**Figure 6** provides an example of this condition and shows that the overall zinc concentration at Monitoring Well B has decreased since the repository was constructed. The latest statistical evaluation of the monitoring data confirms that the amount of contaminants in groundwater is either stable or decreasing.

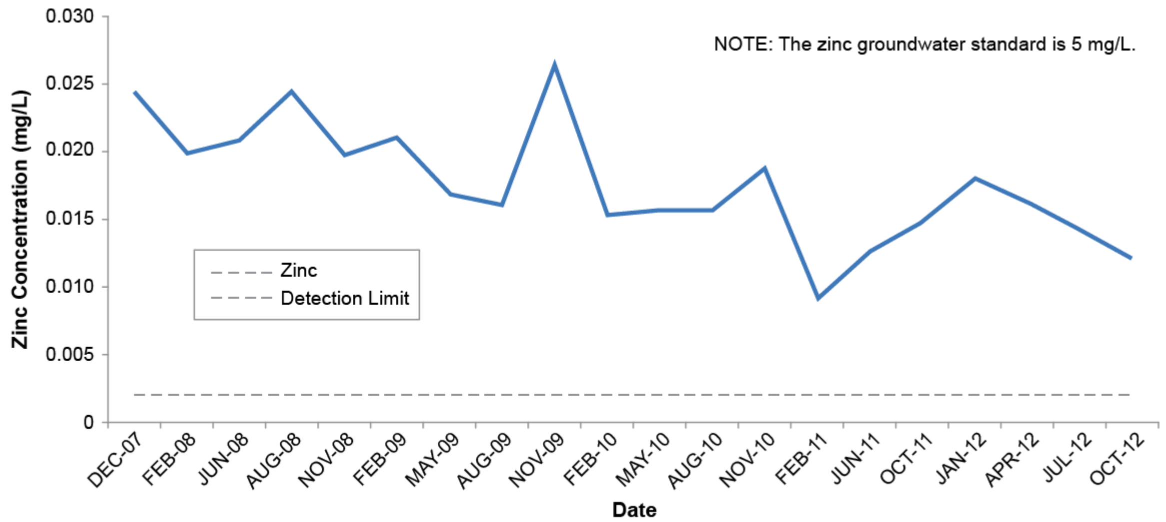


FIGURE 6. Zinc Concentrations are Decreasing at Monitoring Well B

**Figure 7** provides the groundwater monitoring information for zinc. Zinc is more mobile than some other metals like lead. Under existing conditions, zinc spends more time dissolved in water than sticking to soil. The little gray inset explains what the boxes and lines mean for the range of sample results at each well. The regulatory limit is shown by the dashed line going across the top of the figure. There is no primary drinking water standard for zinc, so the secondary standard is the limit. Primary groundwater standards are based on protection of human health while secondary standards are generally based on aesthetic qualities such as taste or color. Zinc concentrations have remained below regulatory standards since monitoring began.

Figure 6 shows a statistically significant, decreasing trend for zinc in Monitoring Well B. It should be noted that these levels are quite low. See Figure 7 for how the Monitoring Well B zinc concentration compares to other wells sampled and to the regulatory limit.

