UTAH DEPARTMENT of ENVIRONMENTAL QUALITY
WATER QUALITY

# *Evaluation of UDEQ Water Quality Data Collected during Spring Runoff following the Gold King Mine Release*

Data Collected: February 16, 2016 – April 4, 2016

***Prepared and Reviewed by:***
Utah Department of Environmental Quality, Division of Water Quality

## *Introduction*

DEQ collected water samples weekly at seven different locations on the San Juan River and two tributaries, McElmo Creek and Montezuma Creek during the months of February, March and the first week of April, 2016. These data were screened against recreational, drinking water, agricultural, and aquatic life criteria with exceendences shown in orange in the following tables. With the exception of aluminum criteria for aquatic life and total dissolved solids for agriculture no other exceedences of criteria were identified.

## *Standards and Screening Values used in Evaluation of San Juan River Water Quality Samples and Finished Water Data*

The table below summarizes applicable water quality standards for the San Juan River (R317-2-14), Utah's drinking water standards (R309-200-5) applicable to public drinking water systems regulated by the State of Utah, as well as screening values for recreational and agricultural uses. Recreational screening values were developed by the Utah Department of Health's Environmental Epidemiology Program (EEP). These values reflect the water contaminant concentrations that would exceed established ATSDR minimal risk levels (MRL), or EPA reference doses (RfD) if an appropriate MRL does not exist, for the most susceptible population: children under the age of five years. These recreational screening values assume an exposure duration of 60 days, with two hours/day spent in the water. The accidental ingestion rate accounts for 50 mL of river water per hour, and total body contact with the water for that two hour time period. An exceedance of these values does not necessarily indicate that adverse health effects will occur; rather, it is used as guidance for health professionals to further determine the likelihood that adverse health effects may occur due to the exposure. Agricultural screening values are derived from National Academy of Science (NAS) Water Quality Criteria, 1972 (the Blue Book). Those guidelines are reprinted in EPA's Guidelines for the Reuse of Waters for Irrigation. Dissolved metal values were used for the assessment of agricultural use waters. Estimated results values below the laboratory's reporting limit are evaluated in this analysis. These results generally show low level concentrations and do not significantly affect the analysis outcome.

| Analyte | CAS # | Units | Utah WQ Standards (R317-2-14) for San Juan River Uses [Dissolved metals] | | | | Recreational Screening Values [Total Metals] | Agricultural Screening Values [Dissolved Metals] | | | Analyte |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1C (Domestic) | 3B (warm water fish) [1-hour] | 3B (warm water fish) [4-day] | 4 (agriculture) | | Livestock Water (ug/L) | Long-Term Irrigation Waters (ug/L) [NAS, 1972] | Short-Term Irrigation Waters (ug/L) [NAS, 1972] | |
| Hardness | - | mg/L | | | | | | 180 mg/L (UA) | | | Hardness |
| Aluminum | 7429-90-5 | µg/L | | 750 | 87 | | 620,767 | 5,000 (NAS) | 5,000 | 20,000 | Aluminum |
| Antimony | 7440-36-0 | µg/L | | | | | 248 | No Data Available | No Data Available | No Data Available | Antimony |
| Arsenic | 7440-38-2 | µg/L | 10 | 340 | 150 | 100 | 186 | 200 (NAS) | 100 | 2,000 | Arsenic |
| Barium | 7440-39-3 | µg/L | 1000 | | | | 124,159 | No Data Available | No Data Available | No Data Available | Barium |
| Beryllium | 7440-41-7 | µg/L | <4 | | | | 1,242 | No Data Available | No Data Available | No Data Available | Beryllium |
| Cadmium | 7440-43-9 | µg/L | 10 | 2 | 0.25 | 10 | 62 | 50 (NAS) | 10 | 50 | Cadmium |
| Calcium | 7440-70-2 | µg/L | | | | | | 500,000 (UA) | No Data Available | No Data Available | Calcium |
| Chromium | 7440-47-3 | µg/L | 50 | 16 (VI); 570 (III) | 11 (VI); 74 (III) | 100 | 410 | 1,000 (NAS) | 100 | 1,000 | Chromium |
| Cobalt | 7440-48-4 | µg/L | | | | | 7,931 | 1,000 (NAS) | 50 | 5,000 | Cobalt |
| Copper | 7440-50-8 | µg/L | | 13 | 9 | 200 | 6,208 | 500 (NAS) | 200 | 5,000 | Copper |
| Iron | 7439-89-6 | µg/L | | 1000 | 1000 | | 851,582 | Limit Not Considered Necessary (NAS) | 5,000 | 20,000 | Iron |
| Lead | 7439-92-1 | µg/L | 15 | 65 | 2.5 | 100 | 910 | 100 (NAS) | 5,000 | 10,000 | Lead |
| Magnesium | 7439-95-4 | µg/L | | | | | | 250,000 (UA) | No Data Available | No Data Available | Magnesium |
| Manganese | 7439-96-5 | µg/L | | | | | 31,040 | Limit Not Considered Necessary (NAS) | 200 | 10,000 | Manganese |
| Mercury | 7439-97-6 | µg/L | 2 | - | 0.012 | | 1,242 | 10 (NAS) | No Data Available | No Data Available | Mercury |
| Molyebdenum | 7439-98-7 | µg/L | | | | | 3,104 | No Data Available | 10 | 50 | Molyebdenum |
| Nickel | 7440-02-0 | µg/L | | 468 | 52 | | 17,480 | No Data Available | 200 | 2,000 | Nickel |
| Potassium | 7440-22-4 | µg/L | | | | | | No Data Available | No Data Available | No Data Available | Potassium |
| Selenium | 7782-49-2 | µg/L | 50 | 18.4 | 4.6 | 50 | 3,104 | 50 (NAS) | 20 | 20 | Selenium |
| Silver | 7440-22-4 | µg/L | 50 | 1.6 | - | | 3,630 | No Data Available | No Data Available | No Data Available | Silver |
| Sodium | 7440-23-5 | µg/L | | | | | | 1,000,000 (UA) | No Data Available | No Data Available | Sodium |
| Thallium | 7440-28-0 | µg/L | | | | | 25 | No Data Available | No Data Available | No Data Available | Thallium |
| Vanadium | 7440-62-2 | µg/L | | | | | 6,208 | 100 (NAS) | 100 | 1,000 | Vanadium |
| Zinc | 7440-66-6 | µg/L | | 120 | 120 | | 217,786 | 25,000 (NAS) | 2,000 | 10,000 | Zinc |
| TDS | | mg/L | | | | | | 1200 (Utah) | 500,000-1,000,000 (NAS) | | |
| pH | | | | | | | | 6.5-9 (Utah) | 4.5-9 (NAS) | | |

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

### *Comparison of San Juan River, McElmo Creek, and Montezuma Creek Raw Water Data with Water Quality Standards (R317-2-14) for Domestic Source Water - Dissolved Metals*

The dissolved water concentrations of metals and metalloids were compared to the Utah's water quality standards for the Class 1C use of protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water. No samples exceeded standards for domestic source water.

