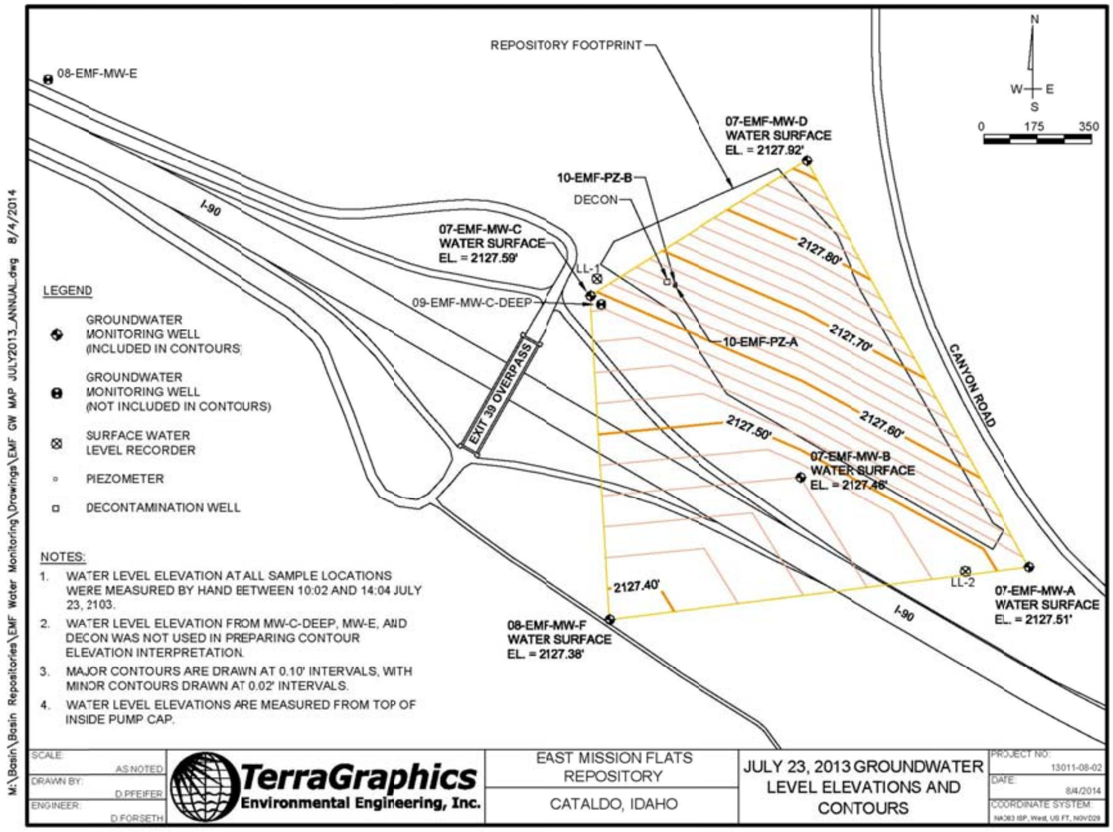

Figure 5. Typical groundwater contours measured at East Mission Flats Repository during the 2013 monitoring events.

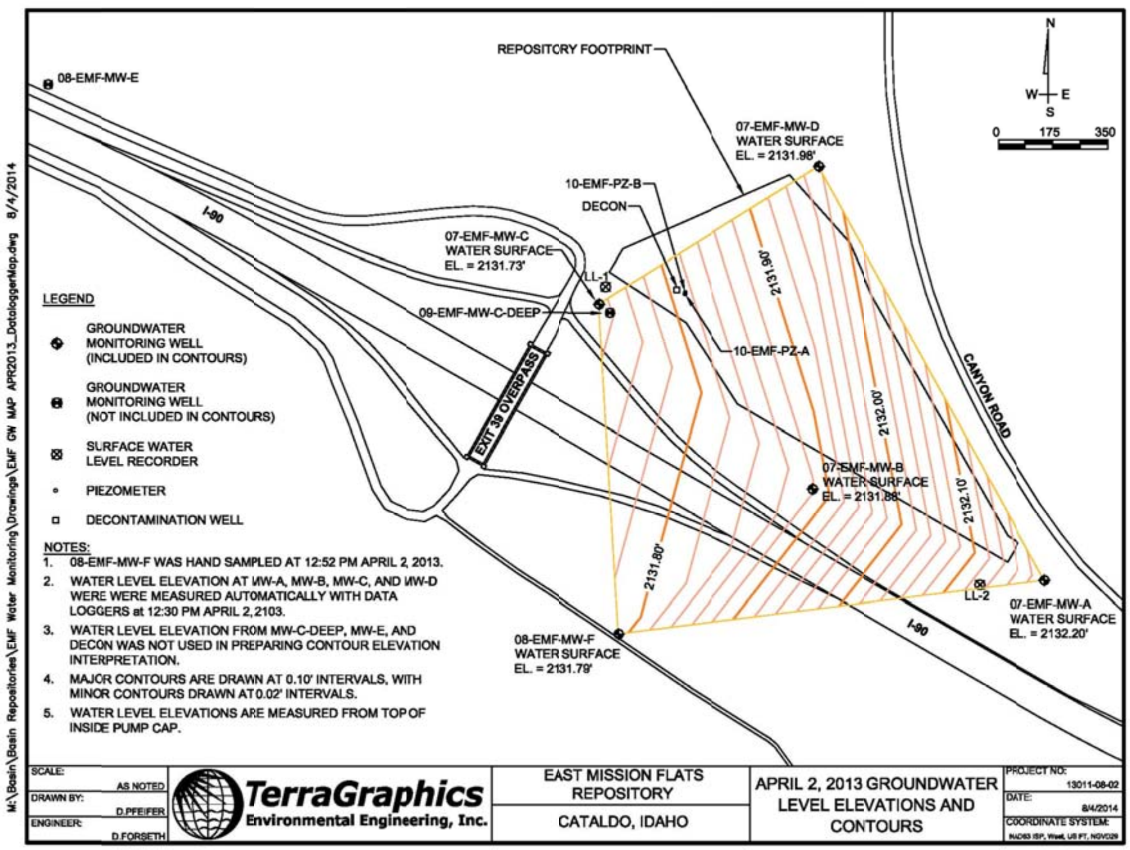

Figure 6. Groundwater contours measured at the East Mission Flats Repository during periods of increased discharge on the Coeur d'Alene River and elevated groundwater levels.

Table 3. East Mission Flats Repository historical dissolved metal frequency of detection and regulatory threshold exceedances.

Metal	Well	Total No. of samples	No. of detects	Frequency of detection (%)	No. of detects above regulatory threshold[a]	Percent of detects above regulatory threshold
Antimony	MW-A	24	0	0%	0	0%
	MW-B	24	0	0%	0	0%
	MW-C	19	0	0%	0	0%
	MW-C-DEEP	13	0	0%	0	0%
	MW-D	21	0	0%	0	0%
	MW-E	20	0	0%	0	0%
	MW-F	20	0	0%	0	0%
	Decon	6	0	0%	0	0%
	Total	*147*	*0*	*0%*	*0*	*0%*
Arsenic	MW-A	24	7	29%	0	0%
	MW-B	24	5	21%	0	0%
	MW-C	19	6	32%	0	0%
	MW-C-DEEP	13	5	38%	0	0%
	MW-D	21	7	33%	0	0%
	MW-E	20	17	85%	7	35%
	MW-F	20	5	25%	0	0%
	Decon	6	6	100%	0	0%
	Total	*147*	*58*	*39%*	*7*	*4%*
Cadmium	MW-A	24	20	83%	0	0%
	MW-B	24	0	0%	0	0%
	MW-C	19	19	100%	0	0%
	MW-C-DEEP	13	0	0%	0	0%
	MW-D	21	2	10%	0	0%
	MW-E	20	1	5%	0	0%
	MW-F	20	19	95%	0	0%
	Decon	6	1	17%	0	0%
	Total	*147*	*62*	*42%*	*0*	*0%*
Lead	MW-A	24	2	8%	0	0%
	MW-B	24	1	4%	0	0%
	MW-C	19	4	21%	0	0%
	MW-C-DEEP	13	3	23%	0	0%
	MW-D	21	1	5%	0	0%
	MW-E	20	0	0%	0	0%
	MW-F	20	4	20%	0	0%
	Decon	6	3	50%	0	0%
	Total	*147*	*18*	*12%*	*0*	*0%*
Zinc	MW-A	24	24	100%	0	0%
	MW-B	24	24	100%	0	0%
	MW-C	19	19	100%	0	0%
	MW-C-DEEP	13	12	92%	0	0%
	MW-D	21	21	100%	0	0%
	MW-E	20	19	95%	0	0%
	MW-F	20	20	100%	0	0%
	Decon	6	6	100%	1	17%
	Total	*147*	*145*	*99%*	*1*	*2%*

Notes:

No. = number

a = For metals, regulatory thresholds are based on total concentrations; dissolved concentrations are compared to these thresholds because there are no regulatory thresholds based on dissolved concentrations.

(shaded) = Greater than or equal to 50%

Table 4. Results for East Mission Flats Repository 2013 statistical analysis.

Metal	Well	Seasonality	Kruskal-Wallis, p-value	Mann-Kendall Trend	Mann-Kendall, p-value
Cd	MWA	None	0.0530	No trend	0.5019
	MWC	None	0.0510	No trend	0.5289
	MWF	None	0.2796	No trend	0.1439
Zn	MWA	None	0.0576	No trend	0.0161
	MWB	None	0.9045	No trend	0.1693
	MWC	None	0.3539	No trend	0.2933
	MWD	None	0.0802	No trend	0.9741
	MWF	None	0.4063	No trend	0.4555

5 Conclusions and Recommendations

Conclusions and recommendations for the EMFR sampling and monitoring objectives are summarized in Table 5.

Table 5. East Mission Flats Repository monitoring objectives, conclusions, and recommendations.

Monitoring Objective	Conclusion	Recommendation
Evaluate water levels and water quality parameters of pore water within the repository waste.	No repository pore water was detected in 2013.	Continue monitoring water levels at both piezometers, and collect water quality samples if sufficient water is detected.
Evaluate if or how surface water influences groundwater levels at the site.	All of the wells except MW-E are screened in a gravel layer that may extend to the CDA River. At high river levels, the river may recharge this gravel layer.	Continue to review hydrographs and maintain water level data for future analyses, if deemed necessary.
Evaluate the quality of floodwater entering and leaving the site.	No floodwater was detected in 2013.	Continue to monitor for floodwater as directed by the agencies.
Evaluate hydraulic gradients and groundwater flow direction over time, both vertically and horizontally, at the EMFR site.	The general 2013 flow direction and hydraulic gradients were consistent with the historical data.	Install available leveloggers in MW-E and MW-F to evaluate water levels and groundwater gradients. Use hand-measured water levels as QC checks on the levelogger data. Use levelogger data to develop contour maps.
Evaluate the potential effects of the repository on groundwater.	No 2013 detected concentrations exceeded regulatory thresholds. No visually apparent increases in arsenic, cadmium, lead, or zinc were observed. No statistically significant trends were detected (for the wells and metals with sufficient data for analysis).	Continue quarterly monitoring of dissolved metals, field parameters, and other non-metal analytes. Develop prediction limit testing for EMFR according to the USEPA's Unified Guidance. For optimization purposes: • Remove total metals from the laboratory analyses because they are not used to evaluate effects from the EMFR on groundwater. • Eliminate monitoring the Decon well because the opportunistic sampling when the well is activated does not provide sufficient data to meaningfully evaluate trends over time or seasonally.

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Appendix A. Analyte and Field Parameter Data

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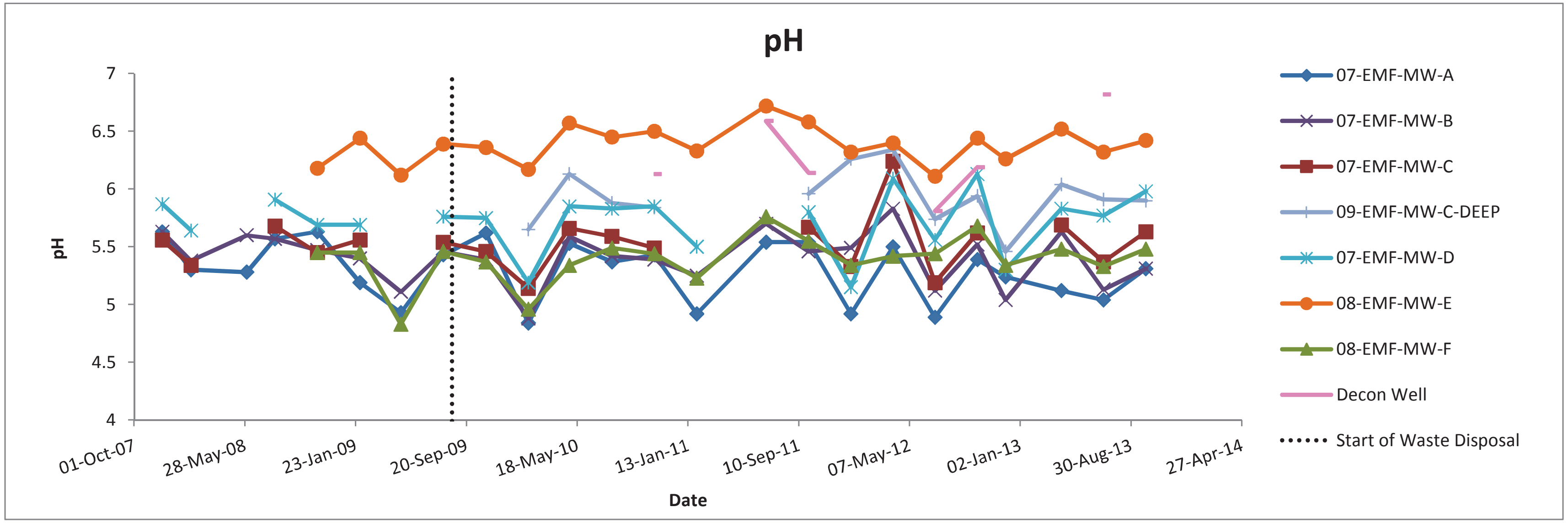
Figure A-1. Field Parameter Data at EMFR Groundwater Sites