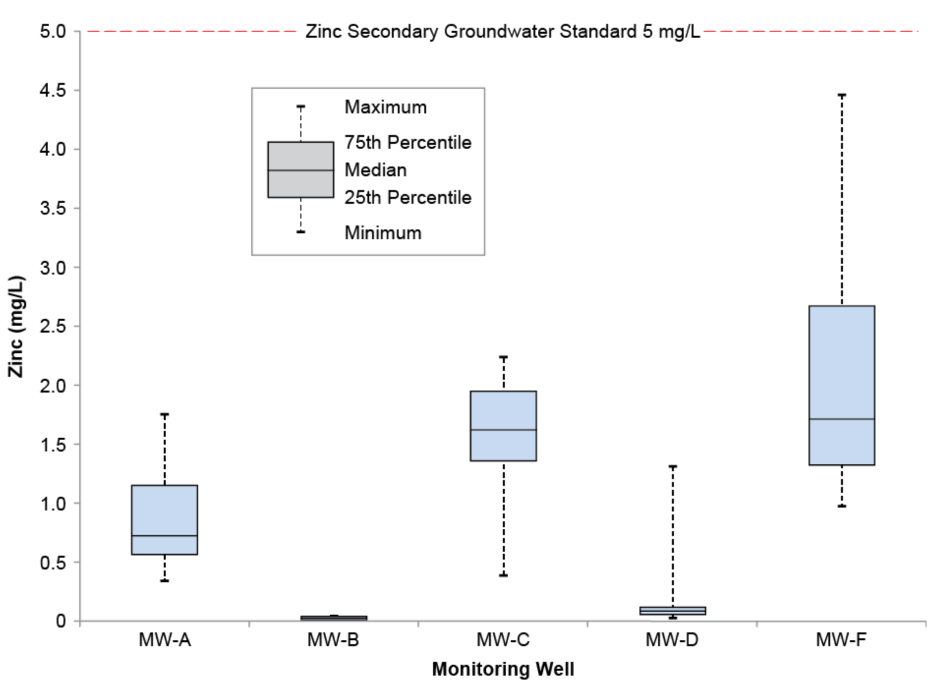


FIGURE 7. Box Plots of Zinc Concentration in Groundwater Monitoring Wells at the East Mission Flats Repository, 2007-2012

## Summary of Sampling Results

Flood water sampling results indicate that surface water quality is not impacted by waste material placed in the repository. Flood waters contain fewer metals when they leave the site, due to the natural process of sedimentation that occurs in this area.

Evaluation of groundwater samples confirms that groundwater metals concentrations have remained stable or decreased since monitoring began prior to repository construction. It is anticipated that groundwater metals concentrations will continue to fluctuate due to the historical contamination that exists throughout the area. Monitoring of the site and evaluation of trends will continue to help ensure safe and effective repository operations as waste placement continues.

## Conclusions

The sampling plan at this repository is designed to detect any impact the continued placement of material has on the surrounding environment. The groundwater is monitored quarterly to continually ensure that contaminants remain on site and do not contaminate groundwater. The site is visually inspected weekly and the EPA will continue to monitor flood events. EPA continues to look for ways to improve the monitoring of EMFR and welcomes your ideas.

## Questions?

Feel free to contact Craig Cameron at Cameron.Craig@epa.gov or 509-376-8665.

For monitoring results and more information: http://yosemite.epa.gov/R10/CLEANUP.NSF/sites/east_mission_flats_repository.

EPA United States Environmental Protection Agency



ES031313184355SEA

# Water Sampling at East Mission Flats Repository

## Introduction

The Environmental Protection Agency wants to share the results of water samples collected from the East Mission Flats Repository (EMFR). EPA is providing this brochure in response to requests from the community. The brochure gives details about the monitoring program, sampling results, and protective features of the repository.

The EMFR is located in the Coeur d'Alene River floodplain; two miles west of Cataldo, east of Exit 39 off Interstate 90 (see **Figure 1**). The EMFR serves as a collection point for contaminated soil that has been removed from community areas and cleanup sites. Like other local repositories, the EMFR is designed to help protect people's health and the environment. Contamination is removed from many locations within the Bunker Hill Superfund Site and taken to a place where it is consolidated, stabilized, and monitored over the long term. The Idaho Department of Environmental Quality has been an active partner in clean up and has contributed significantly to the siting, operation and monitoring of repositories.