# Domestic Source Water Screening Values - Dissolved Metals

## Domestic Source Water (Dissolved Metals)

No Exceedence | Above Screening Level

| | | | | Aluminum | Antimony | Arsenic | Barium | Beryllium | Cadmium | Chromium | Cobalt | Copper | Iron | Lead | Manganese | Mercury | Molybdenum | Nickel | Potassium | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Domestic Source Screening Values** | | | | | | 10 | 1,000 | 4 | 10 | 50 | | | | 15 | | 2 | | | | 50 | 50 | | | |
| **Monitoring Location** | **Site Description** | **Collection Date** | **Collection Time** | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | mg/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 4954000 | San Juan R @ US160 Xing in CO | 2/16/2016 | 3:00 PM | 319.3 | ND | ND | 186.9 | ND | ND | ND | ND | 6.0 | 155.0 | 0.5 | 14.4 | ND | 1.5 | ND | 3.1 | 1.6 | ND | ND | ND | 22.5 |
| | | 2/23/2016 | 10:10 AM | 14.9 | ND | ND | ND | ND | ND | ND | ND | 1.8 | ND | ND | ND | ND | 1.4 | ND | 3.1 | 1.2 | ND | ND | ND | ND |
| | | 2/29/2016 | 4:00 PM | 10.4 | ND | ND | ND | ND | ND | ND | ND | 1.7 | ND | ND | ND | ND | 1.2 | ND | 2.6 | 1.1 | ND | ND | ND | ND |
| | | 3/9/2016 | 8:20 AM | 17.3 | ND | ND | ND | ND | ND | ND | ND | 1.0 | ND | ND | ND | ND | 1.2 | ND | 2.3 | ND | ND | ND | ND | ND |
| | | 3/15/2016 | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.3 | ND | 2.2 | ND | ND | ND | ND | ND |
| | | 3/22/2016 | 9:30 AM | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.2 | ND | 2.2 | ND | ND | ND | ND | ND |
| | | 3/28/2016 | 4:50 PM | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.2 | ND | 2.2 | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 12:20 PM | 52.3 | ND | ND | ND | ND | ND | ND | ND | 2.4 | 36.2 | 0.1 | 5.3 | ND | 1.4 | ND | 2.5 | ND | ND | ND | ND | ND |
| 4953880 | McElmo Creek at U262 xing near Town of Montezuma Creek | 2/23/2016 | 5:35 PM | ND | ND | 1.1 | ND | ND | ND | ND | ND | 1.6 | ND | ND | 12.7 | ND | 3.0 | ND | 6.8 | 2.0 | ND | ND | ND | ND |
| | | 2/29/2016 | 5:00 PM | 69.6 | ND | ND | ND | ND | ND | ND | ND | 2.1 | 24.7 | ND | 20.1 | ND | 3.2 | ND | 5.3 | 2.5 | ND | ND | ND | ND |
| | | 3/9/2016 | 9:05 AM | ND | ND | ND | ND | ND | ND | ND | ND | 1.2 | ND | ND | 18.6 | ND | 3.0 | ND | 5.0 | 2.0 | ND | ND | ND | ND |
| | | 3/15/2016 | 9:20 AM | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 8.6 | ND | 3.1 | ND | 4.5 | ND | ND | ND | ND | ND |
| | | 3/22/2016 | 10:30 AM | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 9.7 | ND | 3.3 | ND | 4.6 | 1.2 | ND | ND | ND | ND |
| | | 3/28/2016 | 5:40 PM | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 27.5 | ND | 3.7 | ND | 5.1 | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 1:30 PM | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 25.7 | ND | 3.8 | ND | 4.8 | ND | ND | ND | ND | ND |
| 4953990 | San Juan R @ Town of Montezuma | 2/16/2016 | 4:15 PM | 231.2 | ND | ND | 161.7 | ND | ND | ND | ND | 3.5 | 109.0 | 0.3 | 8.8 | ND | 1.7 | ND | 3.5 | 1.4 | ND | ND | ND | 18.1 |
| | | 2/23/2016 | 6:00 PM | 18.5 | 3.5 | ND | ND | ND | ND | ND | ND | 1.7 | ND | 0.2 | ND | ND | 1.8 | ND | 3.5 | 1.6 | ND | ND | ND | ND |
| | | 2/29/2016 | 5:30 PM | 22.4 | ND | ND | ND | ND | ND | ND | ND | 1.4 | ND | ND | ND | ND | 1.4 | ND | 2.8 | ND | ND | ND | ND | ND |
| | | 3/9/2016 | 10:00 AM | 34.3 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.3 | ND | 2.4 | ND | ND | ND | ND | ND |
| | | 3/15/2016 | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.4 | ND | 2.4 | ND | ND | ND | ND | ND |
| | | 3/22/2016 | 10:55 AM | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.4 | ND | 2.4 | ND | ND | ND | ND | ND |
| | | 3/28/2016 | 3:45 PM | ND | ND | ND | ND | ND | ND | ND | ND | 1.0 | ND | ND | ND | ND | 1.3 | ND | 2.2 | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 2:00 PM | ND | ND | ND | ND | ND | ND | ND | ND | 1.1 | ND | ND | ND | ND | 1.5 | ND | 2.5 | ND | ND | ND | ND | ND |
| 4953560 | Montezuma Creek at U163 xing | 2/23/2016 | 6:30 PM | ND | ND | 2.9 | 106.3 | ND | ND | ND | ND | 2.9 | ND | ND | ND | ND | 3.6 | ND | 6.3 | 3.6 | ND | ND | ND | ND |
| | | 2/29/2016 | 5:40 PM | ND | ND | 3.1 | 242.1 | ND | ND | ND | ND | 3.9 | ND | ND | 6.3 | ND | 4.8 | ND | 8.7 | 4.1 | ND | ND | ND | ND |
| | | 3/9/2016 | 9:40 AM | 12.2 | ND | 2.5 | 125.7 | ND | ND | ND | ND | 2.8 | ND | ND | 9.9 | ND | 5.4 | ND | 7.5 | 3.5 | ND | ND | ND | ND |
| | | 3/15/2016 | 10:20 AM | ND | ND | 2.4 | 127.5 | ND | ND | ND | ND | 1.9 | ND | ND | 58.6 | ND | 5.9 | ND | 8.5 | ND | ND | ND | ND | ND |
| 4953250 | San Juan R @ Sand Island | 2/16/2016 | 5:00 PM | 128.5 | ND | 1.0 | 104.8 | ND | ND | ND | ND | 2.7 | 71.7 | 0.2 | ND | ND | 1.7 | ND | 3.3 | 1.5 | ND | ND | ND | ND |
| | | 2/24/2016 | 8:40 AM | 34.8 | ND | ND | ND | ND | ND | 5.4 | ND | 2.0 | 57.2 | 0.2 | 6.9 | ND | 1.6 | ND | 3.0 | 1.3 | ND | ND | ND | ND |
| | | 3/1/2016 | 8:15 AM | 60.1 | ND | ND | ND | ND | ND | ND | ND | 1.3 | 44.2 | ND | ND | ND | 1.4 | ND | 2.7 | 1.3 | ND | ND | ND | ND |
| | | 3/9/2016 | 12:10 PM | 10.0 | ND | ND | ND | ND | ND | ND | ND | 1.0 | ND | ND | ND | ND | 1.3 | ND | 2.4 | ND | ND | ND | ND | ND |
| | | 3/15/2016 | 11:00 AM | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.5 | ND | 2.6 | ND | ND | ND | ND | ND |
| | | 3/22/2016 | 11:40 AM | 10.1 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.4 | ND | 2.4 | ND | ND | ND | ND | ND |
| | | 3/29/2016 | 9:50 AM | 16.1 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.4 | ND | 2.2 | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 2:40 PM | 14.6 | ND | ND | ND | ND | ND | ND | ND | 1.0 | ND | ND | ND | ND | 1.5 | ND | 2.5 | ND | ND | ND | ND | ND |
| 4953000 | San Juan R @ Mexican Hat US163 Xing | 2/17/2016 | 9:00 AM | 57.7 | ND | 1.0 | ND | ND | ND | ND | ND | 2.0 | 37.2 | 0.1 | ND | ND | 1.7 | ND | 3.0 | 1.6 | ND | ND | ND | ND |
| | | 2/24/2016 | 9:20 AM | ND | ND | ND | ND | ND | ND | ND | ND | 1.3 | ND | ND | ND | ND | 1.6 | ND | 2.9 | 1.3 | ND | ND | ND | ND |
| | | 3/1/2016 | 9:00 AM | 21.6 | ND | 1.1 | ND | ND | ND | ND | ND | 1.4 | ND | ND | ND | ND | 1.6 | ND | 2.7 | 1.3 | ND | ND | ND | ND |
| | | | 9:10 AM | 16.9 | ND | 1.0 | ND | ND | ND | ND | ND | 2.0 | ND | ND | ND | ND | 1.4 | ND | 2.7 | 1.0 | ND | ND | ND | 11.3 |
| | | 3/9/2016 | 11:30 AM | 17.7 | ND | ND | ND | ND | ND | ND | ND | 1.6 | ND | ND | ND | ND | 1.4 | ND | 2.5 | ND | ND | ND | ND | ND |
| | | 3/15/2016 | 11:45 AM | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.5 | ND | 3.3 | ND | ND | ND | ND | ND |
| | | 3/22/2016 | 12:25 PM | 10.4 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.5 | ND | 2.5 | ND | ND | ND | ND | ND |
| | | 3/29/2016 | 8:55 AM | 16.8 | ND | ND | ND | ND | ND | ND | ND | 1.0 | ND | ND | ND | ND | 1.4 | ND | 2.2 | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 3:30 PM | ND | ND | ND | ND | ND | ND | ND | ND | 1.1 | ND | ND | ND | ND | 1.5 | ND | 2.5 | ND | ND | ND | ND | ND |
| 4952942 | San Juan R @ Clay Hills | 2/17/2016 | 10:30 AM | 162.9 | ND | 1.1 | 112.5 | ND | ND | ND | ND | 2.3 | 77.5 | 0.2 | 5.5 | ND | 1.7 | ND | 3.1 | 1.7 | ND | ND | ND | 11.9 |