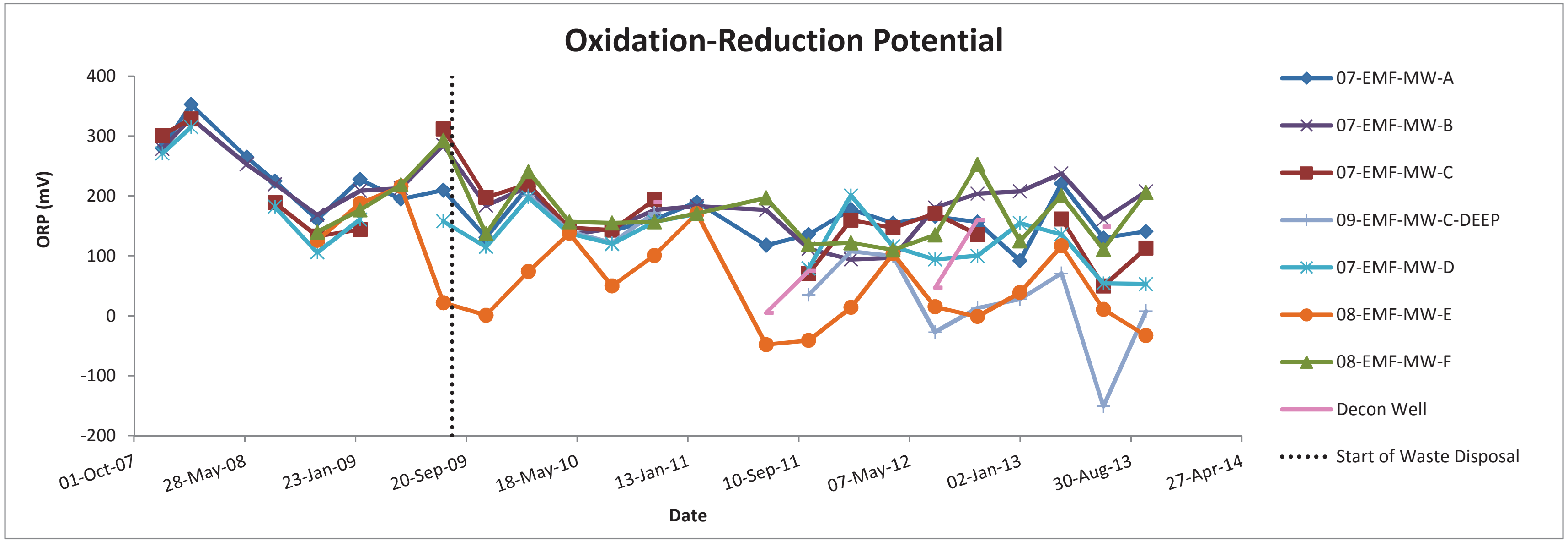
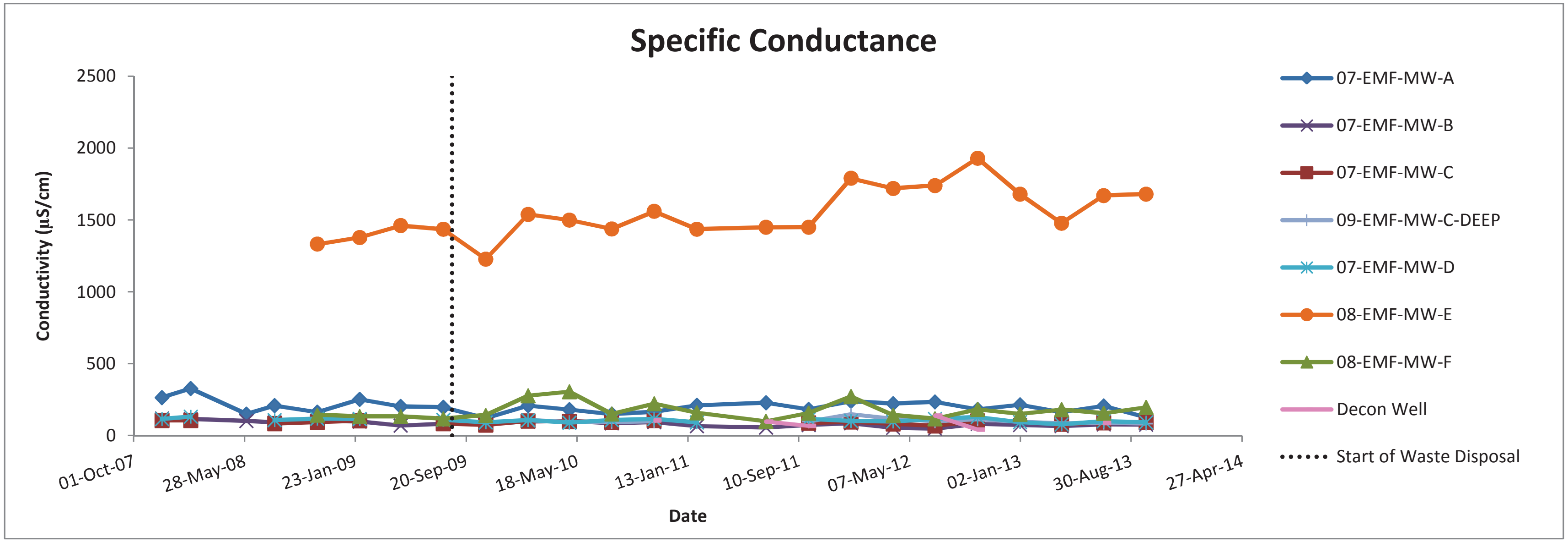


Figure A-1. Field Parameter Data at EMFR Groundwater Sites



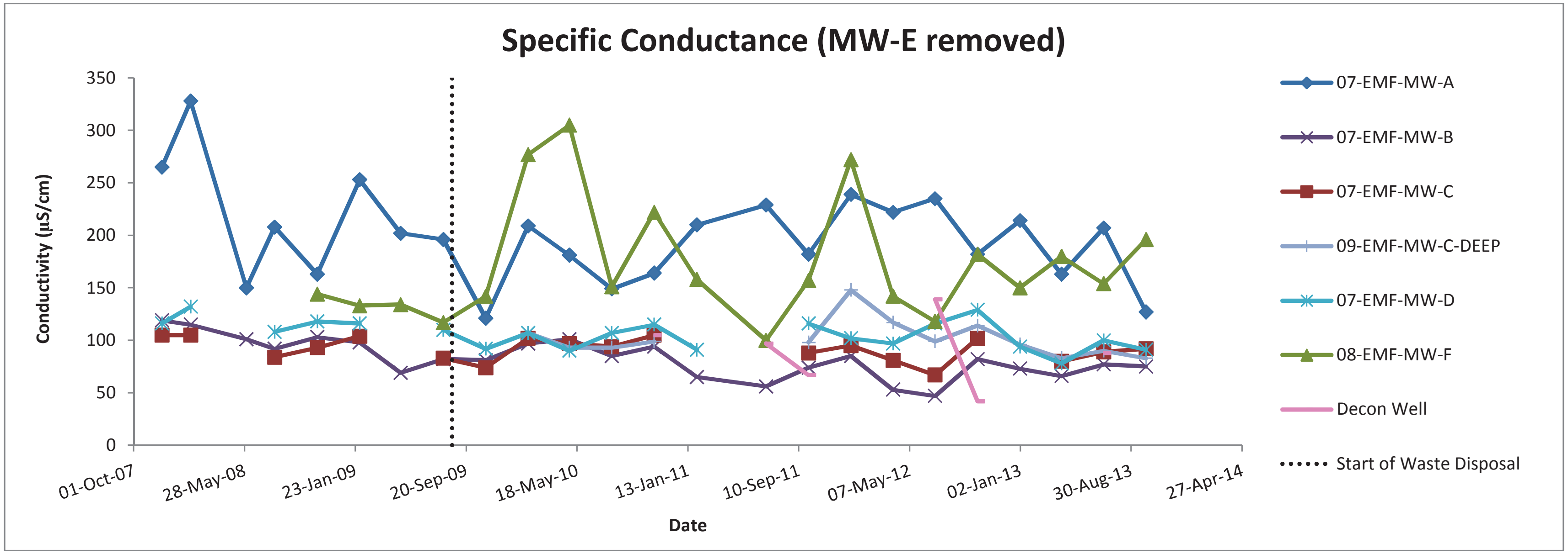
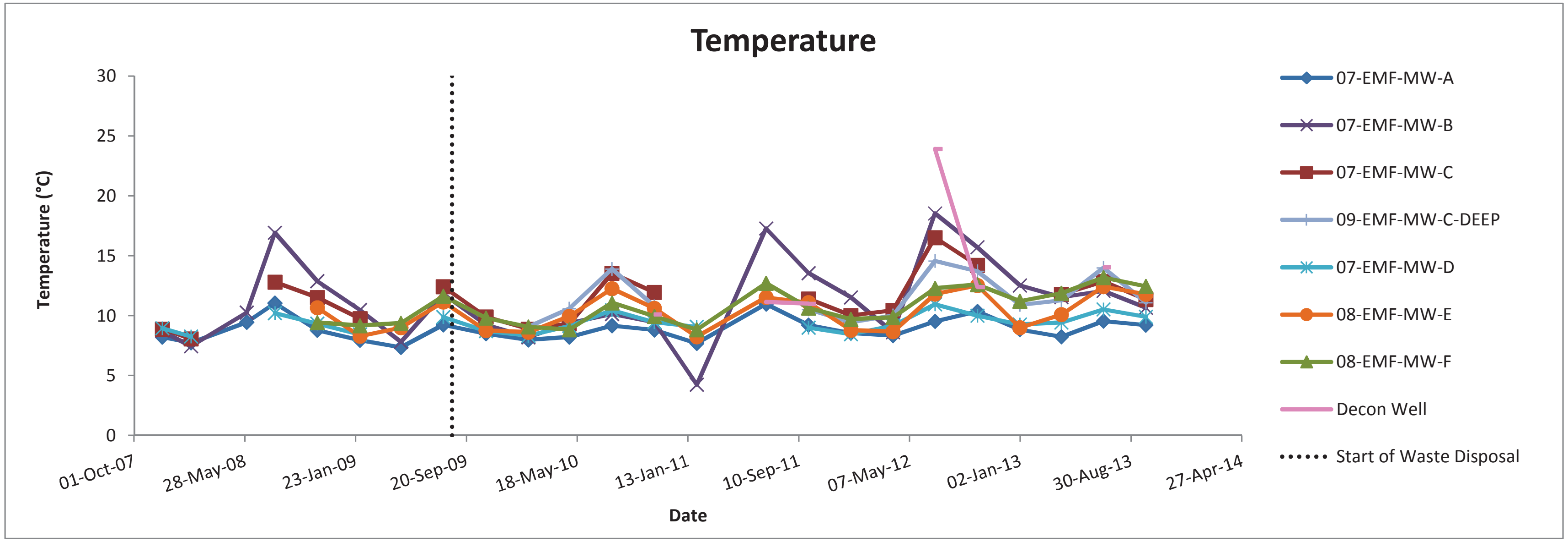


