Evaluation of UDEQ Sediment Data Collected in Response to the Gold King Mine Release

Data Collected: August 8, 2015 – October 26, 2015

Prepared and Reviewed by:
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Utah Department of Natural Resources, Division of Wildlife Resources
Utah Department of Agriculture and Food
Summary

The Utah Department of Environmental Quality (DEQ) collected sediment samples from up to five sites on at least 4 different days between August and October, 2015 on the San Juan River plus one sample collected at McElmo Wash on one day. The sampling locations were selected in the field to be more likely representative of depositional environments in the river. The first round of sediment samples was collected prior to the predicted arrival of the contaminated water from the Gold King Mine to Utah. The second sampling round was collected after the contaminated water had started crossing into Utah.

The solids/sediment portion of the contamination from the Gold King Mine was expected to travel slower and more dispersed than the dissolved water contamination because the solids could settle to the river bed in upstream sections of the San Juan River system, including in the Animas River, prior to being re-entrained and transported downstream to Utah.

At each site, ten (10) samples of the top (approximately) 1 cm of sediment were combined for laboratory analyses for each DEQ sediment sample collected at each location. Sediments were analyzed for metals and metalloids and are reported in dry weight concentrations. The Screening Analysis table compares the sediment concentrations to human health-based screening values for soil because sediment-specific screening values are unavailable. The screening-level analyses show that sediment concentrations were lower than the health-based screening values for soil which indicates that health effects to people from exposure to these pollutants in sediment are unlikely. UDAF also reviewed the sediment data and found it difficult to predict adverse effects to the health of livestock and use of irrigation waters. Storm events or natural spring runoff waters may vary the amount of elements found in waters. Continual monitoring and data collection will be necessary for long-term planning, evaluation, and continued use of the San Juan River for agricultural purposes.

While some patterns observed in pollutant concentrations in the UDWQ sediment appear to be related to the Gold King Mine spill, additional analyses are necessary. At the Stateline sample location, sediment concentrations were generally similar between the pre- and post- plume arrival samples with the exception of mercury that increased over an order of magnitude before decreasing to pre-plume concentrations by the last sampling event. The concentrations in sediment at Montezuma Creek and Bluff of aluminum, arsenic, beryllium, cobalt, copper, cadmium, chromium, iron, lead, manganese, vanadium, and zinc all increase by approximately a factor of two after the pollutant plume was predicted to arrive in Utah. The sediment concentrations then consistently decreased for the next sampling round about a month later. However, these same patterns were not consistently exhibited in the sediment samples from the downstream locations of Mexican Hat and Clay Hills. Metals concentrations in sediment at these locations did not always increase after the predicted plume arrival. For instance, beryllium concentrations were lower post-plume at the Stateline site, increased at the Montezuma and Sand Island sites, was lower post-plume at the Mexican hat site. In addition, no pre-plume sediment sample is available for the Clay Hills location to conduct a pre-plume comparison. The lack of consistent patterns of contamination at the lower San Juan sites ( Mexican Hat and Clay Hills) may be an indication that the contaminated sediments from the Gold King Mine release haven’t been transported to these locations yet.

The results of the San Juan sediment samples were also compared to concentrations measured in USGS cores collected from the San Juan River delta in Lake Powell in 2010-2011. The pollutant concentrations from the approximately 4.5 meter long cores were variable within the cores and Core 3 shows a marked increase in metals concentration at approximately 3.9 meters. The concentrations in USGS Lake Powell cores were generally higher than the DEQ sediment samples but still within the same order of magnitude for aluminum, cobalt, chromium, copper, iron, lead, manganese, vanadium, and zinc. However, the USGS core samples were not dated and based on the currently available data and small number of samples, the differences between the concentrations measured in the Lake Powell cores and DEQ sediments cannot be interpreted with confidence. More sophisticated measuring methods including dating of the sediments and repeating the study are also likely needed.

Future analyses should consider all watershed sources such as mining sources upstream including the Gold King Mine, permitted discharges and natural sources. Additional analyses are also necessary to evaluate the potential impacts of storm events on the observed concentrations. Previous analyses suggested that hydrologic influences from two large flashy tributaries (McElmo Wash and Chinle Wash) may have an important influence on background conditions in the San Juan River. DEQ is developing a long term monitoring plan to further investigate these questions.
**Screening Values**

Screening values are taken from the Agency for Toxic Substance and Disease Registry (ATSDR). As is most appropriate for recreational exposures, ATSDR Environmental Media Evaluation Guideline (EMEG) health-based child intermediate exposure (>14 days up to one year) comparison values, were chosen first if available, followed by ATSDR EMEG health-based child chronic exposure (>1 year) comparison values. In the absence of EMEGs, ATSDR child Reference Dose Media Evaluation Guidelines (RMEGs), based upon EPA RfDs, were used. In the absence of RMEGs, EPA risk-based Regional Screening Levels (RSLs) were used.