### *Comparison of San Juan River, McElmo Creek, and Montezuma Creek Raw Water Data with Water Quality Criteria (R317-14-2) for Aquatic Life Use (Warm-water Fishery) – Dissolved Metals*

The water concentrations of metals and metalloids were compared to Utah's chronic and acute water quality standards for the Class 3B aquatic life use. All of Utah's aquatic life criteria are based on dissolved fractions with the exception of aluminum which is based on total recoverable fraction. The chronic alumininum standard was exceeded at all sample locations on almost all dates although maximum concentrations were not as high as the previous summary report where values exceeded 100,000 µg/L at the Stateline, Montezuma, Sand Island, Mexican Hat, and Clay Hills sites.

No other exceedances of aquatic life criteria were observed however the analytical method used for mercury does not have sufficient sensitivity and the detection limit is higher than the standard. Therefore, all nondetect concentrations are too high to determine if the water concentrations comply with the standard and this remains a significant uncertainty.

## Aquatic Life Use (Dissolved Metals)

No Exceedence | Above Screening Level

| Monitoring Location | Site Description | Collection Date | Collection Time | Aluminum ug/L | Antimony ug/L | Arsenic ug/L | Barium ug/L | Beryllium ug/L | Cadmium ug/L | Chromium ug/L | Cobalt ug/L | Copper ug/L | Iron ug/L | Lead ug/L | Manganese ug/L | Mercury ug/L | Molybdenum ug/L | Nickel ug/L | Selenium ug/L | Silver ug/L | Thallium ug/L | Vanadium ug/L | Zinc ug/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Utah Aquatic Life Use 1-hour | | 750 | | 340 | | | 2 | 570 | | 13 | 1000 | 65 | | | | 468 | 18.4 | 1.6 | | | 120 |
| | | Utah Aquatic Life Use 4-hour | | 87 | | 150 | | | 0.25 | 74 | | 9 | 1000 | 2.5 | | 0.012 | | 52 | 4.6 | | | | 120 |
| 4954000 | San Juan R @ US160 Xing in CO | 2/16/2016 | 3:00 PM | 70,180 | ND | ND | 186.9 | ND | ND | ND | ND | 6.0 | 155.0 | 0.5 | 14.4 | ND | 1.5 | ND | 1.6 | ND | ND | ND | 22.5 |
| | | 2/23/2016 | 10:10 AM | 2,475 | ND | ND | ND | ND | ND | ND | ND | 1.8 | ND | ND | ND | ND | 1.4 | ND | 1.2 | ND | ND | ND | ND |
| | | 2/29/2016 | 4:00 PM | 3,282 | ND | ND | ND | ND | ND | ND | ND | 1.7 | ND | ND | ND | ND | 1.2 | ND | 1.1 | ND | ND | ND | ND |
| | | 3/9/2016 | 8:20 AM | 2,887 | ND | ND | ND | ND | ND | ND | ND | 1.0 | ND | ND | ND | ND | 1.2 | ND | ND | ND | ND | ND | ND |
| | | 3/15/2016 | | 1,544 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.3 | ND | ND | ND | ND | ND | ND |
| | | 3/22/2016 | 9:30 AM | 528 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.2 | ND | ND | ND | ND | ND | ND |
| | | 3/28/2016 | 4:50 PM | 256 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.2 | ND | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 12:20 PM | 1,408 | ND | ND | ND | ND | ND | ND | ND | 2.4 | 36.2 | 0.1 | 5.3 | ND | 1.4 | ND | ND | ND | ND | ND | ND |
| 4953880 | McElmo Creek at U262 xing near Town of Montezuma Creek | 2/23/2016 | 5:35 PM | 1,124 | ND | 1.1 | ND | ND | ND | ND | ND | 1.6 | ND | ND | 12.7 | ND | 3.0 | ND | 2.0 | ND | ND | ND | ND |
| | | 2/29/2016 | 5:00 PM | 2,249 | ND | ND | ND | ND | ND | ND | ND | 2.1 | 24.7 | ND | 20.1 | ND | 3.2 | ND | 2.5 | ND | ND | ND | ND |
| | | 3/9/2016 | 9:05 AM | 385 | ND | ND | ND | ND | ND | ND | ND | 1.2 | ND | ND | 18.6 | ND | 3.0 | ND | 2.0 | ND | ND | ND | ND |
| | | 3/15/2016 | 9:20 AM | 4,814 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 8.6 | ND | 3.1 | ND | ND | ND | ND | ND | ND |
| | | 3/22/2016 | 10:30 AM | 715 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 9.7 | ND | 3.3 | ND | 1.2 | ND | ND | ND | ND |
| | | 3/28/2016 | 5:40 PM | 103 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 27.5 | ND | 3.7 | ND | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 1:30 PM | 65 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 25.7 | ND | 3.8 | ND | ND | ND | ND | ND | ND |
| 4953990 | San Juan R @ Town of Montezuma | 2/16/2016 | 4:15 PM | 81,859 | ND | ND | 161.7 | ND | ND | ND | ND | 3.5 | 109.0 | 0.3 | 8.8 | ND | 1.7 | ND | 1.4 | ND | ND | ND | 18.1 |
| | | 2/23/2016 | 6:00 PM | 1,703 | 3.5 | ND | ND | ND | ND | ND | ND | 1.7 | ND | 0.2 | ND | ND | 1.8 | ND | 1.6 | ND | ND | ND | ND |
| | | 2/29/2016 | 5:30 PM | 3,441 | ND | ND | ND | ND | ND | ND | ND | 1.4 | ND | ND | ND | ND | 1.4 | ND | ND | ND | ND | ND | ND |
| | | 3/9/2016 | 10:00 AM | 3,198 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.3 | ND | ND | ND | ND | ND | ND |
| | | 3/15/2016 | | 2,224 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.4 | ND | ND | ND | ND | ND | ND |
| | | 3/22/2016 | 10:55 AM | 429 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.4 | ND | ND | ND | ND | ND | ND |
| | | 3/28/2016 | 3:45 PM | 211 | ND | ND | ND | ND | ND | ND | ND | 1.0 | ND | ND | ND | ND | 1.3 | ND | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 2:00 PM | 1,424 | ND | ND | ND | ND | ND | ND | ND | 1.1 | ND | ND | ND | ND | 1.5 | ND | ND | ND | ND | ND | ND |
| 4953560 | Montezuma Creek at U163 xing | 2/23/2016 | 6:30 PM | 1,823 | ND | 2.9 | 106.3 | ND | ND | ND | ND | 2.9 | ND | ND | ND | ND | 3.6 | ND | 3.6 | ND | ND | ND | ND |
| | | 2/29/2016 | 5:40 PM | 1,078 | ND | 3.1 | 242.1 | ND | ND | ND | ND | 3.9 | ND | ND | 6.3 | ND | 4.8 | ND | 4.1 | ND | ND | ND | ND |
| | | 3/9/2016 | 9:40 AM | 1,459 | ND | 2.5 | 125.7 | ND | ND | ND | ND | 2.8 | ND | ND | 9.9 | ND | 5.4 | ND | 3.5 | ND | ND | ND | ND |
| | | 3/15/2016 | 10:20 AM | 77 | ND | 2.4 | 127.5 | ND | ND | ND | ND | 1.9 | ND | ND | 58.6 | ND | 5.9 | ND | ND | ND | ND | ND | ND |