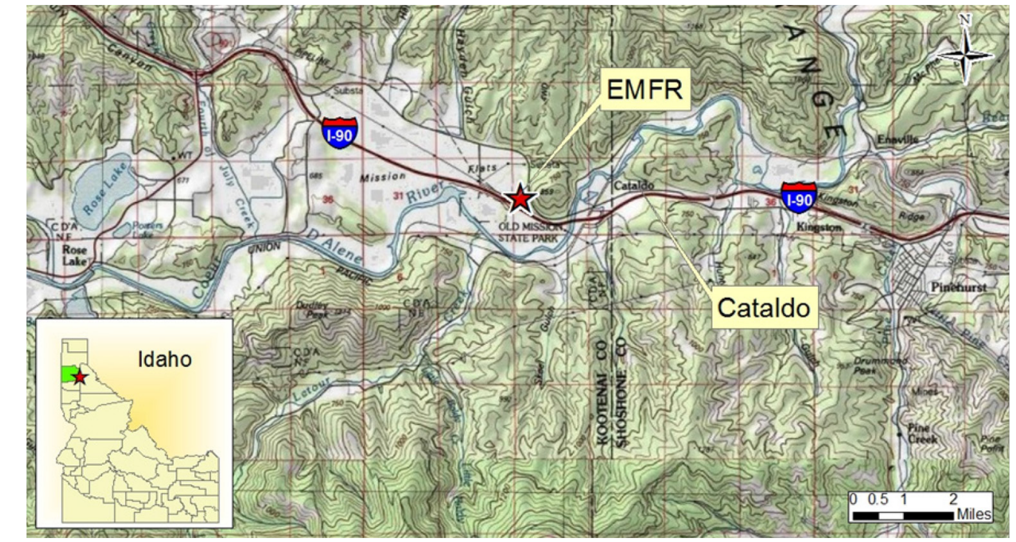


FIGURE 1. Location of East Mission Flats Repository

## Why Sample?

Waste soil within EMFR contains metals such as arsenic, lead, and zinc. Sampling ensures that the repository is doing its job: safely protecting human health. While unlikely, metals within the waste soil may leave the repository through two main pathways. Soil particles may be washed off the repository during heavy rain storms or by flood waters flowing around the repository. These particles may contaminate surface water. Secondly, under certain conditions, contamination attached to soil particles could dissolve and move with the water to contaminate groundwater or surface water. Sampling monitors these two unlikely but potential pathways.

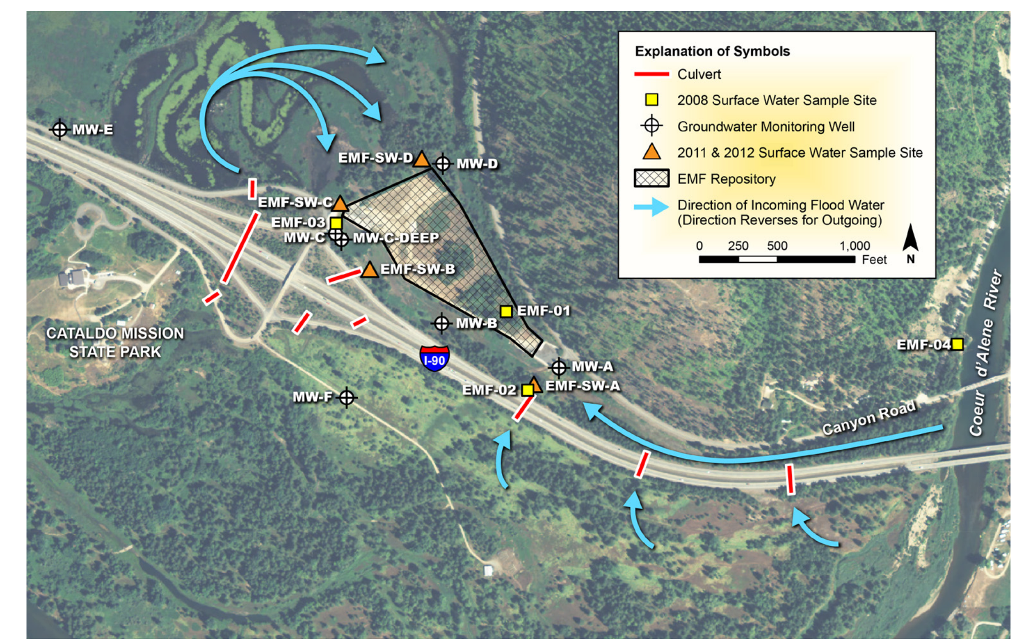


FIGURE 2. East Mission Flats Repository Surface and Groundwater Sampling Locations

## 2008 Sampling Results – Before EMFR Construction

EPA collected water samples in 2008 to determine conditions before repository construction and waste placement. EPA collected samples of flood water coming into the EMFR area on May 16, 2008. EPA sampled flood water leaving the area on May 20, 2008. **Figure 2** shows sampling locations and direction of incoming flood waters (receding flood waters generally flow in the opposite direction of the arrows shown in the figure).