Figure A-1. Field Parameter Data at EMFR Groundwater Sites



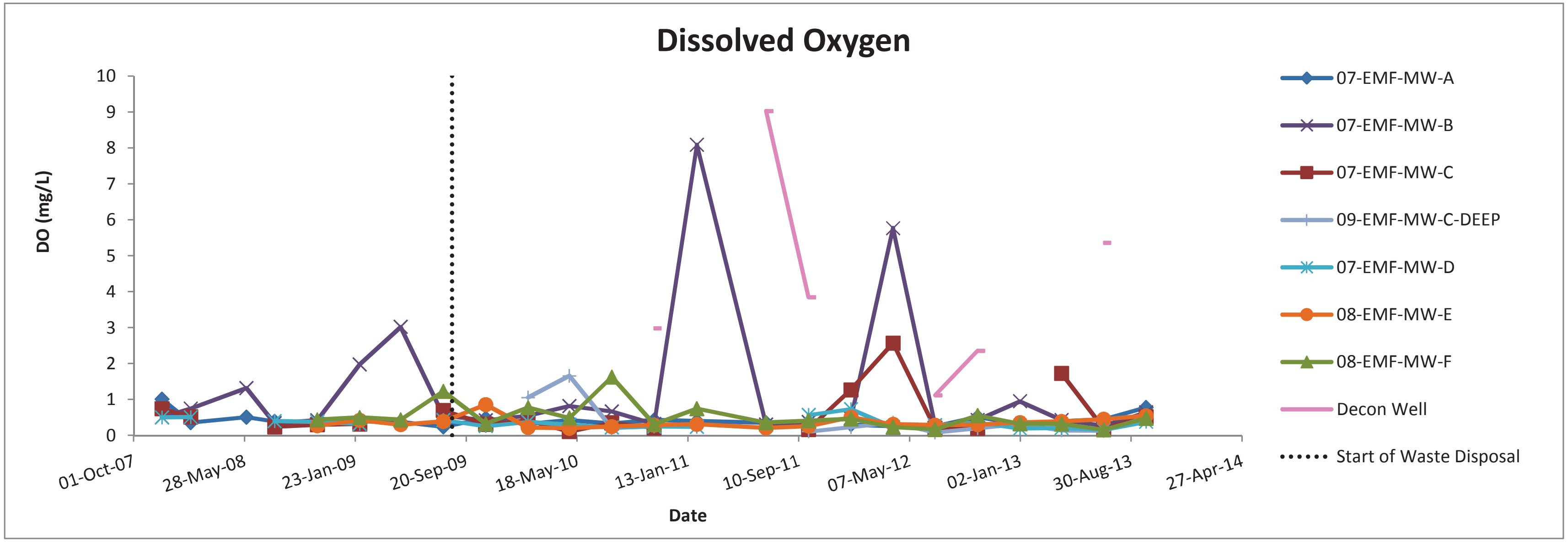
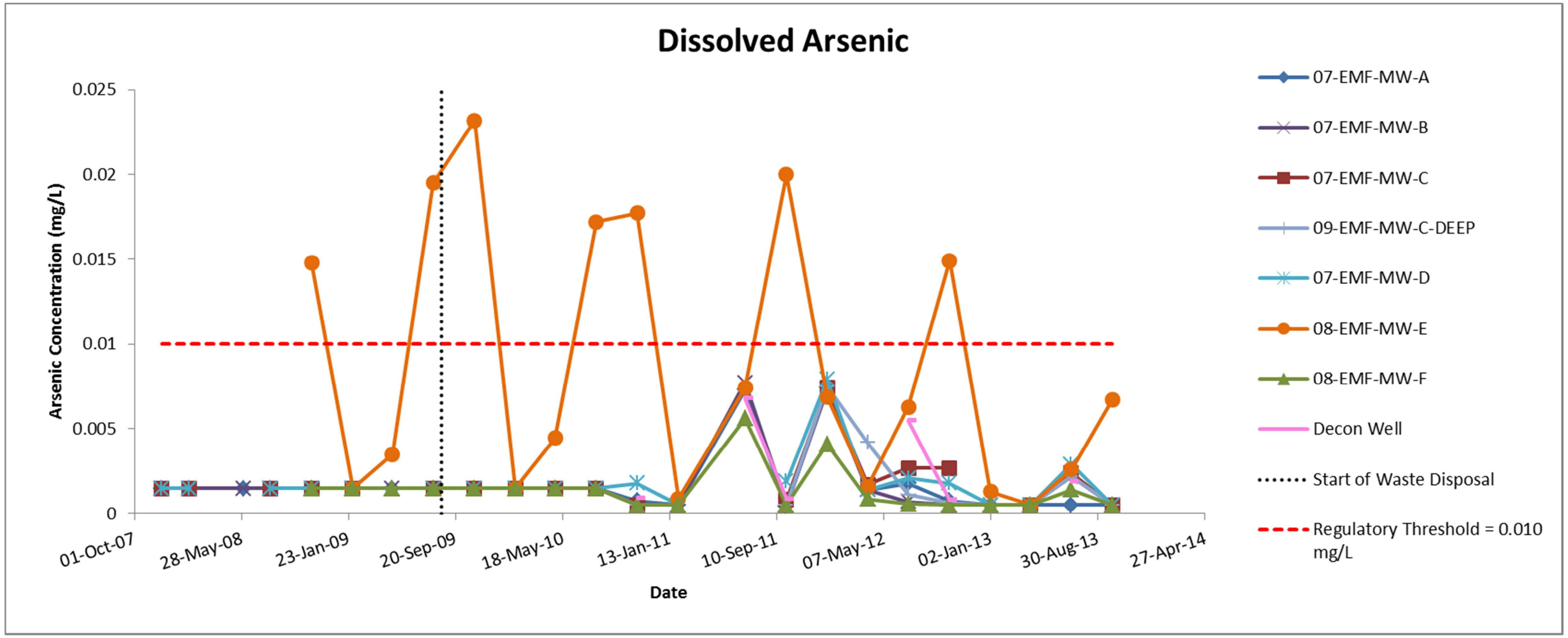


Figure A-2. Dissolved Metals Data at EMFR Groundwater Sites



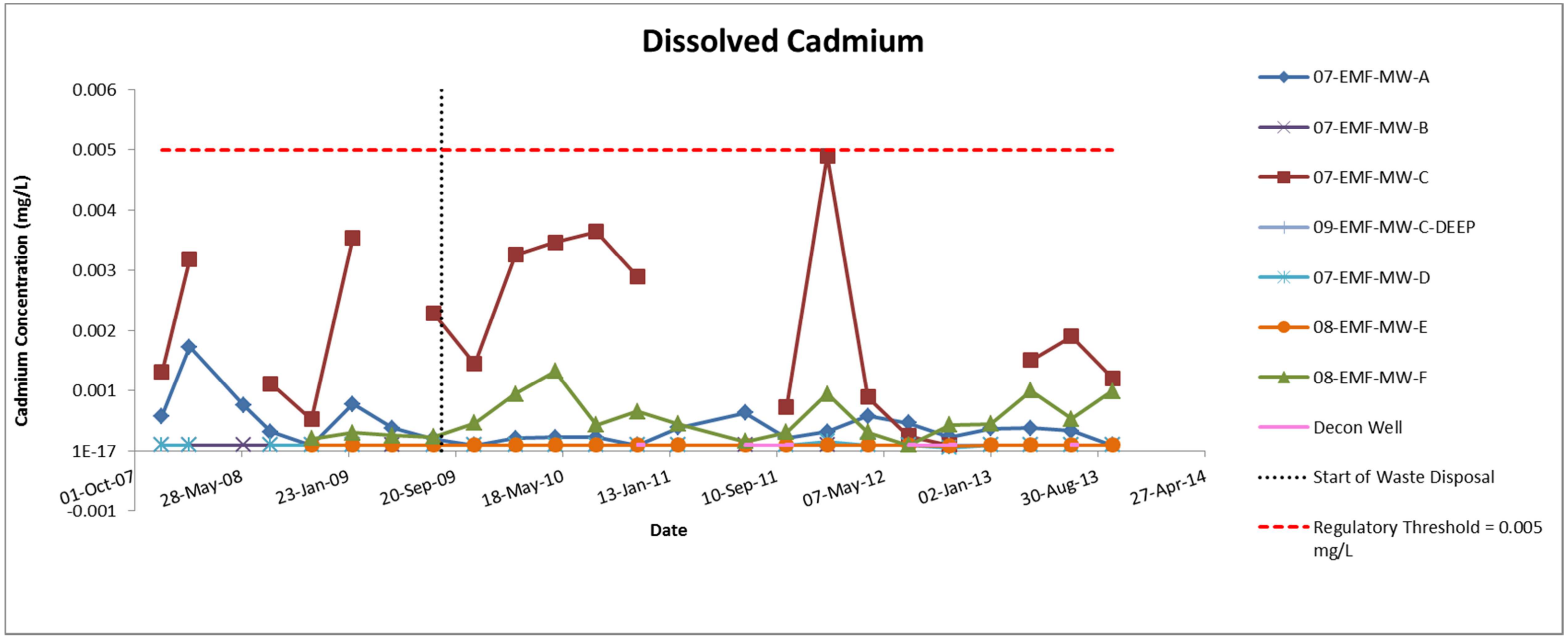
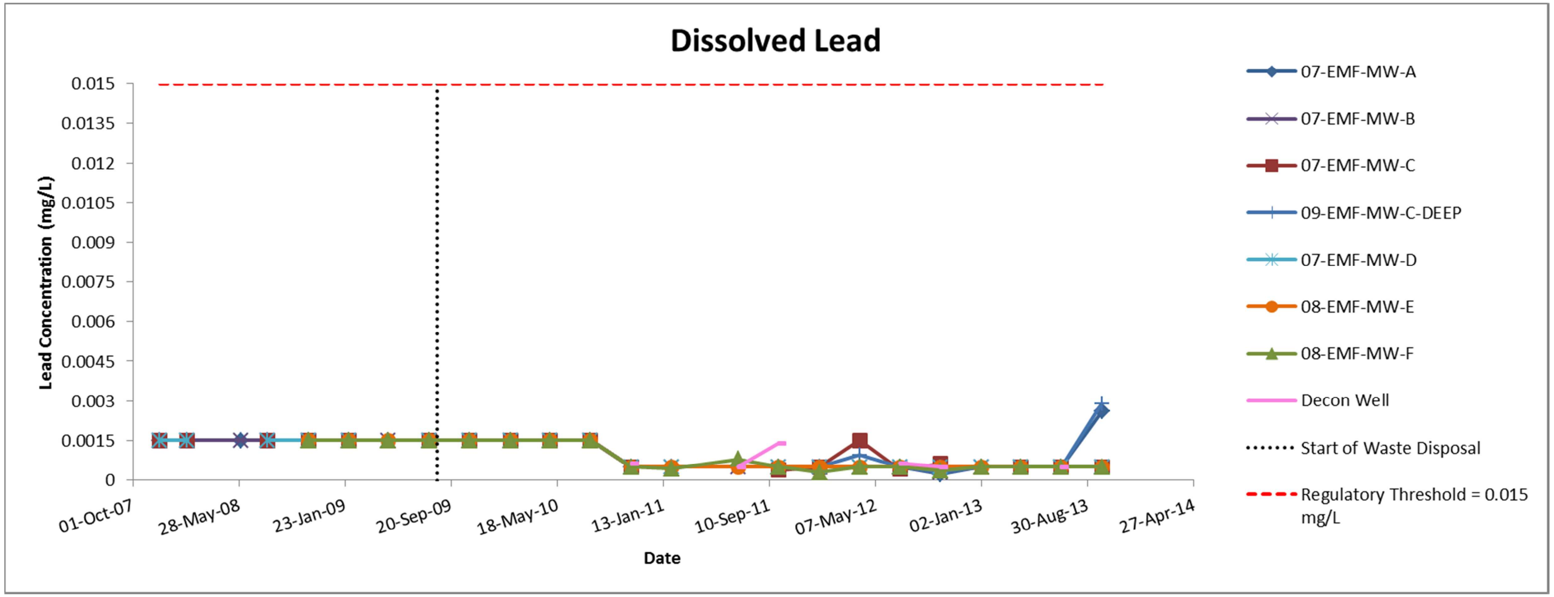


Figure A-2. Dissolved Metals Data at EMFR Groundwater Sites



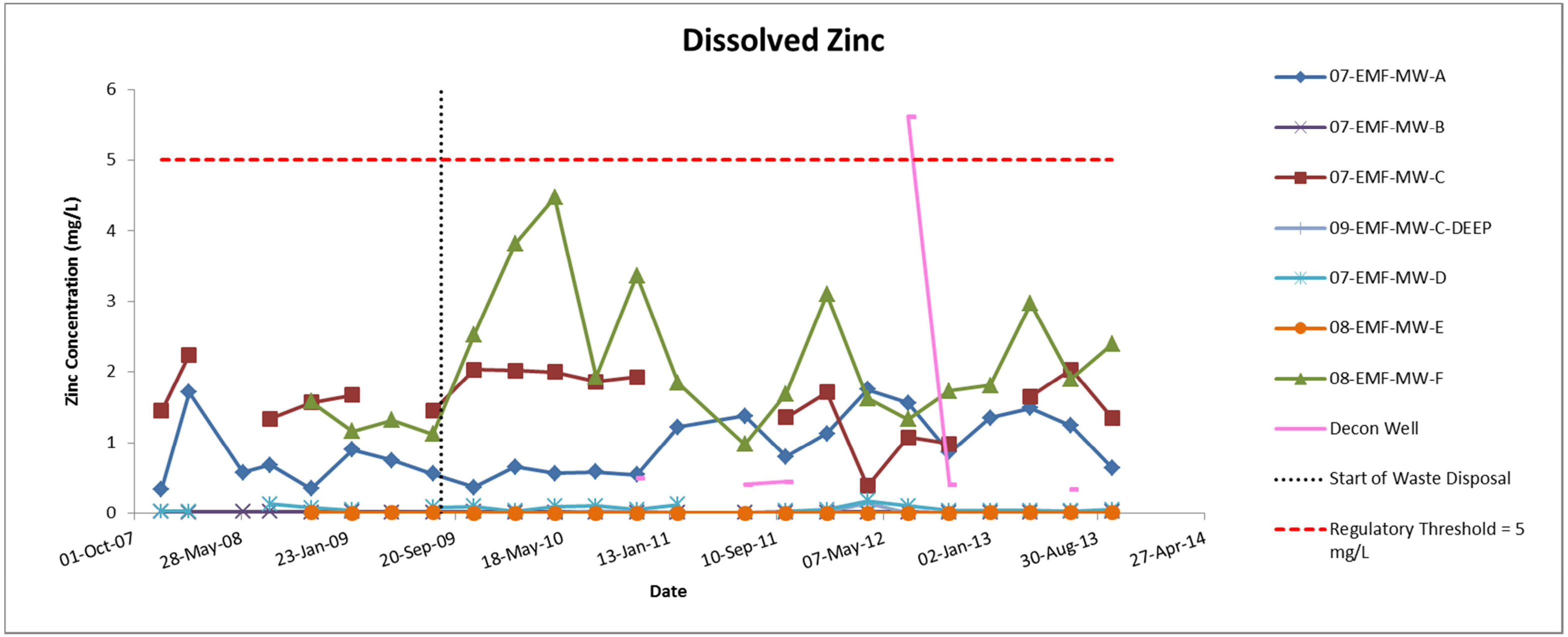


Table A-1
Groundwater Monitoring Results
Dissolved Metals
East Mission Flats Repository