## Aquatic Life Use (Dissolved Metals)

No Exceedence | Above Screening Level

| Monitoring Location | Site Description | Collection Date | Collection Time | Aluminum | Antimony | Arsenic | Barium | Beryllium | Cadmium | Chromium | Cobalt | Copper | Iron | Lead | Manganese | Mercury | Molybdenum | Nickel | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Utah Aquatic Life Use 1-hour | | 750 | | 340 | | | 2 | 570 | | 13 | 1000 | 65 | | | | 468 | 18.4 | 1.6 | | | 120 |
| | | Utah Aquatic Life Use 4-hour | | 87 | | 150 | | | 0.25 | 74 | | 9 | 1000 | 2.5 | | 0.012 | | 52 | 4.6 | | | | 120 |
| | | | | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 4953250 | San Juan R @ Sand Island | 2/16/2016 | 5:00 PM | 68,001 | ND | 1.0 | 104.8 | ND | ND | ND | ND | 2.7 | 71.7 | 0.2 | ND | ND | 1.7 | ND | 1.5 | ND | ND | ND | ND |
| | | 2/24/2016 | 8:40 AM | 1,580 | ND | ND | ND | ND | ND | 5.4 | ND | 2.0 | 57.2 | 0.2 | 6.9 | ND | 1.6 | ND | 1.3 | ND | ND | ND | ND |
| | | 3/1/2016 | 8:15 AM | 3,321 | ND | ND | ND | ND | ND | ND | ND | 1.3 | 44.2 | ND | ND | ND | 1.4 | ND | 1.3 | ND | ND | ND | ND |
| | | 3/9/2016 | 12:10 PM | 3,731 | ND | ND | ND | ND | ND | ND | ND | 1.0 | ND | ND | ND | ND | 1.3 | ND | ND | ND | ND | ND | ND |
| | | 3/15/2016 | 11:00 AM | 1,900 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.5 | ND | ND | ND | ND | ND | ND |
| | | 3/22/2016 | 11:40 AM | 545 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.4 | ND | ND | ND | ND | ND | ND |
| | | 3/29/2016 | 9:50 AM | 1,975 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.4 | ND | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 2:40 PM | 295 | ND | ND | ND | ND | ND | ND | ND | 1.0 | ND | ND | ND | ND | 1.5 | ND | ND | ND | ND | ND | ND |
| 4953000 | San Juan R @ Mexican Hat US163 Xing | 2/17/2016 | 9:00 AM | 70,228 | ND | 1.0 | ND | ND | ND | ND | ND | 2.0 | 37.2 | 0.1 | ND | ND | 1.7 | ND | 1.6 | ND | ND | ND | ND |
| | | 2/24/2016 | 9:20 AM | 2,268 | ND | ND | ND | ND | ND | ND | ND | 1.3 | ND | ND | ND | ND | 1.6 | ND | 1.3 | ND | ND | ND | ND |
| | | 3/1/2016 | 9:00 AM | 3,766 | ND | 1.1 | ND | ND | ND | ND | ND | 1.4 | ND | ND | ND | ND | 1.6 | ND | 1.3 | ND | ND | ND | ND |
| | | | 9:10 AM | 2,078 | ND | 1.0 | ND | ND | ND | ND | ND | 2.0 | ND | ND | ND | ND | 1.4 | ND | 1.0 | ND | ND | ND | 11.3 |
| | | 3/9/2016 | 11:30 AM | 4,030 | ND | ND | ND | ND | ND | ND | ND | 1.6 | ND | ND | ND | ND | 1.4 | ND | ND | ND | ND | ND | ND |
| | | 3/15/2016 | 11:45 AM | 2,385 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.5 | ND | ND | ND | ND | ND | ND |
| | | 3/22/2016 | 12:25 PM | 1,759 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.5 | ND | ND | ND | ND | ND | ND |
| | | 3/29/2016 | 8:55 AM | 501 | ND | ND | ND | ND | ND | ND | ND | 1.0 | ND | ND | ND | ND | 1.4 | ND | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 3:30 PM | 193 | ND | ND | ND | ND | ND | ND | ND | 1.1 | ND | ND | ND | ND | 1.5 | ND | ND | ND | ND | ND | ND |
| 4952942 | San Juan R @ Clay Hills | 2/17/2016 | 10:30 AM | 47,903 | ND | 1.1 | 112.5 | ND | ND | ND | ND | 2.3 | 77.5 | 0.2 | 5.5 | ND | 1.7 | ND | 1.7 | ND | ND | ND | 11.9 |

### *Comparison of San Juan River Raw Water Data with Recreational Water Screening Values - Total Metals*

The Utah Department of Health's Environmental Epidemiology Program (EEP) has generated site-specific recreational screening values for metals and metalloid exposures to the San Juan River waters. These values reflect the water contaminant concentrations that would exceed established ATSDR minimal risk levels (MRL), or EPA reference doses (RfD) if an appropriate MRL does not exist, for the most susceptible population: children under the age of five years.

These recreational screening values assume an exposure duration of 60 days, with two hours/day spent in the water. The accidental ingestion rate accounts for 50 mL of river water per hour, and total body contact with the water for that two hour time period. An exceedance of these values does not necessarily indicate that adverse health effects will occur; rather, it is used as guidance for health professionals to further determine the likelihood that adverse health effects may occur due to the exposure.

No metal or metalloid exceeded a recreational screening value. Recreational exposures to San Juan River water is not expected to harm people's health.

**Summary of Recreational Screening Values**

| Contaminant | CV (µg/L) | Source | MRL (mg/kg/day) | Type | Screening Value | Units |
|---|---|---|---|---|---|---|
| Aluminum | 10,000 | I. EMEG | 1.00E+00 | Chronic | 620,767 | µg/L |
| Antimony | 4 | RMEG | 4.00E-04 | RfD | 248 | µg/L |
| Arsenic | 3 | C. EMEG | 3.00E-04 | Chronic | 186 | µg/L |
| Barium | 2,000 | I. EMEG | 2.00E-01 | Chronic | 124,159 | µg/L |
| Beryllium | 20 | C. EMEG | 2.00E-03 | Chronic | 1,242 | µg/L |
| Cadium | 5 | I. EMEG | 1.00E-04 | Chronic | 62 | µg/L |
| Chromium | 60 | Cr(VI) RSL | 9.00E-04 | Cr(VI) Chr. | 410 | µg/L |
| Cobalt | 100 | I. EMEG | 1.00E-02 | Intermediate | 7,931 | µg/L |
| Copper | 100 | I. EMEG | 1.00E-02 | Intermediate | 6,208 | µg/L |
| Iron | 14,000 | RSL | 8.75E-01 | UDOH | 851,582 | µg/L |
| Lead | 15 | RSL | 9.37E-04 | UDOH | 910 | µg/L |
| Manganese | 500 | RMEG | 5.00E-02 | RfD | 31,040 | µg/L |
| Mercury | 0.63 | RSL | 2.00E-03 | Intermediate | 1,242 | µg/L |
| Molybdenum | 50 | RMEG | 5.00E-03 | RfD | 3,104 | µg/L |
| Nickel | 200 | RMEG | 2.00E-02 | RfD | 17,480 | µg/L |
| Selenium | 50 | RMEG | 5.00E-03 | Chronic | 3,104 | µg/L |
| Silver | 50 | RMEG | 5.00E-03 | RfD | 3,630 | µg/L |
| Thallium | 0.2 | RSL | 4.00E-05 | PPRTV subchronic RfD | 25 | µg/L |
| Vanadium | 100 | I. EMEG | 1.00E-02 | Intermediate | 6,208 | µg/L |
| Zinc | 3,000 | I. EMEG | 3.00E-01 | Chronic | 217,786 | µg/L |