EPA tested for total arsenic, lead, and zinc and dissolved amounts of the same metals. Metals not dissolved in water may settle out while the flood water recedes. Dissolved metals are more easily transported by receding flood water.

The 2008 pre-construction sampling results showed that metals-contaminated sediments carried in the flood water entered the area where the future repository would be and settled out. Because the contaminated sediments settled out, the water was cleaner when it left the site than when it entered. Although the total amount of minerals in the water dropped, there were slight increases in the amount of lead dissolved in the water leaving the site at EMF-01 and EMF-02 and increased amounts of zinc dissolved in the water at EMF-04 (see Figure 2). The increases were barely measurable and insignificant compared to the overall decrease in total concentrations.

## 2009 EMFR Construction

Flood water sampling results helped determine what types of features were needed to protect the EMFR. The protective features below (**Figure 3**) were used in the construction of the repository:

- Engineered filter fabric and 12 inches of six-inch rocks cover the lower part of the waste soil pile to shield it from erosion during floods.
- Top soil and vegetation stabilize slopes and help evaporate water.
- A silt fence surrounding the area is designed to collect sediment and help prevent contamination from flowing off site.
- Until the repository is filled up and closed, the repository's slopes are continually stabilized using several common techniques.

The location of the repository provides some very important natural protection, too. A layer of native clay and silt underneath the EMFR tends to capture metals on its surface, limiting any potential movement of contaminants.

Monitoring instruments called piezometers remain in the soil mass at the repository. When water is present, the piezometers record physical and chemical properties of water in the soil. These include water levels, pH levels, how the water conducts electricity, the oxidation reduction potential, water temperature, and amount of oxygen dissolved in the water. The soil mass has remained relatively dry and, generally, there has not been enough water in the soil for routine measurements. The small amount of water observed in the piezometers confirms that flood waters flow around the EMF waste soil mass, not through it.

**Figure 4**, shows the relationship between the flood plain, the freeway, the repository and Canyon Road. The location of the repository naturally slows flood flows because flood water can only enter and leave the site through a few culverts under I-90 or a restrictive side channel to the east. The slow moving flood water causes contaminants that entered the site with the flood water to settle out, or be deposited on the site. Due to this natural settling there are lower levels of contamination in flood water as it leaves the site. The settling of contaminated sediments on the flood plain had already been occurring long before the repository was located at the site. The pre-existing soil contamination located below the repository provides strong evidence of this natural process. This same process is responsible for contamination of thousands of acres of flood plain throughout the basin. EMFR is routinely inspected and flood waters have not washed away any waste placed there.