Well No.	Sample Date	Dissolved Constituents (mg/L) Antimony	Arsenic	Cadmium	Lead	Zinc
07-EMF-MW-A	11-Dec-07	0.003 U	0.003 U	0.000578 J	0.003 U	0.347 J
	25-Feb-08	0.003 U	0.003 U	0.00172	0.003 U	1.71 J
	3-Jun-08	0.003 U	0.003 U	0.000763	0.003 U	0.582
	19-Aug-08	0.003 U	0.003 U	0.000321	0.003 U	0.683
	10-Nov-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.353
	4-Feb-09	0.003 U	0.003 U	0.000777	0.003 U	0.898
	7-May-09	0.003 U	0.003 U	0.000382	0.003 U	0.753
	10-Aug-09	0.003 U	0.003 U	0.000204	0.003 U	0.558
	11-Nov-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.368
	25-Feb-10	0.003 U	0.003 U	0.000208	0.003 U	0.657
	19-May-10	0.003 U	0.003 U	0.000225	0.003 U	0.568
	25-Aug-10	0.003 U	0.003 U	0.000227	0.003 U	0.584
	16-Nov-10	0.002 U	0.00076 J	0.0002 U	0.001 U	0.544 J
	10-Feb-11	0.002 U	0.001 U	0.00039	0.001 U	1.22 J
	6-Jul-11	0.002 U	0.0073 J*	0.00063	0.001 U	1.38
	24-Oct-11	0.002 U	0.00044 J	0.000220	0.001 UJ	0.804
	25-Jan-12	0.002 U	0.0074 J*	0.00032	0.001 U	1.13
	10-Apr-12	0.002 U	0.0014	0.00058	0.001 U	1.75
	31-Jul-12	0.002 U	0.0018	0.00046	0.001 U	1.56
	29-Oct-12	0.002 U	0.00075 J	0.00023	0.00022 J	0.862 J
	23-Jan-13	0.002 U	0.001 U	0.00037	0.001 U	1.35
	2-Apr-13	0.002 U	0.001 U	0.00038	0.001 U	1.49
	23-Jul-13	0.002 U	0.001 U	0.00033	0.001 U	1.24
	17-Oct-13	0.002 U	0.001 U	0.0002 U	0.0026	0.648
07-EMF-MW-B	10-Dec-07	0.003 U	0.003 U	0.0002 U	0.003 U	0.0243 J
	25-Feb-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.0198 J
	3-Jun-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.0212
	19-Aug-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.0244
	10-Nov-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.0197
	4-Feb-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.0210
	7-May-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.0168
	10-Aug-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.0160
	11-Nov-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.0264
	25-Feb-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.0153
	19-May-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.0157
	25-Aug-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.0157
	16-Nov-10	0.002 U	0.001 U	0.0002 U	0.001 U	0.0187 J
	10-Feb-11	0.002 U	0.001 U	0.0002 U	0.001 U	0.0091 J*
	6-Jul-11	0.002 U	0.0077 J*	0.0002 U	0.001 U	0.0126
	24-Oct-11	0.002 U	0.001 U	0.0002 U	0.001 UJ	0.0148 J*
	25-Jan-12	0.002 U	0.0073 J*	0.0002 U	0.001 U	0.0180
	10-Apr-12	0.002 U	0.0014	0.0002 U	0.001 U	0.0162
	31-Jul-12	0.002 U	0.00071 J	0.0002 U	0.001 U	0.0142
	29-Oct-12	0.002 U	0.001 U	0.0002 U	0.00028 J	0.0121 J
	24-Jan-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0181
	2-Apr-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0197
	23-Jul-13	0.002 U	0.0022 J*	0.0002 U	0.001 U	0.0285 J*
	17-Oct-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0227

Well No.	Sample Date	Dissolved Constituents (mg/L)									
		Antimony		Arsenic		Cadmium		Lead		Zinc	
07-EMF-MW-C	10-Dec-07	0.003	U	0.003	U	0.0013	J	0.003	U	1.45	J
	25-Feb-08	0.003	U	0.003	U	0.00318		0.003	U	2.24	J
	3-Jun-08		NS		NS		NS		NS		NS
	19-Aug-08	0.003	U	0.003	U	0.00111		0.003	U	1.34	
	10-Nov-08	0.003	U	0.003	U	0.000522		0.003	U	1.57	
	3-Feb-09	0.003	U	0.003	U	0.00354		0.003	U	1.67	
	7-May-09		NS		NS		NS		NS		NS
	10-Aug-09	0.003	U	0.003	U	0.00229		0.003	U	1.45	
	11-Nov-09	0.003	U	0.003	U	0.00144		0.003	U	2.03	
	25-Feb-10	0.003	U	0.003	U	0.00326		0.003	U	2.02	
	19-May-10	0.003	U	0.003	U	0.00346		0.003	U	2.00	
	25-Aug-10	0.003	U	0.003	U	0.00364		0.003	U	1.86	
	16-Nov-10	0.002	U	0.001	U	0.0029		0.001	U	1.93	J
	10-Feb-11		NS		NS		NS		NS		NS
	6-Jul-11		NS		NS		NS		NS		NS
	24-Oct-11	0.002	U	0.00081	J	0.00072		0.00038	J	1.36	
	25-Jan-12	0.002	U	0.0074	J*	0.0049		0.001	U	1.71	
	10-Apr-12	0.002	U	0.0017		0.00089		0.0015		0.388	
	31-Jul-12	0.002	U	0.0027		0.00025		0.00041	J	1.08	
	29-Oct-12	0.002	U	0.0027		0.00010	J	0.00061	J	0.988	J
	23-Jan-13		NS		NS		NS		NS		NS
	2-Apr-13	0.002	U	0.001	U	0.0015		0.001	U	1.65	
	23-Jul-13	0.002	U	0.0024	J*	0.0019		0.001	U	2.03	
	17-Oct-13	0.002	U	0.001	U	0.0012		0.001	U	1.35	
09-EMF-MW-C Deep	25-Feb-10	0.003	U	0.003	U	0.0002	U	0.003	U	0.0113	
	19-May-10	0.003	U	0.003	U	0.0002	U	0.003	U	0.005	U
	25-Aug-10	0.003	U	0.003	U	0.0002	U	0.003	U	0.0317	
	16-Nov-10	0.002	U	0.001	U	0.0002	U	0.001	U	0.0216	J
	10-Feb-11		NS		NS		NS		NS		NS
	6-Jul-11		NS		NS		NS		NS		NS
	24-Oct-11	0.002	U	0.001	U	0.0002	U	0.001	UJ	0.0167	
	25-Jan-12	0.002	U	0.0075	J*	0.0002	U	0.001	U	0.0191	
	10-Apr-12	0.002	U	0.0042	J*	0.0002	U	0.00095	J	0.154	
	31-Jul-12	0.002	U	0.0011		0.0002	U	0.001	U	0.0116	
	29-Oct-12	0.002	U	0.00065	J	0.0002	U	0.00028	J	0.0032	J
	23-Jan-13	0.002	U	0.001	U	0.0002	U	0.001	U	0.0226	
	2-Apr-13	0.002	U	0.001	U	0.0002	U	0.001	U	0.0237	
	23-Jul-13	0.002	U	0.0022	J*	0.0002	U	0.001	U	0.0088	J*
	17-Oct-13	0.002	U	0.001	U	0.0002	U	0.0029		0.0096	J*
07-EMF-MW-D	10-Dec-07	0.003	U	0.003	U	0.0002	U	0.003	U	0.0326	J
	25-Feb-08	0.003	U	0.003	U	0.0002	U	0.003	U	0.0285	J
	3-Jun-08		NS		NS		NS		NS		NS
	19-Aug-08	0.003	U	0.003	U	0.0002	U	0.003	U	0.132	
	10-Nov-08	0.003	U	0.003	U	0.0002	U	0.003	U	0.0794	
	3-Feb-09	0.003	U	0.003	U	0.0002	U	0.003	U	0.0531	
	7-May-09		NS		NS		NS		NS		NS
	11-Aug-09	0.003	U	0.003	U	0.0002	U	0.003	U	0.0918	
	11-Nov-09	0.003	U	0.003	U	0.0002	U	0.003	U	0.103	
	25-Feb-10	0.003	U	0.003	U	0.0002	U	0.003	U	0.0352	
	19-May-10	0.003	U	0.003	U	0.0002	U	0.003	U	0.105	
	25-Aug-10	0.003	U	0.003	U	0.0002	U	0.003	U	0.109	
	16-Nov-10	0.002	U	0.0018		0.0002	U	0.001	U	0.0563	J
	10-Feb-11	0.002	U	0.001	U	0.0002	U	0.001	U	0.127	J*
	6-Jul-11		NS		NS		NS		NS		NS
	25-Oct-11	0.002	U	0.0019		0.0002	U	0.001	UJ	0.0395	
	26-Jan-12	0.002	U	0.0079	J*	0.00016	J	0.001	U	0.0584	
	10-Apr-12	0.002	U	0.0014		0.0002	U	0.001	U	0.184	
	1-Aug-12	0.002	U	0.0021		0.0002	U	0.001	U	0.112	
	30-Oct-12	0.002	U	0.0018		0.00005	J	0.00047	J	0.0464	J
	24-Jan-13	0.002	U	0.001	U	0.0002	U	0.001	U	0.0425	
	2-Apr-13	0.002	U	0.001	U	0.0002	U	0.001	U	0.0466	
	23-Jul-13	0.002	U	0.0029	J*	0.0002	U	0.001	U	0.0387	J*
	17-Oct-13	0.002	U	0.001	U	0.0002	U	0.001	U	0.0537	

Well No.	Sample Date	Dissolved Constituents (mg/L)				
		Antimony	Arsenic	Cadmium	Lead	Zinc
08-EMF-MW-E	10-Nov-08	0.003 U	0.0148	0.0002 U	0.003 U	0.0141
	3-Feb-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.01 U
	7-May-09	0.003 U	0.0035	0.0002 U	0.003 U	0.00889
	11-Aug-09	0.003 U	0.0195	0.0002 U	0.003 U	0.00848
	11-Nov-09	0.003 U	0.0232	0.0002 U	0.003 U	0.00671
	25-Feb-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.00599
	19-May-10	0.003 U	0.00447	0.0002 U	0.003 U	0.00633
	25-Aug-10	0.003 U	0.0172	0.0002 U	0.003 U	0.00687
	16-Nov-10	0.002 U	0.0177	0.0002 U	0.001 U	0.0069 J
	10-Feb-11	0.002 U	0.00089 J	0.0002 U	0.001 U	0.0042 J
	6-Jul-11	0.002 U	0.0074 J*	0.0002 U	0.001 U	0.0048 J
	24-Oct-11	0.002 U	0.020	0.0002 U	0.001 UJ	0.0045
	26-Jan-12	0.002 U	0.0069 J*	0.0002 U	0.001 U	0.0051 J*
	11-Apr-12	0.002 U	0.002	0.0002 U	0.001 U	0.0063 J*
	1-Aug-12	0.002 U	0.0063	0.0002 U	0.001 U	0.0064
	29-Oct-12	0.002 U	0.0149	0.00008 J	0.001 U	0.0071 J*
	23-Jan-13	0.002 U	0.0013	0.0002 U	0.001 U	0.0091 J*
	2-Apr-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0083 J*
	23-Jul-13	0.002 U	0.0026 J*	0.0002 U	0.001 U	0.0124 J*
	17-Oct-13	0.002 U	0.0067	0.0002 U	0.001 U	0.0120 J*
08-EMF-MW-F	11-Nov-08	0.003 U	0.003 U	0.000205	0.003 U	1.58
	3-Feb-09	0.003 U	0.003 U	0.000304	0.003 U	1.16
	7-May-09	0.003 U	0.003 U	0.000258	0.003 U	1.32
	10-Aug-09	0.003 U	0.003 U	0.00023	0.003 U	1.12
	11-Nov-09	0.003 U	0.003 U	0.000464	0.003 U	2.53
	25-Feb-10	0.003 U	0.003 U	0.000947	0.003 U	3.82
	19-May-10	0.003 U	0.003 U	0.00132	0.003 U	4.47
	25-Aug-10	0.003 U	0.003 U	0.000436	0.003 U	1.93
	16-Nov-10	0.002 U	0.001 U	0.00065	0.001 U	3.37 J
	10-Feb-11	0.002 U	0.001 U	0.00045	0.00043 J	1.84 J
	6-Jul-11	0.002 U	0.0056 J*	0.00016 J	0.00079 J	0.976
	25-Oct-11	0.002 U	0.001 U	0.00031	0.001 UJ	1.69
	26-Jan-12	0.002 U	0.0041 J*	0.00094	0.00029 J	3.10
	11-Apr-12	0.002 U	0.00086 J	0.00031	0.001 U	1.63
	1-Aug-12	0.002 U	0.00057 J	0.0002 U	0.001 U	1.33
	30-Oct-12	0.002 U	0.001 U	0.00043	0.00036 J	1.73 J
	23-Jan-13	0.002 U	0.001 U	0.00045	0.001 U	1.81
	2-Apr-13	0.002 U	0.001 U	0.0010	0.001 U	2.97
	23-Jul-13	0.002 U	0.0014 J*	0.00053	0.001 U	1.90
	17-Oct-13	0.002 U	0.001 U	0.00099	0.001 U	2.39
Decon Well	16-Nov-10	0.002 U	0.00092 J	0.0002 U	0.00061 J	0.504 J
	10-Feb-11	NS	NS	NS	NS	NS
	6-Jul-11	0.002 U	0.0068 J*	0.0002 U	0.001 U	0.407
	25-Oct-11	0.002 U	0.0009 J	0.0002 U	0.0014 J	0.449
	26-Jan-12	NS	NS	NS	NS	NS
	10-Apr-12	NS	NS	NS	NS	NS
	1-Aug-12	0.002 U	0.0055	0.0002 U	0.00063 J	5.62
	30-Oct-12	0.002 U	0.00080 J	0.000099 J	0.001 U	0.401 J
	2-Apr-13	NS	NS	NS	NS	NS
	24-Jul-13	0.002 U	0.00190 J*	0.0002 U	0.001 U	0.342
	17-Oct-13	NS	NS	NS	NS	NS
Regulatory Threshold		0.006[a]	0.01[a]	0.005[a]	0.015[a]	5.0[b]

Notes:

mg/L = milligrams per liter

NS = Not sampled

limit) or the sample detection limit.