# Recreational Water Screening Values - Total Metals

## Screening Value Calculations

Adapted from standard ATSDR exposure dose equations for ingestion and dermal exposures.

$$C = \frac{ED \times BW_I \times BW_D}{(BW_D \times IR_I \times EF_I \times CF_I) + (BW_I \times P_D \times SA_D \times ET_D \times CF_D)}$$ ; where

| | |
|---|---|
| C | Concentration (mg/L) – these calculated values are converted to µg/L for screening values where appropriate. |
| ED | Exposure dose (mg/kg/day) |
| $BW_i$ | Child body weight for ingestion (16 kg) |
| $BW_d$ | Child body weight for dermal (30kg) |
| $IR_i$ | Intake rate for ingestion (0.1 L/day) |
| $EF_i$ | Exposure factor for ingestion (0.1644 = 60 days/year) |
| $CF_i$ | Conversion factor, ingestion (1 for mg/L entries) |
| $SA_d$ | Surface area (whole body, which is 8,750 $cm^2$ for children) |
| $ET_d$ | Exposure time (2 hour/day) |
| $CF_d$ | Conversion factor, dermal (0.001 for mg/L) |
| $P_d$ | Permeability coefficient (see table below) |

| **Permeability coefficients** | |
|---|---|
| Aluminum | 1.00E-03 (EPA Dermal Exposure Assessment; EPA RAGS part E Exhibit 3-1) |
| Antimony | 1.00E-03 |
| Arsenic | 1.00E-03 |
| Barium | 1.00E-03 |
| Beryllium | 1.00E-03 |
| Cadmium | 1.00E-03 |
| Chromium VI | 2.00E-03 |
| Cobalt | 4.00E-04 (EPA RAGS part E Exhibit 3-1) |
| Copper | 1.00E-03 |
| Iron | N/A |
| Lead | 4.00E-06 |
| Manganese | 1.00E-03 |
| Mercury | 1.00E-03 (EPA RAGS part E Exhibit 3-1) |
| Molybdenum | 1.00E-03 (Table 8 from a contractor-derived HHRA for CalDOT; EPA RAGS part E Exhibit 3-1) |
| Nickel | 2.00E-04 |
| Selenium | 1.00E-03 |
| Silver | 6.00E-04 |
| Thallium | 1.00E-03 |
| Vanadium | 1.00E-03 |
| Zinc | 6.00E-04 |