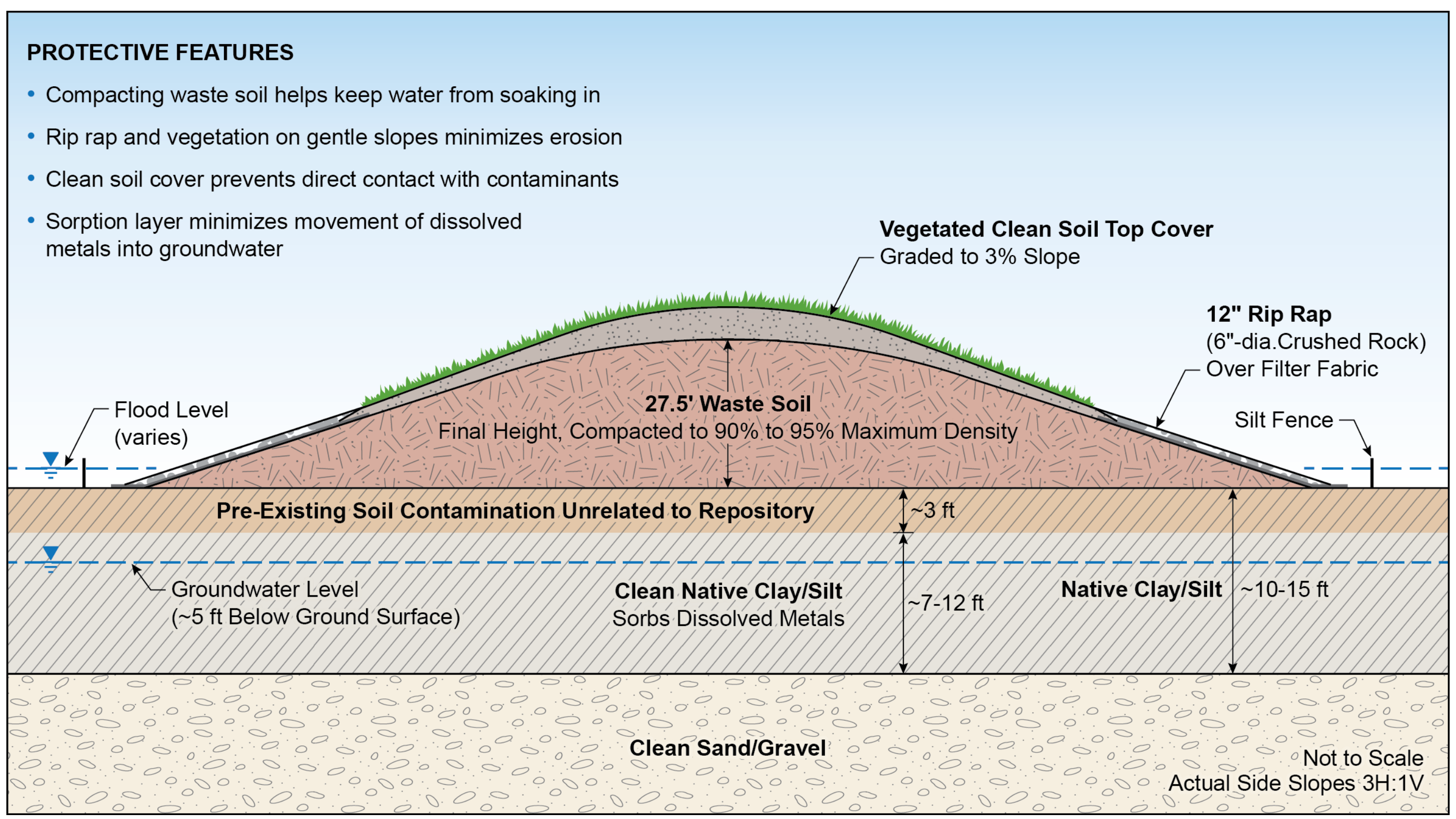


FIGURE 3. Protective Features of East Mission Flats Repository





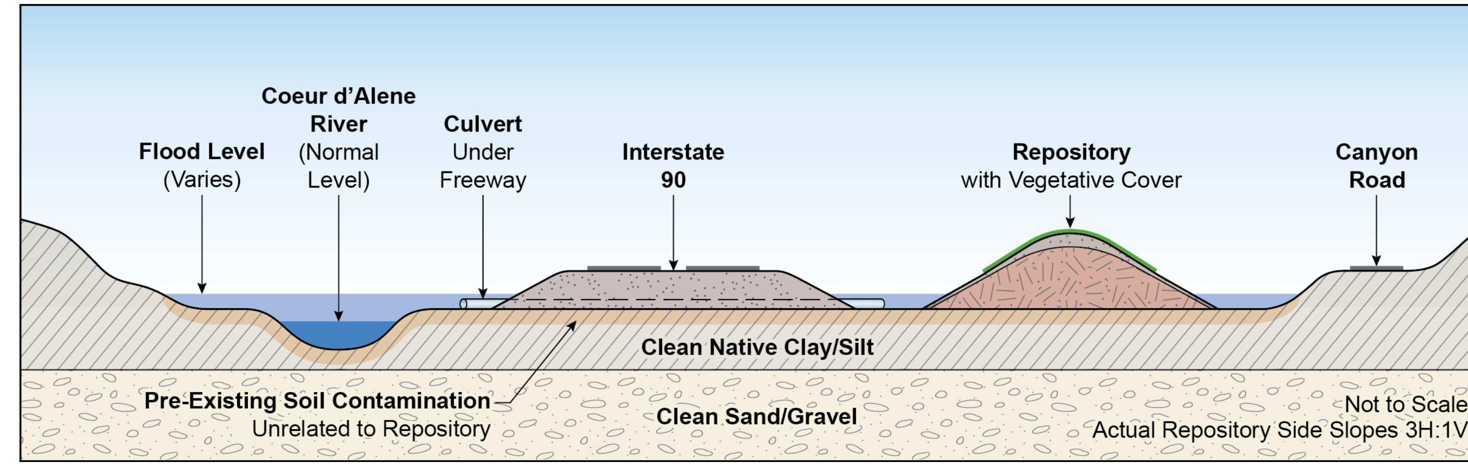


FIGURE 4. High and Low Water Levels at East Mission Flats Repository

## 2012 Flood Water Sampling Results

In April 2012, EPA collected water samples from four locations as flood water entered and left the repository area. EPA wanted to assess flood water quality surrounding the EMFR after placing contaminated soil. The sampling locations vary from those used in 2008 (Figure 2). Direct comparisons between years are difficult because no two years are exactly alike: water levels rise and fall at different rates, and floods vary in length and intensity. The results from different floods can be used to confirm that the general pattern is not changing: the flood water is generally cleaner as it flows back to the river.

Flood water sampled in 2012 showed lower amounts of arsenic, lead, and zinc in the water leaving the area. Zinc concentrations entering the site in 2012 were higher than regulations allowed for protection of aquatic life and decreased to below the regulatory values in water exiting the site. These results continue to confirm that the flood water flowing