J = Reported concentration is an estimate based on data quality review

J* = The result is an estimated quantity. This analyte was detected in both the sample result and an associated field blank sample during the same sampling event.

a. National Primary Drinking Water Regulation (Maximum Contaminant Level)

b. National Secondary Drinking Water Regulation

(pink box) = Value exceeds the regulatory threshold

Table A-2
Groundwater Monitoring Results
Total Metals
East Mission Flats Repository

Well No.	Sample Date	Total Constituents (mg/L)				
		Antimony	Arsenic	Cadmium	Lead	Zinc
MW-A	11 Dec 07	0.003 U	0.003 U	0.000535	0.0030 U	0.284
	25 Feb 08	0.003 U	0.003 U	0.00174	0.0030 U	1.61
	3-Jun-08	0.0032	0.0276	0.000926	0.00602	0.615
	19-Aug-08	0.003 U	0.003 U	0.000511	0.0030 U	0.710
	10-Nov-08	0.003 U	0.00445	0.00020 U	0.0030 U	0.369
	4-Feb-09	0.003 U	0.00426	0.000809	0.0030 U	0.884
	7-May-09	0.003 U	0.0103	0.000398	0.0030 U	0.757
	10-Aug-09	0.003 U	0.003 U	0.000216	0.0030 U	0.611
	11-Nov-09	0.003 U	0.003 U	0.00020 U	0.0030 U	0.300
	25-Feb-10	0.003 U	0.003 U	0.000221	0.0030 U	0.636
	19-May-10	0.003 U	0.003 U	0.00024	0.0030 U	0.534
	25-Aug-10	0.003 U	0.003 U	0.00020 U	0.0030 U	0.568
	16-Nov-10	0.002 U	0.00092 J	0.00020 U	0.0010 U	0.555 J
	10-Feb-11	0.002 U	0.0305	0.00055	0.0049	1.37 J
	6-Jul-11	0.002 U	0.0446 J	0.00084	0.0073	1.51
	24-Oct-11	0.002 U	0.0122	0.000280	0.0011 J	0.860
	25-Jan-12	0.002 U	0.0022	0.00042	0.0010 U	1.25
	10-Apr-12	0.002 U	0.0319 J	0.00078	0.0025	1.74
	31-Jul-12	0.002 U	0.0186	0.00050	0.0024	1.65
	29-Oct-12	0.002 U	0.0049	0.00027	0.00055 J	0.868 J
	23-Jan-13	0.002 U	0.0038	0.00044	0.0010 U	1.40 J
	2-Apr-13	0.002 U	0.0108	0.00038	0.0010 U	1.39
	23-Jul-13	0.002 U	0.012 J	0.00036	0.0010 UJ	1.36
	17-Oct-13	0.002 U	0.0061	0.00021	0.0010 U	0.737
MW-B	10 Dec 07	0.003 U	0.003 U	0.00020 U	0.00527	0.0267
	25 Feb 08	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0163
	3-Jun-08	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0255
	19-Aug-08	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0306
	10-Nov-08	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0202
	4-Feb-09	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0200
	7-May-09	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0166
	10-Aug-09	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0169
	11-Nov-09	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0213
	25-Feb-10	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0160
	19-May-10	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0149
	25-Aug-10	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0142
	16-Nov-10	0.002 U	0.001 U	0.00020 U	0.0010 U	0.0167 J
	10-Feb-11	0.002 U	0.001 U	0.00020 U	0.0010 U	0.0099 J
	6-Jul-11	0.002 U	0.0071 J	0.00020 U	0.0010 U	0.0130
	24-Oct-11	0.002 U	0.001 U	0.00020 U	0.0010 UJ	0.0157
	25-Jan-12	0.002 U	0.001 U	0.00020 U	0.00033 J	0.0181
	10-Apr-12	0.002 U	0.0013 J	0.00020 U	0.00021 J	0.0164
	31-Jul-12	0.002 U	0.00074 J	0.00020 U	0.0010 U	0.0164
	29-Oct-12	0.002 U	0.001 U	0.00006 J	0.00029 J	0.0124 J
	24-Jan-13	0.002 U	0.001 U	0.00020 U	0.0010 U	0.0181 J
	2-Apr-13	0.002 U	0.001 U	0.00020 U	0.0010 U	0.0196
	23-Jul-13	0.002 U	0.0018 J	0.00020 U	0.0010 UJ	0.0242
	17-Oct-13	0.002 U	0.001 U	0.00020 U	0.0010 U	0.0250

Well No.	Sample Date	Total Constituents (mg/L) Antimony	Arsenic	Cadmium	Lead	Zinc
MW-C	10 Dec 07	0.003 U	0.003 U	0.00115	0.0030 U	1.28
	25 Feb 08	0.003 U	0.003 U	0.00282	0.0030 U	1.97
	3-Jun-08	NS	NS	NS	NS	NS
	19-Aug-08	0.003 U	0.003 U	0.00185	0.0030 U	1.43
	10-Nov-08	0.003 U	0.003 U	0.00138	0.0032	1.59
	3-Feb-09	0.003 U	0.003 U	0.00359	0.0030 U	1.88
	7-May-09	NS	NS	NS	NS	NS
	10-Aug-09	0.003 U	0.003 U	0.00229	0.0030 U	1.56
	11-Nov-09	0.003 U	0.003 U	0.00138	0.0030 U	1.72
	25-Feb-10	0.003 U	0.003 U	0.00322	0.0030 U	1.91
	19-May-10	0.003 U	0.003 U	0.00374	0.0030 U	1.94
	25-Aug-10	0.003 U	0.003 U	0.00333	0.0030 U	1.67
	16-Nov-10	0.002 U	0.001 U	0.003	0.0010 U	1.93 J
	10-Feb-11	NS	NS	NS	NS	NS
	6-Jul-11	NS	NS	NS	NS	NS
	24-Oct-11	0.002 U	0.0011	0.00091	0.00092 J	1.43
	25-Jan-12	0.002 U	0.00042 J	0.0041	0.00045 J	1.80
	10-Apr-12	0.002 U	0.0018 J	0.0011	0.0048	0.414
	31-Jul-12	0.002 U	0.0026	0.00068	0.0022	1.16
	29-Oct-12	0.002 U	0.0022	0.00038	0.0028	11.50 J
	23-Jan-13	NS	NS	NS	NS	NS
	2-Apr-13	0.002 U	0.001 U	0.0012	0.0010 U	1.64
	23-Jul-13	0.002 U	0.0021 J	0.0020	0.0010 UJ	1.97
	17-Oct-13	0.002 U	0.001 U	0.0016	0.0010 U	1.66
MW-C Deep	25-Feb-10	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0119
	19-May-10	0.003 U	0.003 U	0.00020 U	0.0030 U	0.005 U
	25-Aug-10	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0326
	16-Nov-10	0.003 U	0.001 U	0.00020 U	0.0010 U	0.0255 J
	10-Feb-11	NS	NS	NS	NS	NS
	6-Jul-11	NS	NS	NS	NS	NS
	24-Oct-11	0.002 U	0.001 U	0.00020 U	0.0020 J	0.0180
	25-Jan-12	0.002 U	0.00048 J	0.00017 J	0.00052 J	0.0222
	10-Apr-12	0.002 U	0.0038 J	0.00034	0.0048	0.222
	31-Jul-12	0.002 U	0.0013	0.00020 U	0.00069 J	0.0310
	29-Oct-12	0.002 U	0.00052 J	0.00020 U	0.00023 J	0.004 J
	23-Jan-13	0.002 U	0.001 U	0.00020 U	0.0010 U	0.0411 J
	2-Apr-13	0.002 U	0.001 U	0.00020 U	0.0010 U	0.0265
	23-Jul-13	0.002 U	0.0023 J	0.00120	0.0086 J	0.2220
	17-Oct-13	0.002 U	0.001 U	0.00020 U	0.0013	0.0334
MW-D	10 Dec 07	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0336
	25 Feb 08	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0268
	3-Jun-08	NS	NS	NS	NS	NS
	19-Aug-08	0.003 U	0.00845	0.00020 U	0.00407	0.140
	10-Nov-08	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0866
	3-Feb-09	0.003 U	0.00434	0.00020 U	0.0030 U	0.0522
	7-May-09	NS	NS	NS	NS	NS
	11-Aug-09	0.003 U	0.003 U	0.00020 U	0.0030 U	0.0870
	11-Nov-09	0.003 U	0.0035	0.00020 U	0.0030 U	0.0795
	25-Feb-10	0.003 U	0.00424	0.00020 U	0.0030 U	0.0338
	19-May-10	0.003 U	0.003 U	0.00020 U	0.0030 U	0.103
	25-Aug-10	0.003 U	0.00561	0.00020 U	0.0030 U	0.0963
	16-Nov-10	0.002 U	0.0027	0.00020 U	0.0010 U	0.0388 J
	10-Feb-11	0.002 U	0.0103	0.00020 U	0.008900	0.147 J
	6-Jul-11	NS	NS	NS	NS	NS
	25-Oct-11	0.002 U	0.0044	0.00020 U	0.0010 UJ	0.0298
	26-Jan-12	0.002 U	0.0017	0.00018 J	0.0010 U	0.0497
	10-Apr-12	0.002 U	0.0428 J	0.00032	0.0019	0.253
	1-Aug-12	0.002 U	0.0176	0.00020 U	0.0020	0.116
	30-Oct-12	0.002 U	0.0053	0.00020 U	0.00056 J	0.0437 J
	24-Jan-13	0.002 U	0.0231	0.00020 U	0.0010 U	0.0371 J
	2-Apr-13	0.002 U	0.0617	0.00020 U	0.0017	0.0430
	23-Jul-13	0.002 U	0.0398	0.00020 U	0.0014 J	0.0460
	17-Oct-13	0.002 U	0.0264	0.00020 U	0.0017	0.0785

Well No.	Sample Date	Total Constituents (mg/L) Antimony	Arsenic	Cadmium	Lead	Zinc
MW-E	10 Nov 08	0.003 U	0.0167	0.00020 U	0.0030 U	0.0176
	3-Feb-09	0.003 U	0.0101	0.00020 U	0.0030 U	0.0114
	7-May-09	0.003 U	0.0137	0.00020 U	0.0030 U	0.0120
	11-Aug-09	0.003 U	0.0194	0.00020 U	0.0030 U	0.0091
	11-Nov-09	0.003 U	0.0205	0.00020 U	0.0030 U	0.0074
	25-Feb-10	0.003 U	0.0119	0.00020 U	0.0030 U	0.0088
	19-May-10	0.003 U	0.00982	0.00020 U	0.0030 U	0.0078
	25-Aug-10	0.003 U	0.0162	0.00020 U	0.0030 U	0.0073
	16-Nov-10	0.002 U	0.0198	0.00020 U	0.0010 U	0.0064 J
	10-Feb-11	0.002 U	0.0141	0.00012 J	0.0010 U	0.0066 J
	6-Jul-11	0.002 U	0.0279	0.00020 U	0.0010 U	0.0068 J
	24-Oct-11	0.002 U	0.017	0.00020 U	0.0010 UJ	0.0039
	26-Jan-12	0.002 U	0.0083	0.00020 U	0.0010 U	0.0053
	11-Apr-12	0.002 U	0.004 J	0.00020 U	0.0010 U	0.0065
	1-Aug-12	0.002 U	0.0090	0.00020 U	0.0010 U	0.0065
	29-Oct-12	0.002 U	0.0175	0.00020 U	0.00026 J	0.0081 J
	23-Jan-13	0.002 U	0.0069	0.00020 U	0.0010 U	0.0102 J
	2-Apr-13	0.002 U	0.0036	0.00020 U	0.0010 U	0.0096
	23-Jul-13	0.002 U	0.0071 J	0.00020 U	0.0010 UJ	0.0103
	17-Oct-13	0.002 U	0.0107	0.00020 U	0.0010 U	0.0098
MW-F	11-Nov-08	0.003 U	0.003 U	0.00020 U	0.0030 U	1.53
	3-Feb-09	0.003 U	0.003 U	0.00033	0.0030 U	1.17
	7-May-09	0.003 U	0.003 U	0.000316	0.0030 U	1.36
	10-Aug-09	0.003 U	0.003 U	0.000291	0.0030 U	1.13
	11-Nov-09	0.003 U	0.003 U	0.000424	0.0030 U	2.13
	25-Feb-10	0.003 U	0.003 U	0.00106	0.0030 U	3.70
	19-May-10	0.003 U	0.003 U	0.00122	0.0030 U	4.58
	25-Aug-10	0.003 U	0.003 U	0.000362	0.0030 U	1.72
	16-Nov-10	0.002 U	0.001 U	0.00070	0.0010 U	3.21 J
	10-Feb-11	0.002 U	0.001 U	0.00043	0.0023	1.92 J
	6-Jul-11	0.002 U	0.0057 J	0.00015 J	0.0010 U	1.08
	25-Oct-11	0.002 U	0.001 J	0.00033	0.00033 J	1.76
	26-Jan-12	0.002 U	0.00028 J	0.0011	0.00071 J	3.65
	11-Apr-12	0.002 U	0.0012 J	0.00031	0.00038 J	1.59
	1-Aug-12	0.002 U	0.00061 J	0.00020 U	0.0010 U	1.25
	30-Oct-12	0.002 U	0.001 U	0.00037	0.0004 J	1.55 J
	23-Jan-13	0.002 U	0.001 U	0.00039	0.0010 U	1.63 J
	2-Apr-13	0.002 U	0.001 U	0.0011	0.0010 U	2.98
	23-Jul-13	0.002 U	0.0016 J	0.00057	0.0010 UJ	1.82
	17-Oct-13	0.002 U	0.001 U	0.00095	0.0010 U	2.40
Decon Well	16-Nov-10	0.002 U	0.001	0.00020 U	0.00064 J	0.480 J
	10-Feb-11	NS	NS	NS	NS	NS
	6-Jul-11	0.002 U	0.006 J	0.00020 U	0.0010 U	0.395
	25-Oct-11	0.002 U	0.00091 J	0.00020 U	0.0019 J	0.453
	26-Jan-12	NS	NS	NS	NS	NS
	10-Apr-12	NS	NS	NS	NS	NS
	1-Aug-12	0.002 U	0.0041	0.00020 U	0.0029	10.1
	30-Oct-12	0.002 U	0.00081 J	0.00020 U	0.00056 J	0.419 J
	23-Jan-13	NS	NS	NS	NS	NS
	2-Apr-13	NS	NS	NS	NS	NS
	24-Jul-13	0.002 U	0.00200 J	0.00020 U	0.0010 UJ	0.348
	17-Oct-13	NS	NS	NS	NS	NS
Reporting Limit [a]		0.003	0.003	0.0002	0.003	0.005
Regulatory Threshold		0.006[b]	0.01[b]	0.005[b]	0.015[b]	5.0[c]