# Recreational Water Screening Values - Total Metals

## Recreational Water (Total Metals)

No Exceedence | Above Screening Level

| Monitoring Location | Site Description | Collection Date | Collection Time | Aluminum | Antimony | Arsenic | Barium | Beryllium | Cadmium | Chromium | Cobalt | Copper | Iron | Lead | Manganese | Mercury | Molybdenum | Nickel | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Recreational Screening Values | | 620,767 | 248 | 186 | 124,159 | 1,242 | 62 | 410 | 7,931 | 6,208 | 851,582 | 910 | 31,040 | 1,242 | 3,104 | 17,480 | 3,104 | 3,630 | 25 | 6,208 | 217,786 |
| | | | | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 4954000 | San Juan R @ US160 Xing in CO | 2/16/2016 | 3:00 PM | 70,180 | ND | 10.3 | 890.0 | 5.1 | ND | 37.1 | 31.6 | 82.6 | 51,500 | 56.7 | 1,426.9 | ND | ND | 40.4 | 16.5 | ND | ND | 70.8 | 202.0 |
| | | 2/23/2016 | 10:10 AM | 2,475 | ND | 1.5 | 226.6 | 2.1 | 0.4 | 4.5 | ND | 16.3 | 1,250 | 9.8 | 921.6 | ND | ND | 7.5 | ND | ND | ND | ND | 58.1 |
| | | 2/29/2016 | 4:00 PM | 3,282 | ND | 1.8 | 120.1 | ND | 0.1 | 6.2 | ND | 6.0 | 3,312 | 4.3 | 129.0 | ND | 1.1 | ND | ND | ND | ND | ND | 23.4 |
| | | 3/9/2016 | 8:20 AM | 2,887 | ND | 2.0 | 106.0 | ND | 0.1 | 5.8 | ND | 6.0 | 2,970 | 4.8 | 144.1 | ND | ND | ND | ND | ND | ND | ND | 28.8 |
| | | 3/15/2016 | | 1,544 | ND | ND | ND | ND | ND | 4.3 | ND | 4.7 | 1,640 | 3.2 | 101.3 | ND | 1.1 | ND | ND | ND | ND | ND | 18.3 |
| | | 3/22/2016 | 9:30 AM | 528 | ND | 1.7 | ND | ND | ND | 5.0 | ND | 3.6 | 659 | 2.3 | 64.0 | ND | ND | ND | ND | ND | ND | ND | ND |
| | | 3/28/2016 | 4:50 PM | 256 | ND | 9.8 | ND | ND | ND | 8.0 | ND | 2.3 | 356 | 1.3 | 41.9 | ND | ND | ND | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 12:20 PM | 1,408 | ND | 7.8 | ND | ND | ND | 7.8 | ND | 3.7 | 1,320 | 1.9 | 47.4 | ND | 1.3 | ND | ND | ND | ND | ND | 10.4 |
| 4953880 | McElmo Creek at U262 xing near Town of Montezuma Creek | 2/23/2016 | 5:35 PM | 1,124 | ND | 1.3 | ND | ND | 0.3 | 4.7 | ND | 5.4 | 1,680 | 4.8 | 313.5 | ND | 1.3 | 6.6 | 1.2 | ND | ND | ND | 10.5 |
| | | 2/29/2016 | 5:00 PM | 2,249 | ND | ND | ND | ND | ND | 5.3 | ND | 3.0 | 2,050 | 2.2 | 105.4 | ND | 2.6 | 5.1 | 1.3 | ND | ND | ND | ND |
| | | 3/9/2016 | 9:05 AM | 385 | ND | 9.9 | ND | ND | ND | 5.6 | ND | 1.9 | 359 | 0.4 | 33.6 | ND | 2.7 | ND | ND | ND | ND | ND | 20.2 |
| | | 3/15/2016 | 9:20 AM | 4,814 | ND | 2.2 | ND | ND | 0.2 | 7.4 | ND | 6.9 | 5,700 | 4.9 | 182.9 | ND | 3.4 | 9.0 | 1.5 | ND | 0.1 | ND | 20.4 |
| | | 3/22/2016 | 10:30 AM | 715 | ND | 7.3 | ND | ND | 0.2 | 6.1 | ND | 3.3 | 1,300 | 3.1 | 165.1 | ND | 1.6 | 6.3 | 1.1 | ND | ND | ND | ND |
| | | 3/28/2016 | 5:40 PM | 103 | ND | 10.9 | ND | ND | ND | 9.4 | ND | 1.7 | 179 | 0.4 | 55.0 | ND | 3.3 | ND | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 1:30 PM | 65 | ND | 11.4 | ND | ND | ND | 7.6 | ND | 1.5 | 117 | 0.3 | 54.4 | ND | 3.8 | ND | 1.3 | ND | ND | ND | ND |
| 4953990 | San Juan R @ Town of Montezuma | 2/16/2016 | 4:15 PM | 81,859 | ND | 12.7 | 929.0 | 5.9 | ND | 39.7 | 34.1 | 92.9 | 60,100 | 67.4 | 1,628.7 | ND | ND | 43.8 | 33.0 | ND | ND | 80.2 | 222.9 |
| | | 2/23/2016 | 6:00 PM | 1,703 | ND | 1.8 | 136.2 | 1.1 | 0.3 | 3.4 | ND | 13.0 | 1,490 | 9.1 | 496.2 | ND | ND | 5.3 | 1.3 | ND | ND | ND | 36.4 |
| | | 2/29/2016 | 5:30 PM | 3,441 | ND | 1.6 | 123.0 | ND | 0.1 | 5.7 | ND | 6.1 | 3,360 | 4.5 | 142.5 | ND | 1.1 | ND | 1.1 | ND | ND | ND | 22.7 |
| | | 3/9/2016 | 10:00 AM | 3,198 | ND | 2.5 | 115.4 | ND | 0.1 | 6.2 | ND | 5.7 | 3,300 | 4.6 | 133.9 | ND | 1.0 | ND | ND | ND | ND | ND | 24.1 |
| | | 3/15/2016 | | 2,224 | ND | ND | 102.7 | ND | ND | 5.0 | ND | 5.3 | 2,310 | 3.3 | 99.5 | ND | 1.5 | ND | ND | ND | ND | ND | 15.9 |
| | | 3/22/2016 | 10:55 AM | 429 | ND | 1.6 | ND | ND | ND | 6.2 | ND | 3.1 | 590 | 2.2 | 82.4 | ND | ND | ND | ND | ND | ND | ND | ND |
| | | 3/28/2016 | 3:45 PM | 211 | ND | 10.1 | ND | ND | ND | 8.5 | ND | 3.3 | 315 | 1.5 | 41.0 | ND | ND | ND | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 2:00 PM | 1,424 | ND | ND | ND | ND | ND | 7.6 | ND | 3.5 | 1,040 | 1.6 | 40.2 | ND | 1.4 | ND | ND | ND | ND | ND | ND |
| 4953560 | Montezuma Creek at U163 xing | 2/23/2016 | 6:30 PM | 1,823 | ND | 3.4 | 149.8 | ND | ND | 3.7 | ND | 5.3 | 843 | 3.6 | 198.6 | ND | 1.7 | ND | 3.1 | ND | ND | ND | ND |
| | | 2/29/2016 | 5:40 PM | 1,078 | ND | 3.1 | 173.3 | ND | ND | 4.3 | ND | 4.0 | 561 | 1.0 | 34.2 | ND | 3.8 | ND | 3.5 | ND | ND | ND | ND |
| | | 3/9/2016 | 9:40 AM | 1,459 | ND | 2.1 | 126.4 | ND | ND | 5.4 | ND | 3.3 | 682 | 0.7 | 28.3 | ND | 4.4 | ND | 2.5 | ND | ND | ND | ND |
| | | 3/15/2016 | 10:20 AM | 77 | ND | 2.2 | 123.9 | ND | ND | 4.1 | ND | 2.8 | 51 | ND | 62.7 | ND | 6.0 | ND | 1.2 | ND | ND | ND | ND |
| 4953250 | San Juan R @ Sand Island | 2/16/2016 | 5:00 PM | 68,001 | ND | 12.0 | 952.0 | 5.5 | ND | 36.0 | 30.0 | 78.5 | 51,600 | 59.0 | 1,478.9 | ND | ND | 39.5 | 22.2 | ND | ND | 68.9 | 197.7 |
| | | 2/24/2016 | 8:40 AM | 1,580 | ND | 1.7 | 150.9 | 1.2 | 0.3 | 4.0 | ND | 11.7 | 1,140 | 7.6 | 591.5 | ND | ND | 5.5 | ND | ND | ND | ND | 33.1 |
| | | 3/1/2016 | 8:15 AM | 3,321 | ND | 1.2 | 122.5 | ND | 0.1 | 4.3 | ND | 6.6 | 3,080 | 5.1 | 198.8 | ND | 1.0 | ND | ND | ND | ND | ND | 25.5 |
| | | 3/9/2016 | 12:10 PM | 3,731 | ND | 7.1 | 158.7 | ND | 0.2 | 8.2 | ND | 7.7 | 3,920 | 6.4 | 196.4 | ND | 1.2 | ND | ND | ND | ND | ND | 30.7 |
| | | 3/15/2016 | 11:00 AM | 1,900 | ND | 1.8 | ND | ND | ND | 5.2 | ND | 4.5 | 1,950 | 2.8 | 77.0 | ND | 1.4 | ND | ND | ND | ND | ND | 12.1 |
| | | 3/22/2016 | 11:40 AM | 545 | ND | 1.1 | ND | ND | ND | 5.5 | ND | 3.3 | 679 | 2.3 | 87.6 | ND | ND | ND | ND | ND | ND | ND | ND |
| | | 3/29/2016 | 9:50 AM | 1,975 | ND | 1.0 | ND | ND | ND | 8.1 | ND | 3.2 | 1,610 | 1.9 | 55.3 | ND | 1.4 | ND | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 2:40 PM | 295 | ND | ND | ND | ND | ND | ND | ND | 2.9 | 338 | 1.9 | 73.4 | ND | 1.2 | ND | ND | ND | ND | ND | ND |
| 4953000 | San Juan R @ Mexican Hat US163 Xing | 2/17/2016 | 9:00 AM | 70,228 | ND | 12.8 | 845.0 | ND | ND | 34.2 | ND | 79.3 | 51,300 | 59.9 | 1,514.5 | ND | ND | 38.7 | 25.9 | ND | ND | 72.8 | 194.2 |
| | | 2/24/2016 | 9:20 AM | 2,268 | ND | 1.5 | 160.0 | 1.3 | 0.3 | 3.9 | ND | 13.6 | 1,360 | 10.8 | 637.0 | ND | ND | 5.1 | ND | ND | ND | ND | 33.4 |
| | | 3/1/2016 | 9:00 AM | 3,766 | ND | 1.4 | 130.4 | ND | 0.1 | 4.8 | ND | 7.4 | 3,360 | 5.0 | 194.1 | ND | 1.1 | ND | ND | ND | ND | ND | 23.4 |
| | | | 9:10 AM | 2,078 | ND | 1.1 | 104.1 | ND | 0.1 | 3.7 | ND | 6.5 | 2,030 | 4.0 | 142.0 | ND | ND | ND | ND | ND | ND | ND | 18.6 |
| | | 3/9/2016 | 11:30 AM | 4,030 | ND | 10.3 | 140.2 | ND | 0.2 | 8.2 | ND | 7.6 | 4,170 | 6.4 | 228.1 | ND | 1.1 | ND | ND | ND | ND | ND | 31.6 |
| | | 3/15/2016 | 11:45 AM | 2,385 | ND | ND | 105.8 | ND | ND | 5.6 | ND | 5.4 | 2,330 | 3.1 | 87.1 | ND | 1.5 | ND | ND | ND | 0.2 | ND | 15.2 |
| | | 3/22/2016 | 12:25 PM | 1,759 | ND | 1.5 | 111.2 | ND | ND | 6.2 | ND | 4.2 | 1,850 | 2.7 | 78.9 | ND | 1.2 | ND | ND | ND | ND | ND | ND |
| | | 3/29/2016 | 8:55 AM | 501 | ND | 4.4 | ND | ND | ND | 8.3 | ND | 2.1 | 482 | 0.9 | 27.2 | ND | 1.2 | ND | ND | ND | ND | ND | ND |
| | | 4/4/2016 | 3:30 PM | 193 | ND | ND | ND | ND | ND | ND | ND | 2.2 | 133 | 1.2 | 43.5 | ND | 1.3 | ND | ND | ND | ND | ND | ND |
| 4952942 | San Juan R @ Clay Hills | 2/17/2016 | 10:30 AM | 47,903 | ND | 10.0 | 628.0 | ND | ND | 23.6 | ND | 53.2 | 35,100 | 40.7 | 954.4 | ND | ND | 24.9 | 13.9 | ND | ND | 53.7 | 129.6 |

### *Comparison of San Juan River Raw Water Data with Screening Values for Agricultural Uses (Stock watering and Irrigation) – Dissolved Metals*

The dissolved water concentrations of metals and metalloids were compared to screening values, including Utah's water quality standards for the Class 4 protected for agricultural uses including irrigation of crops and stock watering. Results are below the screening values for metals and metalloids. The Utah agricultural water quality standard for total dissolved solids was exceeded on all sampling dates at the McElmo Creek and Montezuma Creek tributary sites. UDAF has analyzed the data and compared to current toxicology knowledge and scientific data concerning animal and plant life safety. DAF found no long term exposure potential risks from use of the water for livestock, wildlife, or crop irrigation.