out of the area is cleaner than the contaminated flood water that entered the site. **Figure 5** shows how lead concentrations decrease due to the particles settling out that happens when flood waters recede.

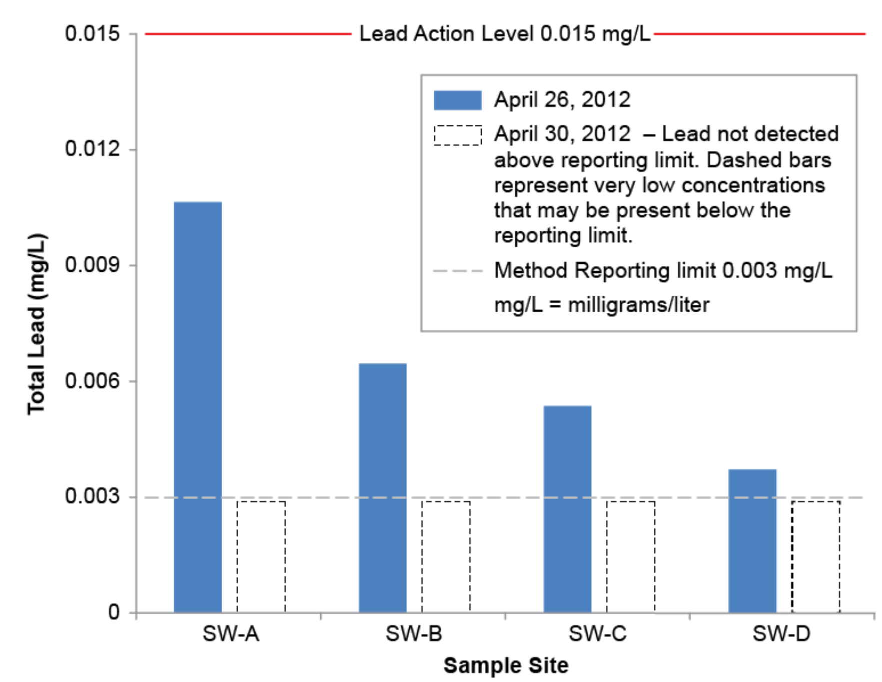


FIGURE 5. Total Lead Measured in the April 2012 Flood Water Sampling Event

## 2012 Groundwater Sampling Results

Figure 2 shows the groundwater sampling locations. Every three months, EPA collects groundwater samples to determine if the repository is impacting groundwater quality. Due to the widespread contamination in the basin, groundwater metals concentrations increase and decrease from one sample to the next. As a result, sometimes metals concentrations are greater than those measured before the repository was built. Although the frequent changes in concentration are carefully monitored, the long term overall change in concentration or trend is the most important change to note.

Detected metals concentrations in the groundwater are within the standards for drinking water. Concentrations detected in 2012 were slightly above those measured before construction in 2007-2009, but when compared to all results, the overall trend shows no detectable change in concentration.