Notes:
- mg/L = milligrams per liter
- ND = Not detected above reporting limit
- NS = Not sampled
- J = Reported concentration is an estimate based on data quality review
- a. Method Reporting Limit (MRL) as listed in the SAP/QAPP (TerraGraphics 2010). However, RL is higher if a sample dilution is necessary.
- b. National Primary Drinking Water Regulation (Maximum Contaminant Level)
- c. National Secondary Drinking Water Regulation

(pink) = Value exceeds the regulatory threshold

(green) = Data from 2013 sampling.

Table A-3
Groundwater Monitoring Results
Field Parameters
East Mission Flats Repository

Well	Date	Parameter				
		pH	Conductivity (uS/cm)	Temperature (^{o}C)	DO (mg/L)	ORP (mV)
07-EMF-MW-A	11 Dec 07	5.63	265	8.21	1.01	280
	25 Feb 08	5.30	328	7.73	0.36	353
	3-Jun-08	5.28	150	9.45	0.51	265
	19-Aug-08	5.57	208	11.05	0.39	225
	10-Nov-08	5.63	163	8.79	0.34	161
	4-Feb-09	5.19	253	7.95	0.39	228
	7-May-09	4.93	202	7.35	0.38	195
	10-Aug-09	5.43	196	9.23	0.24	210
	11-Nov-09	5.62	121	8.49	0.48	131
	25-Feb-10	4.84	209	7.97	0.32	216
	19-May-10	5.53	181	8.21	0.42	147
	25-Aug-10	5.37	149	9.17	0.33	142
	16-Nov-10	5.43	164	8.81	0.43	161
	10-Feb-11	4.92	210	7.69	0.40	190
	6-Jul-11	5.54	229	10.98	0.35	118
	24-Oct-11	5.54	182	9.21	R	136
	25-Jan-12	4.92	239	8.54	0.30	178
	10-Apr-12	5.50	222	8.34	0.26	155
	31-Jul-12	4.89	235	9.53	0.26	166
	29-Oct-12	5.39	182	10.35	0.52	157
	23-Jan-13	5.24	214	8.84	0.30	92
	2-Apr-13	5.12	163	8.23	0.39	221
	23-Jul-13	5.04	207	9.54	0.45	130
	17-Oct-13	5.31	127	9.22	0.78	141
07-EMF-MW-B	10 Dec 07	5.63	119	8.71	0.51	279
	25 Feb 08	5.38	115	7.46	0.75	330
	3-Jun-08	5.60	101	10.26	1.32	253
	19-Aug-08	5.57	92	16.92	0.34	220
	10-Nov-08	5.47	103	12.88	0.42	169
	4-Feb-09	5.40	98	10.48	1.98	209
	7-May-09	5.11	69	7.8	3.02	213
	10-Aug-09	5.46	82	11.81	0.55	285
	11-Nov-09	5.39	81	9.24	0.42	184
	25-Feb-10	4.88	97	8.2	0.55	216
	19-May-10	5.59	101	9.37	0.82	135
	25-Aug-10	5.42	85	10.13	0.67	146
	16-Nov-10	5.39	94	9.44	0.32	177
	10-Feb-11	5.25	65	4.24	8.09	183
	6-Jul-11	5.70	56	17.28	0.30	177
	24-Oct-11	5.46	74	13.55	0.37 J	112
	25-Jan-12	5.49	85	11.53	0.47	94
	10-Apr-12	5.83	53	8.61	5.77	97
	31-Jul-12	5.12	47	18.55	0.28	181
	29-Oct-12	5.52	82	15.71	0.43	204
	24-Jan-13	5.04	73	12.53	0.95	208
	2-Apr-13	5.63	66	11.54	0.43	238
	23-Jul-13	5.13	77	12.06	0.27	161
	17-Oct-13	5.31	75	10.67	0.64	208

Well	Date	Parameter				
		pH	Conductivity (uS/cm)	Temperature (^{O}C)	DO (mg/L)	ORP (mV)
07-EMF-MW-C	10 Dec 07	5.56	105	8.89	0.75	301
	25 Feb 08	5.34	105	8.07	0.52	329
	3-Jun-08	NS	NS	NS	NS	NS
	19-Aug-08	5.68	84	12.81	0.24	189
	10-Nov-08	5.45	93	11.51	0.30	133
	3-Feb-09	5.56	104	9.76	0.32	144
	7-May-09	NS	NS	NS	NS	NS
	10-Aug-09	5.54	83	12.42	0.70	312
	11-Nov-09	5.46	74	9.91	0.31	198
	25-Feb-10	5.14	102	8.89	0.42	220
	19-May-10	5.66	97	9.33	0.11 J	147
	25-Aug-10	5.59	94	13.54	0.35	143
	16-Nov-10	5.49	105	11.94	0.21	194
	10-Feb-11	NS	NS	NS	NS	NS
	6-Jul-11	NS	NS	NS	NS	NS
	24-Oct-11	5.67	88	11.41	0.17 J	71
	25-Jan-12	5.33	95	10.03	1.27	160
	10-Apr-12	6.24	81	10.45	2.57	147
	31-Jul-12	5.19	67	16.51	0.20	171
	29-Oct-12	5.62	102	14.22	0.20	136
	23-Jan-13	NS	NS	NS	NS	NS
	2-Apr-13	5.69	80	11.78	1.73	162
	23-Jul-13	5.37	89	12.85	0.20	50
	17-Oct-13	5.63	92	11.36	0.52	113
09-EMF-MW-C-Deep	25-Feb-10	5.65	107	9.07	1.06	201
	19-May-10	6.13	93	10.60	1.66	141
	25-Aug-10	5.88	93	13.90	0.21	122
	16-Nov-10	5.84	99	10.79	0.26	172
	10-Feb-11	NS	NS	NS	NS	NS
	6-Jul-11	NS	NS	NS	NS	NS
	24-Oct-11	5.96	98	10.52	0.11	35
	25-Jan-12	6.26	148	9.46	0.23	108
	10-Apr-12	6.34	117	10.03	0.36	100
	31-Jul-12	5.74	99	14.56	0.08	-27
	29-Oct-12	5.94	114	13.70	0.20	13
	23-Jan-13	5.46	96	10.90	0.32	28
	2-Apr-13	6.04	83	11.29	0.14	71
	23-Jul-13	5.91	90	13.99	0.13	-151
	17-Oct-13	5.90	83	11.09	0.50	8

Well	Date	Parameter				
		pH	Conductivity (uS/cm)	Temperature (^{O}C)	DO (mg/L)	ORP (mV)
07-EMF-MW-D	10 Dec 07	5.87	116	8.95	0.50	271
	25 Feb 08	5.64	132	8.26	0.51	315
	3-Jun-08	NS	NS	NS	NS	NS
	19-Aug-08	5.91	108	10.22	0.40	182
	10-Nov-08	5.69	118	9.34	0.38	106
	3-Feb-09	5.69	116	8.43	0.32	161
	7-May-09	NS	NS	NS	NS	NS
	11-Aug-09	5.76	110	9.87	0.43	158
	11-Nov-09	5.75	92	8.72	0.26	115
	25-Feb-10	5.19	107	8.32	0.38	198
	19-May-10	5.85	90	9.13	0.30	138
	25-Aug-10	5.83	107	10.46	0.22	120
	16-Nov-10	5.85	115	9.44	0.25	157
	10-Feb-11	5.50	91	9.07	0.24	170
	6-Jul-11	NS	NS	NS	NS	NS
	25-Oct-11	5.80	116	9	0.57 J	79
	26-Jan-12	5.15	102	8.44	0.73	201
	10-Apr-12	6.09	97	9.16	0.23	116
	1-Aug-12	5.56	116	10.95	0.29	94
	30-Oct-12	6.13	129	9.99	0.36	100
	24-Jan-13	5.30	94	9.27	0.19	155
	2-Apr-13	5.83	78	9.43	0.21	136
	23-Jul-13	5.77	100	10.52	0.15	54
	17-Oct-13	5.98	91	9.91	0.38	53
08-EMF-MW-E	10-Nov-08	6.18	1,332	10.66	0.27	126
	3-Feb-09	6.44	1,379	8.29	0.42	188
	7-May-09	6.12	1,461	8.99	0.30	216
	11-Aug-09	6.39	1,435	11.14	0.39	22
	11-Nov-09	6.36	1,228	8.77	0.86	1
	25-Feb-10	6.17	1,540	8.61	0.22	74
	19-May-10	6.57	1,500	9.96	0.20	138
	25-Aug-10	6.45	1,438	12.26	0.25	50
	16-Nov-10	6.50	1,560	10.61	0.29	101
	10-Feb-11	6.33	1,436	8.23	0.31	171
	6-Jul-11	6.72	1,449	11.52	0.21	-48
	24-Oct-11	6.58	1,450	11.1	0.26	-41
	26-Jan-12	6.32	1,790	8.79	0.51	14
	11-Apr-12	6.40	1,720	8.67	0.31	104
	1-Aug-12	6.11	1,740	11.81	0.29	15
	29-Oct-12	6.44	1,930	12.53	0.30	-1
	23-Jan-13	6.26	1,680	8.99	0.36	39
	2-Apr-13	6.52	1,478	10.10	0.39	117
	23-Jul-13	6.32	1,670	12.43	0.45	11
	17-Oct-13	6.42	1,680	11.79	0.55	-33

Well	Date	Parameter				
		pH	Conductivity (uS/cm)	Temperature (^{o}C)	DO (mg/L)	ORP (mV)
08-EMF-MW-F	11-Nov-08	5.45	144	9.43	0.44	140
	3-Feb-09	5.45	133	9.16	0.50	177
	7-May-09	4.83	134	9.37	0.44	219
	10-Aug-09	5.46	117	11.63	1.23	293
	11-Nov-09	5.37	142	9.81	0.33	137
	25-Feb-10	4.96	277	9.07	0.78	241
	19-May-10	5.34	305	8.82	0.49	157
	25-Aug-10	5.49	151	11.08	1.63	155
	16-Nov-10	5.44	222	9.94	0.31	157
	10-Feb-11	5.23	158	8.82	0.75	171
	6-Jul-11	5.76	100	12.72	0.36	197
	25-Oct-11	5.55	157	10.65	0.41 J	119
	26-Jan-12	5.34	272	9.70	0.46	122
	11-Apr-12	5.42	142	9.85	0.23	110
	1-Aug-12	5.44	118	12.29	0.17	135
	30-Oct-12	5.68	182	12.59	0.56	253
	23-Jan-13	5.34	150	11.22	0.33	125
	2-Apr-13	5.48	180	11.87	0.32	201
	23-Jul-13	5.33	154	13.18	0.16	111
	17-Oct-13	5.48	196	12.45	0.48	206
Decon	16-Nov-10	6.13	105	10.12	2.98	190
	10-Feb-11	NS	NS	NS	NS	NS
	6-Jul-11	6.59	97	11.14	9.03	5
	25-Oct-11	6.14	67	11.00	3.85	75
	26-Jan-11	NS	NS	NS	NS	NS
	10-Apr-12	NS	NS	NS	NS	NS
	1-Aug-12	5.81	139	23.92	1.12	47
	30-Oct-12	6.19	42	12.40	2.36	160
	23-Jan-13	NS	NS	NS	NS	NS
	2-Apr-13	NS	NS	NS	NS	NS
	24-Jul-13	6.82	88	14.05	5.36	149
	17-Oct-13	NS	NS	NS	NS	NS

Notes:
^{o}C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts
µS/cm = microSiemens per centimeter
DO = Dissolved oxygen
ORP = Oxidation-reduction potential
NS = Not sampled
R = Rejected
J = Estimate
[green shaded box] = Data from 2013 sampling.