# Agricultural Screening Values – Dissolved Metals

## Agricultural Water (Dissolved Metals)

No Exceedence | Above Screening Level

| | | | | Aluminum | Antimony | Arsenic | Barium | Beryllium | Cadmium | Calcium | Chromium | Cobalt | Copper | Iron | Lead | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Selenium | Silver | 1,000,000 | TDS @ 180 C | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Livestock Water Screening Value | | | | 5,000 | | 200 | | | 50 | 500 | 1,000 | 1,000 | 500 | | 100 | 250,000 | | 10 | | | 50 | | 1,000,000 | 1,200 | | 100 | 25,000 |
| Irrigation Water Short-Term | | | | 20,000 | | 2,000 | | | 50 | | 1,000 | 5,000 | 5,000 | 20,000 | 10,000 | | 10,000 | | 50 | 2,000 | 20 | | | | | 1,000 | 10,000 |
| Irrigation Water Long-Term | | | | 5,000 | | 100 | | | 10 | | 100 | 50 | 200 | 5,000 | 5,000 | | 200 | | 10 | 200 | 20 | | | 500,000 | | 100 | 2,000 |
| Utah DWQ Agriculutral Use Criteria | | | | | | 100 | | | 10 | | 100 | | 200 | | 100 | | | | | | 50 | | | 1,200 | | | |
| Monitoring Location | Site Description | Collection Date | Collection Time | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | mg/L | ug/L | ug/L | ug/L | ug/L | ug/L | mg/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | mg/L | mg/L | ug/L | ug/L | ug/L |
| 4954000 | San Juan R @ US160 Xing in CO | 2/16/2016 | 3:00 PM | 319.3 | ND | ND | 186.9 | ND | ND | 66.2 | ND | ND | 6.0 | 155.0 | 0.5 | 10.9 | 14.4 | ND | 1.5 | ND | 1.6 | ND | 62.9 | 490 | ND | ND | 22.5 |
| | | 2/23/2016 | 10:10 AM | 14.9 | ND | ND | ND | ND | ND | 67.9 | ND | ND | 1.8 | ND | ND | 12.5 | ND | ND | 1.4 | ND | 1.2 | ND | 44.8 | 394 | ND | ND | ND |
| | | 2/29/2016 | 4:00 PM | 10.4 | ND | ND | ND | ND | ND | 71.1 | ND | ND | 1.7 | ND | ND | 13.7 | ND | ND | 1.2 | ND | 1.1 | ND | 39.2 | 386 | ND | ND | ND |
| | | 3/9/2016 | 8:20 AM | 17.3 | ND | ND | ND | ND | ND | 64.9 | ND | ND | 1.0 | ND | ND | 12.0 | ND | ND | 1.2 | ND | ND | ND | 34.2 | 358 | ND | ND | ND |
| | | 3/15/2016 | | ND | ND | ND | ND | ND | ND | 71.9 | ND | ND | ND | ND | ND | 13.4 | ND | ND | 1.3 | ND | ND | ND | 37.0 | 376 | ND | ND | ND |
| | | 3/22/2016 | 9:30 AM | ND | ND | ND | ND | ND | ND | 67.4 | ND | ND | ND | ND | ND | 13.1 | ND | ND | 1.2 | ND | ND | ND | 35.6 | 382 | ND | ND | ND |
| | | 3/28/2016 | 4:50 PM | ND | ND | ND | ND | ND | ND | 70.8 | ND | ND | ND | ND | ND | 12.6 | ND | ND | 1.2 | ND | ND | ND | 38.1 | 360 | ND | ND | ND |
| | | 4/4/2016 | 12:20 PM | 52.3 | ND | ND | ND | ND | ND | 74.1 | ND | ND | 2.4 | 36.2 | 0.1 | 13.7 | 5.3 | ND | 1.4 | ND | ND | ND | 42.5 | 392 | ND | ND | ND |
| 4953880 | McElmo Creek at U262 xing near Town of Montezuma Creek | 2/23/2016 | 5:35 PM | ND | ND | 1.1 | ND | ND | ND | 213.7 | ND | ND | 1.6 | ND | ND | 114.8 | 12.7 | ND | 3.0 | ND | 2.0 | ND | 118.6 | 1,718 | ND | ND | ND |
| | | 2/29/2016 | 5:00 PM | 69.6 | ND | ND | ND | ND | ND | 244.0 | ND | ND | 2.1 | 24.7 | ND | 142.0 | 20.1 | ND | 3.2 | ND | 2.5 | ND | 146.0 | 2,042 | ND | ND | ND |
| | | 3/9/2016 | 9:05 AM | ND | ND | ND | ND | ND | ND | 254.0 | ND | ND | 1.2 | ND | ND | 156.0 | 18.6 | ND | 3.0 | ND | 2.0 | ND | 167.0 | 2,180 | ND | ND | ND |
| | | 3/15/2016 | 9:20 AM | ND | ND | ND | ND | ND | ND | 229.0 | ND | ND | ND | ND | ND | 115.0 | 8.6 | ND | 3.1 | ND | ND | ND | 112.0 | 1,698 | ND | ND | ND |
| | | 3/22/2016 | 10:30 AM | ND | ND | ND | ND | ND | ND | 231.0 | ND | ND | ND | ND | ND | 118.0 | 9.7 | ND | 3.3 | ND | 1.2 | ND | 118.0 | 1,754 | ND | ND | ND |
| | | 3/28/2016 | 5:40 PM | ND | ND | ND | ND | ND | ND | 265.0 | ND | ND | ND | ND | ND | 159.0 | 27.5 | ND | 3.7 | ND | ND | ND | 170.0 | 2,154 | ND | ND | ND |
| | | 4/4/2016 | 1:30 PM | ND | ND | ND | ND | ND | ND | 239.0 | ND | ND | ND | ND | ND | 146.0 | 25.7 | ND | 3.8 | ND | ND | ND | 163.0 | 2,014 | ND | ND | ND |
| 4953990 | San Juan R @ Town of Montezuma | 2/16/2016 | 4:15 PM | 231.2 | ND | ND | 161.7 | ND | ND | 76.6 | ND | ND | 3.5 | 109.0 | 0.3 | 18.3 | 8.8 | ND | 1.7 | ND | 1.4 | ND | 72.7 | 574 | ND | ND | 18.1 |
| | | 2/23/2016 | 6:00 PM | 18.5 | 3.5 | ND | ND | ND | ND | 81.4 | ND | ND | 1.7 | ND | 0.2 | 21.3 | ND | ND | 1.8 | ND | 1.6 | ND | 52.5 | 508 | ND | ND | ND |
| | | 2/29/2016 | 5:30 PM | 22.4 | ND | ND | ND | ND | ND | 80.2 | ND | ND | 1.4 | ND | ND | 20.3 | ND | ND | 1.4 | ND | ND | ND | 46.4 | 488 | ND | ND | ND |