<table>
<thead>
<tr>
<th>Analyte</th>
<th>CAS #</th>
<th>Units</th>
<th>Health-Based Comparison Value for Water Ingestion (CV)</th>
<th>CV Type and Source</th>
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<tr>
<td>Aluminum</td>
<td>7429-90-5</td>
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<td>Child Chronic EMEG</td>
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<td>Barium</td>
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<td>Beryllium</td>
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<td>Cadmium</td>
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<td>Zinc</td>
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<td>Mercury</td>
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<td>9.4 [Total Metals]</td>
<td>Child RSL</td>
</tr>
</tbody>
</table>

RMEG: ATSDR Reference Dose Media Evaluation Guide
EMEG: ATSDR Environmental Media Evaluation Guide
RSL: EPA Regional Screening Level
# Sediment Screening Analysis

<table>
<thead>
<tr>
<th>Monitoring Location</th>
<th>Site Description</th>
<th>Collection Date</th>
<th>Collection Time</th>
<th>Sediment Screening Analysis</th>
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**Table:**

<table>
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<tr>
<th>Screening Level Value for Sediment</th>
<th>Above Screening Level</th>
<th>Prior to Plume Arrival</th>
<th>Estimated Plume Arrival</th>
<th>Post Plume Arrival</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Aluminum</td>
<td>Arsenic</td>
<td>Beryllium</td>
<td>Cobalt</td>
</tr>
<tr>
<td></td>
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<td>Lead</td>
<td>Magnesium</td>
<td>Mercury</td>
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<td></td>
<td>Nickel</td>
<td>Sodium</td>
<td>Thallium</td>
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</tr>
<tr>
<td>5000</td>
<td>mg/kg</td>
<td>mg/kg</td>
<td>mg/kg</td>
<td>mg/kg</td>
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<tr>
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**Notes:**
- Sediment Screening Analysis includes the analysis of various contaminants in sediment samples.
- The table illustrates the screening level values for sediment, including concentrations of metals and other substances.
- The data is organized by monitoring location and site description, providing dates and collection times for each sample.

**References:**
- UTAH DIVISION OF WATER QUALITY
- Sediment Screening Analysis

**Table Columns:
- Monitoring Location: The location where the sediment samples were collected.
- Site Description: The specific site within the location.
- Collection Date: The date the sample was collected.
- Collection Time: The time the sample was collected.
- Sediment Screening Analysis: A detailed analysis of the sediment, including concentrations of various substances.
**Cadmium**

Screening Value: 25 (mg/kg-dry)

- **Stateline**
- **At McElmo Wash**
- **Montezuma**
- **Sand Island**
- **Mexican Hat**
- **Clay Hills**

- 8/8/2015 (Pre-Plume)
- 8/15/2015 (Post-Plume)
- 8/19/2015
- 9/22/2015
- 9/23/2015
- 10/26/2015
- 10/27/2015

**Chromium**

Screening Value: 250 (mg/kg-dry)

- **Stateline**
- **At McElmo Wash**
- **Montezuma**
- **Sand Island**
- **Mexican Hat**
- **Clay Hills**

- 8/8/2015 (Pre-Plume)
- 8/15/2015 (Post-Plume)
- 8/19/2015
- 9/22/2015
- 9/23/2015
- 10/26/2015
- 10/27/2015
Iron
Screening Value: 55000 (mg/kg-dry)

- Stateline
- At McElmo Wash
- Montezuma
- Sand Island
- Mexican Hat
- Clay Hills

Lead
Screening Value: 400 (mg/kg-dry)

- Stateline
- At McElmo Wash
- Montezuma
- Sand Island
- Mexican Hat
- Clay Hills
Molybdenum
Screening Value: 250 (mg/kg-dry)

- Stateline
- At McElmo Wash
- Montezuma
- Sand Island
- Mexican Hat
- Clay Hills

Nickel
Screening Value: 1000 (mg/kg-dry)

- Stateline
- At McElmo Wash
- Montezuma
- Sand Island
- Mexican Hat
- Clay Hills
Silver
Screening Value: 250 (mg/kg-dry)

Thallium
Screening Value: 0.78 (mg/kg-dry)