Table A-4
Groundwater Monitoring Results
Other Analytes Results
East Mission Flats Repository

Well No.	Sample Date	Total Constituents (mg/L)							Dissolved Constituents (mg/L)						
		Carbonate	Bicarbonate	Alkalinity	Calcium	Magnesium	Phosphorus	Hardness	Chloride	Nitrate as N	Sulfate as SO_4	Calcium	Magnesium	Sodium	Potassium
MW-A	11 Dec 07	ND	NS	23.0	NS	NS	0.01	39.9	NS	NS	NS	9.12	4.16	12.8	7.79
	25 Feb 08	ND	13.7	13.7	NS	NS	0.02	76.5	NS	NS	NS	16.1	8.8	18.1	7.83
	3-Jun-08	ND	8.3	8.3	NS	NS	0.4	48.1	NS	NS	NS	10.5	5.28	7.00	3.08
	19-Aug-08	ND	19.5	19.5	12.1	6.41	0.01	56.7	NS	NS	NS	11.5	5.94	7.41	2.89
	10-Nov-08	ND	30.6	30.6	8.94	4.59	0.04	41.2	10.1	ND	35.6	8.58	4.39	5.58	2.98
	4-Feb-09	ND	25.7	25.7	14.0	7.76	0.12	67	11.3	ND	75.7	14.2	7.65	10.5	3.60
	7-May-09	ND	9.1	9.1	11.3	6.11	0.33	53.4	9.63	ND	56.8	11.1	5.83	6.69	2.42
	10-Aug-09	ND	25.0	25.0	10.4	5.57	0.04	49	7.29	ND	49.9	10.4	5.48	5.66	1.95
	11-Nov-09	ND	19.5	19.5	7.36	3.91	ND	34.5	6.87	ND	32.4	7.52	3.88	4.56	1.97
	25-Feb-10	ND	10.9	10.9	12.4	6.70	0.04	58.6	7.93	ND	56.4	12.1	6.31	6.87	2.30
	19-May-10	ND	11.8	11.8	11.2	6.00	ND	52.7	7.71	ND	49.8	11.2	6.16	6.63	2.06
	25-Aug-10	ND	11.4	11.4	9.47	4.87	0.04	43.7	6.47	ND	41.3	9.68	4.87	4.86	1.43
	16-Nov-10	ND	15.4	15.4	11.4	5.99	0.005 J	53	6.41	ND	42.6	10.9	5.74	5.84	1.68
	10-Feb-11	NS	NS	10.8	14.8	7.91	2.45	70	7.81	ND	63.3	14.1	7.75	8.34	2.12 J
	6-Jul-11	ND	9.8	9.8	15.5	8.38	2.42	73.3	7.95	ND	72.2	14.8	8.12	7.48	2.29
	24-Oct-11	ND	23.5	23.5	12.5	6.65	0.682	58.5	7.7	ND	47.4	11.6	6.21	5.98	1.60
	25-Jan-12	ND	18.0	18.0	15.7 J	7.58 J	0.124 J	70.4	7.18	ND	60.4	14.6	7.02	6.45	1.64
	10-Apr-12	ND	10.7	10.7	15.2	7.46	2.13 J	68.6	7.13	ND	63.2	14.5	6.87	6.24	1.63
	31-Jul-12	ND	14.8	14.8	16.5	8.31	1.02	75.5	6.66	ND	70.4	14.8	7.49	5.99	1.51
	29-Oct-12	ND	15.9	15.9	10.8	5.40	0.219	49.3	7.32	ND	40.1	10.6	5.2	5.13	1.60
	23-Jan-13	ND	23.8	23.8	15.7	7.96	0.16 J	72.1	6.77	ND	63.1	15.4	7.68	6.59	1.59
	2-Apr-13	ND	9.0	9.0	13.6	7.20	0.579	63.7	8.32	ND	55.6	13.6	7.25	6.18	1.43
	23-Jul-13	ND	9.8	9.8	16.8	8.51	0.472	77	7.22	ND	63.7	15.5	7.94	6.76	1.68
	17-Oct-13	ND	10.6	10.6	9.97	5.00 J	0.252	45.5	9.9	0.1	34.3	9.29	4.65	4.79	1.31
MW-B	10 Dec 07	ND	13.9	13.9	NS	NS	ND	36.5	NS	NS	NS	9.18	3.29	5.31	0.69
	25 Feb 08	ND	13.0	13.0	NS	NS	0.01	39.2	NS	NS	NS	10	3.6	7.29	0.72
	3-Jun-08	ND	10.8	10.8	NS	NS	0.01	36.2	NS	NS	NS	9.01	3.32	5.64	0.87
	19-Aug-08	ND	12.4	12.4	6.76	2.45	0.01	27	NS	NS	NS	6.4	2.29	4.91	0.88
	10-Nov-08	ND	15.8	15.8	7.65	2.76	0.01	30.5	5.3	ND	22.4	7.47	2.66	4.82	0.90
	4-Feb-09	ND	12.7	12.7	7.34	2.62	ND	29.1	4.19	0.372	23.3	7.24	2.52	4.79	0.80
	7-May-09	ND	7.8	7.8	5.17	1.90	ND	20.7	2.24	0.165	20.1	5.11	1.86	2.59	ND
	10-Aug-09	ND	10.6	10.6	5.82	2.18	0.02	23.5	3.49	0.125	26.1	5.81	2.22	3.47	0.55
	11-Nov-09	ND	11.6	11.6	6.35	2.36	ND	25.6	5.06	ND	22.9	6.52	2.36	5.18	0.67
	25-Feb-10	ND	12.3	12.3	6.84	2.48	ND	27.3	3.8	0.195	21.5	6.62	2.42	4.29	0.53
	19-May-10	ND	12.0	12.0	8.58	3.18	ND	34.5	6.31	0.332	22.3	8.57	3.31	4.38	0.54
	25-Aug-10	ND	13.1	13.1	7.04	2.65	0.01	28.5	3.94	0.173	16.9	7.23	2.64	3.66	ND
	16-Nov-10	ND	14.3	14.3	8.20	3.07	ND	33.1	4.14	0.052	19.1	8.54	3.14	5.08	0.578
	10-Feb-11	NS	NS	7.7	5.43	2.04	0.0395	22	2.41	0.146	13.8	5.24	1.97	3.43	0.899 J
	6-Jul-11	ND	10.8	10.8	4.02	1.49	0.0532 J	16.2	3.09	ND	9.31	4.18	1.53	3.85	ND
	24-Oct-11	ND	14.4	14.4	6.15	2.31	0.0456 J	24.9	3.21	ND	11.5	5.84	2.13	4.13	0.516
	25-Jan-12	ND	14.0	14.0	6.20 J	2.00 J	0.0468 J	23.7 J	3.31	ND	13	6.17	2.01	4.19	0.714
	10-Apr-12	ND	5.8	5.8	3.94	1.35	0.0262 J	15.4 J	2.74	0.061	10.7	3.79	1.21	2.96	ND
	31-Jul-12	ND	10.5	10.5	3.25	1.10	0.0302 J	12.6 J	1.72	ND	5.71	3.52	1.2	3.06	0.505
	29-Oct-12	ND	17.1	17.1	6.20	2.16	0.0241	24.4 J	2.79	ND	10.3	6.23	2.16	3.65	0.73
	24-Jan-13	ND	12.6	12.6	5.35	1.80	0.0303 J	20.8 J	2.71	0.133	12.2	5.5	1.77	5.67	0.998
	2-Apr-13	ND	16.6	16.6	6.28	2.29	0.0346 J	25.1 J	3.29	0.098	12.6	6.58	2.41	4.06	0.689
	23-Jul-13	ND	17.7	17.7	8.14	2.80	0.0358 J	31.9 J	3.1	0.377	11.9	7.43	2.62	4.23	0.601
	17-Oct-13	ND	21.3	21.3	7.67	2.68 J	0.0238 J	30.2	3.33	0.433	13.1	7.26	2.51	4.33	0.529

Well No.	Sample Date	Total Constituents (mg/L)							Dissolved Constituents (mg/L)						
		Carbonate	Bicarbonate	Alkalinity	Calcium	Magnesium	Phosphorus	Hardness	Chloride	Nitrate as N	Sulfate as SO_4	Calcium	Magnesium	Sodium	Potassium
MW-C	10 Dec 07	ND	21.6	21.6	NS	NS	ND	26.3	NS	NS	NS	5.79	2.9	5.04	2.21
	25 Feb 08	ND	17.9	17.9	NS	NS	ND	30.5	NS	NS	NS	6.5	3.46	4.82	1.71
	3-Jun-08	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	19-Aug-08	ND	17.5	17.5	4.96	2.65	0.01	23.3	NS	NS	NS	5.79	2.43	3.75	1.45
	10-Nov-08	ND	24.0	24.0	5.47	2.94	0.02	25.8	3.43	0.05 ND	18.5	5.3	2.83	3.62	1.42
	3-Feb-09	ND	25.9	25.9	6.20	3.40	ND	29.5	3.49	0.065	21.7	6.05	3.19	4.17	1.51
	7-May-09	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	10-Aug-09	ND	17.2	17.2	4.31	2.41	0.02	20.7	3.06	ND	19.4	4.47	2.56	3.43	1.13
	11-Nov-09	ND	17.9	17.9	5.02	2.85	ND	24.3	3.19	ND	16.4	5.12	2.84	3.51	1.18
	25-Feb-10	ND	17.0	17.0	5.81	3.15	ND	27.5	4.35	0.064 ND	22.5	5.66	3.11	3.59	1.23
	19-May-10	ND	28.5	28.5	5.99	3.34	0.01	28.7	4.36	ND	16.2	5.71	3.45	3.90	1.18
	25-Aug-10	ND	21.2	21.2	5.56	3.13	0.01	26.8	5.72	ND	13.4	5.63	3.1	4.52	1.29
	16-Nov-10	ND	22.8	22.8	7.19	4.02	ND	34.5	6.44	ND	15.3	7.09	4	5.16	1.53
	10-Feb-11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	6-Jul-11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	24-Oct-11	ND	22.8	22.8	4.92	2.80	0.0449 J	23.8	3.65	ND	11.6	5.43	3.15	4.74	1.50
	25-Jan-12	ND	16.1	16.1	5.25 J	2.68 J	0.0351 J	24.1 J	3.57	ND	14.1	5.17	2.62	4.06	1.20
	10-Apr-12	ND	20.4	20.4	5.67	2.87	0.0483 J	26 J	3.36	0.279	9.78	5.3	2.56	3.57	1.72
	31-Jul-12	ND	15.9	15.9	3.66	1.97	0.0512 J	17.2 J	2.02	ND	8.02	3.6	1.94	3.68	1.21
	29-Oct-12	ND	26.4	26.4	5.06	2.74	0.072	23.9 J	3.5	ND	11.1	4.97	2.66	4.01	1.45
	23-Jan-13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2-Apr-13	ND	19.5	19.5	5.63	3.27	0.0279 J	27.5 J	4.66	ND	14.6	6.01	3.48	4.66	1.59
	23-Jul-13	ND	22.4	22.4	6.40	3.52	0.0287 J	30.5 J	5.12	ND	13.8	6.83	3.76	5.21	1.64
	17-Oct-13	ND	28.7	28.7	6.96	3.85 J	0.0292 J	33.2	5.6	ND	13.8	6.59	3.55	4.89	1.48
MW-C Deep	25-Feb-10	ND	36.3	36.3	10.3	3.29	ND	39.3	1.8	0.136	13.7	9.9	3.19	3.17	0.69
	19-May-10	ND	32.2	32.2	9.01	3.11	ND	35.3	1.45	0.13	12.4	8.82	3.22	3.65	0.69
	25-Aug-10	ND	30.1	30.1	8.73	3.01	0.01	34.2	3.12	ND	10	9.14	3.11	3.52	0.75
	16-Nov-10	ND	30.9	30.9	11.4	3.95	ND	44.6	2.85	0.079	11.8	10.7	3.75	4.15	0.801
	10-Feb-11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	6-Jul-11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	24-Oct-11	ND	31.6	31.6	7.89	2.75	0.0405 J	31	3.21	ND	10.1	8.98	3.1	3.84	0.776
	25-Jan-12	ND	53.8	53.8	15.0 J	4.00 J	0.0463 J	53.8	2.44	ND	8.86	13.6	3.59	6.29	1.00
	10-Apr-12	ND	36.0	36.0	10.0	4.17	0.0541 J	42.2	3.09	ND	10.2	9.88	3.96	3.78	1.30
	31-Jul-12	ND	34.4	34.4	8.19	2.69	0.0248 J	31.5 J	2.61	ND	7.11	8.72	2.86	3.80	0.831
	29-Oct-12	ND	36.1	36.1	9.02	2.99	0.0195	34.8	2.91	ND	9.56	9.18	3.01	3.93	0.945
	23-Jan-13	ND	31.0	31.0	10.3	3.38	0.0258 J	39.7	2.85	ND	11.8	NM	NM	NM	NM
	2-Apr-13	ND	30.1	30.1	9.30	3.02	0.0304 J	35.7	2.79	ND	11.7	9.19	2.95	3.9	0.776
	23-Jul-13	ND	36.2	36.2	8.76	3.01	0.0633 J	34.3	2.86	ND	6.46	9.66	3.19	5.49	0.998
	17-Oct-13	ND	34.4	34.4	9.41	3.10 J	0.029 J	36.3	2.45	ND	9.44	9.01	2.9	3.99	0.731