| | | 3/9/2016 | 10:00 AM | 34.3 | ND | ND | ND | ND | ND | 73.9 | ND | ND | ND | ND | ND | 17.9 | ND | ND | 1.3 | ND | ND | ND | 40.1 | 438 | ND | ND | ND |
| | | 3/15/2016 | | ND | ND | ND | ND | ND | ND | 81.2 | ND | ND | ND | ND | ND | 19.7 | ND | ND | 1.4 | ND | ND | ND | 42.0 | 452 | ND | ND | ND |
| | | 3/22/2016 | 10:55 AM | ND | ND | ND | ND | ND | ND | 78.4 | ND | ND | ND | ND | ND | 18.8 | ND | ND | 1.4 | ND | ND | ND | 41.6 | 454 | ND | ND | ND |
| | | 3/28/2016 | 3:45 PM | ND | ND | ND | ND | ND | ND | 75.8 | ND | ND | 1.0 | ND | ND | 16.9 | ND | ND | 1.3 | ND | ND | ND | 40.6 | 410 | ND | ND | ND |
| | | 4/4/2016 | 2:00 PM | ND | ND | ND | ND | ND | ND | 80.1 | ND | ND | 1.1 | ND | ND | 18.0 | ND | ND | 1.5 | ND | ND | ND | 47.5 | 452 | ND | ND | ND |
| 4953560 | Montezuma Creek at U163 xing | 2/23/2016 | 6:30 PM | ND | ND | 2.9 | 106.3 | ND | ND | 157.0 | ND | ND | 2.9 | ND | ND | 98.9 | ND | ND | 3.6 | ND | 3.6 | ND | 217.0 | 1,648 | ND | ND | ND |
| | | 2/29/2016 | 5:40 PM | ND | ND | 3.1 | 242.1 | ND | ND | 164.0 | ND | ND | 3.9 | ND | ND | 116.0 | 6.3 | ND | 4.8 | ND | 4.1 | ND | 366.0 | 2,146 | ND | ND | ND |
| | | 3/9/2016 | 9:40 AM | 12.2 | ND | 2.5 | 125.7 | ND | ND | 134.0 | ND | ND | 2.8 | ND | ND | 84.7 | 9.9 | ND | 5.4 | ND | 3.5 | ND | 370.0 | 1,940 | ND | ND | ND |
| | | 3/15/2016 | 10:20 AM | ND | ND | 2.4 | 127.5 | ND | ND | 139.0 | ND | ND | 1.9 | ND | ND | 78.5 | 58.6 | ND | 5.9 | ND | ND | ND | 512.7 | 2,232 | ND | ND | ND |
| 4953250 | San Juan R @ Sand Island | 2/16/2016 | 5:00 PM | 128.5 | ND | 1.0 | 104.8 | ND | ND | 77.7 | ND | ND | 2.7 | 71.7 | 0.2 | 18.8 | ND | ND | 1.7 | ND | 1.5 | ND | 70.7 | 570 | ND | ND | ND |
| | | 2/24/2016 | 8:40 AM | 34.8 | ND | ND | ND | ND | ND | 83.0 | 5.4 | ND | 2.0 | 57.2 | 0.2 | 23.3 | 6.9 | ND | 1.6 | ND | 1.3 | ND | 53.4 | 526 | ND | ND | ND |
| | | 3/1/2016 | 8:15 AM | 60.1 | ND | ND | ND | ND | ND | 80.0 | ND | ND | 1.3 | 44.2 | ND | 20.7 | ND | ND | 1.4 | ND | 1.3 | ND | 47.0 | 476 | ND | ND | ND |
| | | 3/9/2016 | 12:10 PM | 10.0 | ND | ND | ND | ND | ND | 73.1 | ND | ND | 1.0 | ND | ND | 17.9 | ND | ND | 1.3 | ND | ND | ND | 40.6 | 434 | ND | ND | ND |
| | | 3/15/2016 | 11:00 AM | ND | ND | ND | ND | ND | ND | 82.9 | ND | ND | ND | ND | ND | 20.3 | ND | ND | 1.5 | ND | ND | ND | 48.6 | 466 | ND | ND | ND |
| | | 3/22/2016 | 11:40 AM | 10.1 | ND | ND | ND | ND | ND | 79.6 | ND | ND | ND | ND | ND | 19.3 | ND | ND | 1.4 | ND | ND | ND | 43.1 | 466 | ND | ND | ND |
| | | 3/29/2016 | 9:50 AM | 16.1 | ND | ND | ND | ND | ND | 76.8 | ND | ND | ND | ND | ND | 17.7 | ND | ND | 1.4 | ND | ND | ND | 41.8 | 416 | ND | ND | ND |
| | | 4/4/2016 | 2:40 PM | 14.6 | ND | ND | ND | ND | ND | 79.3 | ND | ND | 1.0 | ND | ND | 18.7 | ND | ND | 1.5 | ND | ND | ND | 50.1 | 456 | ND | ND | ND |
| 4953000 | San Juan R @ Mexican Hat US163 Xing | 2/17/2016 | 9:00 AM | 57.7 | ND | 1.0 | ND | ND | ND | 77.2 | ND | ND | 2.0 | 37.2 | 0.1 | 18.7 | ND | ND | 1.7 | ND | 1.6 | ND | 69.5 | 582 | ND | ND | ND |
| | | 2/24/2016 | 9:20 AM | ND | ND | ND | ND | ND | ND | 85.1 | ND | ND | 1.3 | ND | ND | 22.9 | ND | ND | 1.6 | ND | 1.3 | ND | 54.7 | 530 | ND | ND | ND |
| | | 3/1/2016 | 9:00 AM | 21.6 | ND | 1.1 | ND | ND | ND | 80.7 | ND | ND | 1.4 | ND | ND | 20.5 | ND | ND | 1.6 | ND | 1.3 | ND | 46.6 | 486 | ND | ND | ND |
| | | | 9:10 AM | 16.9 | ND | 1.0 | ND | ND | ND | 80.2 | ND | ND | 2.0 | ND | ND | 20.6 | ND | ND | 1.4 | ND | 1.0 | ND | 47.5 | 476 | ND | ND | 11.3 |
| | | 3/9/2016 | 11:30 AM | 17.7 | ND | ND | ND | ND | ND | 73.1 | ND | ND | 1.6 | ND | ND | 17.7 | ND | ND | 1.4 | ND | ND | ND | 40.4 | 430 | ND | ND | ND |
| | | 3/15/2016 | 11:45 AM | ND | ND | ND | ND | ND | ND | 87.9 | ND | ND | ND | ND | ND | 21.8 | ND | ND | 1.5 | ND | ND | ND | 66.0 | 458 | ND | ND | ND |
| | | 3/22/2016 | 12:25 PM | 10.4 | ND | ND | ND | ND | ND | 82.1 | ND | ND | ND | ND | ND | 19.9 | ND | ND | 1.5 | ND | ND | ND | 44.5 | 470 | ND | ND | ND |
| | | 3/29/2016 | 8:55 AM | 16.8 | ND | ND | ND | ND | ND | 75.0 | ND | ND | 1.0 | ND | ND | 17.4 | ND | ND | 1.4 | ND | ND | ND | 40.7 | 414 | ND | ND | ND |
| | | 4/4/2016 | 3:30 PM | ND | ND | ND | ND | ND | ND | 80.0 | ND | ND | 1.1 | ND | ND | 18.9 | ND | ND | 1.5 | ND | ND | ND | 49.4 | 476 | ND | ND | ND |
| 4952942 | San Juan R @ Clay Hills | 2/17/2016 | 10:30 AM | 162.9 | ND | 1.1 | 112.5 | ND | ND | 79.1 | ND | ND | 2.3 | 77.5 | 0.2 | 21.0 | 5.5 | ND | 1.7 | ND | 1.7 | ND | 67.5 | 568 | ND | ND | 11.9 |