Well No.	Sample Date	Total Constituents (mg/L)							Dissolved Constituents (mg/L)						
		Carbonate	Bicarbonate	Alkalinity	Calcium	Magnesium	Phosphorus	Hardness	Chloride	Nitrate as N	Sulfate as SO_4	Calcium	Magnesium	Sodium	Potassium
MW-D	10 Dec 07	ND	35.7	35.7	NS	NS	0.01 ND	32.7	NS	NS	NS	8.14	3.01	5.42	2.49
	25 Feb 08	ND	26.4	26.4	NS	NS	0.02	36.9	NS	NS	NS	8.52	3.8	7.72	2.39
	3-Jun-08	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	19-Aug-08	ND	30.1	30.1	7.01	3.31	0.05	31.1	NS	NS	NS	6.94	3.19	4.91	1.23
	10-Nov-08	ND	34.0	34.0	7.29	3.56	0.05	32.9	5.28	ND	18	6.96	3.32	5.35	1.39
	3-Feb-09	ND	30.7	30.7	7.00	3.48	0.1	31.8	4.46	ND	20.4	7.14	3.38	5.97	1.47
	7-May-09	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	11-Aug-09	ND	32.2	32.2	5.74	2.95	0.1	26.5	3.18	ND	18.9	5.91	2.93	4.74	1.21
	11-Nov-09	ND	30.8	30.8	6.05	3.09	0.1	27.8	3.21	ND	13.6	6.19	3.05	4.70	1.14
	25-Feb-10	ND	24.3	24.3	6.56	3.30	0.14	30	3.66	0.09	19.3	6.23	3.18	5.11	1.25
	19-May-10	ND	27.2	27.2	7.01	3.33	0.04	31.2	3.08	0.064	12.8	6.95	3.43	4.37	1.04
	25-Aug-10	ND	30.6	30.6	6.46	3.28	0.2	29.7	3.8	ND	12.2	6.65	3.23	4.90	1.16
	16-Nov-10	ND	30.1	30.1	6.85	3.64	0.0145	32.1	3.8	ND	11.5	7.1	3.69	5.81	1.35
	10-Feb-11	NS	NS	27.3	7.21	3.44	0.607	32	3.35	0.06	11.1	7.19	3.46	5.26	1.72 J
	6-Jul-11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	25-Oct-11	ND	36.2	36.2	5.71	3.09	0.239	27	3.03	ND	11.4	5.98	3.17	5.17	1.21
	26-Jan-12	ND	24.0	24.0	6.25 J	2.97 J	0.0856 J	27.9 J	3.13	0.058 J	12.4	6.12	2.93	4.82	1.26
	10-Apr-12	ND	31.6	31.6	8.22	3.37	0.0541 J	34.4	3.61	ND	9.05	8.02	3.24	4.06	1.01
	1-Aug-12	ND	36.4	36.4	6.73	3.26	1.03	30.2 J	2.7	ND	9.35	6.92	3.32	4.78	1.21
	30-Oct-12	ND	39.0	39.0	6.74	3.42	0.238	30.9 J	2.93	ND	10.4	6.51	3.26	4.90	1.32
	24-Jan-13	ND	27.1	27.1	6.68	3.33	0.849	30.4 J	3.22	ND	11.1	6.88	3.36	4.99	1.23
	2-Apr-13	ND	25.7	25.7	6.77	3.57	3.03	31.6 J	4.22	ND	12	6.31	3.34	5.06	1.22
	23-Jul-13	ND	24.0	24.0	6.30	3.15	2.18	28.7 J	3.86	ND	10.1	6.23	3.16	5.11	1.26
	17-Oct-13	ND	29.5	29.5	6.95	3.23 J	1.32	30.6	4.41	ND	8.83	6.66	3.14	4.35	1.12
MW-E	10 Nov 08	ND	545	545	147	56.7	0.13	601	63.8	ND	165	145	55.1	27.3	4.21
	3-Feb-09	ND	606	606	158	61.2	0.06	647	63.3	ND	169	161	60	23.8	3.55
	7-May-09	ND	539	539	162	63.6	0.35	666	70.3	ND	174	155	59.8	21.9	3.39
	11-Aug-09	ND	534	534	137	58.0	0.46	580	63.4	ND	168	141	56.6	23.3	3.68
	11-Nov-09	ND	565	565	157	62.1	0.58	649	75.4	ND	164	158	60.6	18.1	3.14
	25-Feb-10	ND	679	679	174	66.1	0.49	705	76.9	ND	172	173	65.5	18.1	3.17
	19-May-10	ND	612	612	175	68.9	0.31	722	78.1	ND	174	183	73.2	19.5	3.07
	25-Aug-10	ND	552	552	164	63.9	0.44	674	71.9	ND	168	173	65.2	21.7	3.50
	16-Nov-10	ND	584	584	206	81.3	0.0671	849	81	ND	178	40.6	40.9	23.7	4.00
	10-Feb-11	NS	NS	562	185	73.2	0.395	763	1.97	ND	176	183	72.5	23.7	4.21
	6-Jul-11	ND	555	555	165	63.0	0.786	671	81.2	ND	190	162	62.9	23.3	3.62
	24-Oct-11	ND	556	556	160	64.7	0.262 J	666	67.6	ND	180	162	65.1	25.1	3.85
	26-Jan-12	ND	568	568	195	68.9 J	0.227 J	770	2.12	0.194 J	239	188	67.2	20.5	3.43
	11-Apr-12	ND	583	583	214	76.4	0.0935 J	850	94.1	ND	246	209	72.2	21.4	3.52
	1-Aug-12	ND	600	600	204	73.9	0.261	814	85.9	ND	225	202	73.5	23.2	3.72
	29-Oct-12	ND	640	640	205	73.6	0.375	815	96.9	ND	227	198	70.6	22.5	3.82
	23-Jan-13	ND	570	570	224	78.7	0.182	884	121	0.422	252	226	78.5	23	3.52
	2-Apr-13	ND	562	562	212	79.3	0.0874 J	856	137	0.22	255	211	79.3	22.3	3.44
	23-Jul-13	ND	577	577	232	84.5	0.181 J	926	144	ND	229	225	81	23.9	3.65
	17-Oct-13	ND	597	597	237	85.4 J	0.352	943	210	ND	200	230	81.3	23.2	3.68

Well No.	Sample Date	Total Constituents (mg/L)							Dissolved Constituents (mg/L)						
		Carbonate	Bicarbonate	Alkalinity	Calcium	Magnesium	Phosphorus	Hardness	Chloride	Nitrate as N	Sulfate as SO_4	Calcium	Magnesium	Sodium	Potassium
MW-F	11-Nov-08	ND	14.5	14.5	11.0	4.66	ND	46.8	11.5	ND	34.2	10.4	4.44	5.06	0.78
	3-Feb-09	ND	16.8	16.8	10.5	4.21	ND	43.5	8.29	ND	32.6	10.5	4.04	4.53	0.75
	7-May-09	ND	12.8	12.8	9.91	4.03	0.01	41.3	8.01	0.596	39.3	9.86	3.88	4.39	0.75
	10-Aug-09	ND	12.0	12.0	7.97	3.38	0.01	33.8	7.7	ND	39.5	8.4	3.45	4.00	0.72
	11-Nov-09	ND	12.4	12.4	12.2	5.23	ND	51.9	18.5	ND	35.7	12.5	5.26	5.95	0.75
	25-Feb-10	ND	12.8	12.8	19.6	8.70	ND	84.8	31.2	0.153	50.9	19.2	8.67	7.82	0.91
	19-May-10	ND	13.4	13.4	23.5	11.0	0.01	104	38.2	0.255	66	23.4	11.5	10.2	0.92
	25-Aug-10	ND	14.9	14.9	11.8	4.93	ND	49.7	13.1	ND	32.8	12	4.91	5.72	0.75
	16-Nov-10	ND	14.4	14.4	17.7	8.02	ND	0.0773	27.3	ND	40.5	18.6	8.3	9.58	0.984
	10-Feb-11	NS	NS	14.6	12.7	5.32	0.0329	54	13.5	0.203	31.6	13	5.46	7.20	1.21 J
	6-Jul-11	ND	11.7	11.7	7.22	3.01	0.0415 J	30.4	7.13	ND	21.6	7.18	3.1	5.09	0.714
	25-Oct-11	ND	13.5	13.5	10.7	4.90	0.0391 J	46.9	18.8	ND	24.8	11	4.95	8.56	1.19
	26-Jan-12	ND	13.7	13.7	17.1 J	7.18 J	0.0381 J	72.3	33	ND	38	16.8	7.04	10.9	1.01
	11-Apr-12	ND	16.1	16.1	10.3	3.98	0.0193 J	42.1	11.8	0.109	24.6	10	3.78	6.78	0.711
	1-Aug-12	ND	14.3	14.3	7.82	3.16	0.0175 J	32.5 J	8.35	ND	21.6	8.01	3.24	6.15	0.775
	30-Oct-12	ND	14.2	14.2	11.2	4.69	0.0232	47.3	19.8	ND	25.4	10.9	4.63	8.98	1.02
	23-Jan-13	ND	14.0	14.0	11.1	4.64	0.0269 J	46.9	17.6	ND	27.4	11.6	4.69	9.65	0.894
	2-Apr-13	ND	15.6	15.6	12.3	5.85	0.0283 J	54.8	27.3	ND	36.4	13.8	6.51	13.4	1.04
	23-Jul-13	ND	16.9	16.9	11.4	4.90	0.0297 J	48.7	16.3	ND	30.8	11.7	5.04	10.5	0.915
	17-Oct-13	ND	17.5	17.5	14.2	6.27 J	0.0225 J	61.3	28.6	0.061	40.5	14.6	6.52	14.0	0.991
Decon Well	16-Nov-10	ND	31.6	31.6	11.0	3.89	ND	43.5	4.27	0.054	11.2	10.7	3.81	4.18	0.858
	10-Feb-11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	6-Jul-11	ND	29.1	29.1	7.73	2.82	0.0774 J	30.9	3.27	ND	12	7.97	2.91	3.94	0.917
	25-Oct-11	ND	28.8	28.8	8.85	3.22	0.0629 J	35.3	3.21	0.091	10.5	8.72	3.1	4.00	0.799
	26-Jan-12	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	10-Apr-12	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	1-Aug-12	ND	55.7	55.7	9.47	3.14	0.165	36.6	2.6	ND	7.39	9.84	3.26	3.92	0.948
	30-Oct-12	ND	31.1	31.1	9.10	3.10	0.0367	35.5	2.9	ND	9.85	8.65	2.85	3.90	0.934
	23-Jan-13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2-Apr-13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	24-Jul-13	ND	31.3	31.3	9.52	3.23	0.0348 J	37.1	2.83	0.056	9.04	9.89	3.37	4.36	0.956
	17-Oct-13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Reporting Limit [a]		1	1	1	0.040	0.060	0.01	0.347	0.2	0.05	0.3	0.04	0.06	0.5	0.5
Regulatory Threshold		none	none	none	none	none	none	none	250	10	250	none	none	none	none

Notes:

mg/L = milligrams per liter

ND = Not detected above reporting limit

NS = Not sampled

J = Reported concentration is an estimate based on data quality review

a. Method Reporting Limit (MRL) as listed in the SAP/QAPP (TerraGraphics 2010). However, RL is higher if a sample dilution is necessary.

(pink) = Value exceeds the regulatory threshold

(green) = Data from 2013 sampling.

Table A-5
2013 Groundwater Elevations

Monitoring Well	Water Levels (ft amsl)				Change in Water Level/Observations
	Jan. 23/24, 2013	Apr. 2, 2013	Jul. 23, 2013	Oct. 17, 2013	
07-EMF-MW-A	2127.75	2131.96	2127.51	2126.92	5.04
07-EMF-MW-B	2127.68	2131.75	2127.46	2126.83	4.92
07-EMF-MW-C	NM	2131.77	2127.59	2126.90	4.87
09-EMF-MW-C-DEEP	2127.57	2131.75	2127.47	2126.89	4.86
07-EMF-MW-D	2128.15	2131.99	2127.92	2126.98	5.01
08-EMF-MW-E	2135.62	2135.57	2132.54	2131.03	4.59
09-EMF-MW-F	2127.56	2131.79	2127.38	2126.74	5.05
Decon	NM	NM	NM	NM	NA

Notes:

bgs = below ground surface

amsl = above mean sea level

NM = not measured

NA = not applicable

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Appendix B. Maintenance and Sediment Infilling

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Maintenance

No maintenance occurred in 2013 to the monitoring wells or piezometers. The telemetry equipment in PZ-A did not function and troubleshooting, in coordination with the manufacturer, was unsuccessful.

Sediment Infilling

Sediment infilling was evaluated at the seven monitoring wells. Depth to bottom of the well was measured (smallest interval is 0.01 feet) to determine if sediment is accumulating and causing clogging of the well screen. Depth to bottom in the Decon well was not measured because the pump is permanently deployed. From 2012 to 2013, the measured depth to bottom in three of the wells (MW-A, MW-E, and MW-F) appeared to increase slightly by 0.01 to 0.02 feet. The depth to bottom decreased in the other four wells (MW-B, MW-C, MW-C-Deep, and MW-D), with changes ranging from 0.04 feet (MW-C) to 0.09 feet (MW-C-Deep). The decrease in the depth to bottom measurement likely represents sediment infill. Based on these measurements and the accuracy of the method, minor sediment infilling occurred in four of the groundwater monitoring wells but is not expected to clog the well screen or interfere with water sampling.

Table B-1
Monitoring Well Sediment Infill from 2012 to 2013

Monitoring Well	2012 Depth-to-Bottom (ft bgs)	2013 Depth-to-Bottom (ft bgs)	Change/Sediment Infill (ft)
07-EMF-MW-A	29.60	29.62	-0.02
07-EMF-MW-B	30.34	30.29	0.05
07-EMF-MW-C	30.35	30.31	0.04
09-EMF-MW-C-DEEP	98.15	98.06	0.09
07-EMF-MW-D	30.38	30.31	0.07
08-EMF-MW-E	27.43	27.45	-0.02
09-EMF-MW-F	31.66	31.67	-0.01
Decon	74.28	NM	NA

Notes:

bgs = below ground surface

amsl = above mean sea level

NM = not measured

NA = not applicable