

Post-Gold King  
Mine Release  
Incident:  
Conceptual  
Monitoring Plan  
for Surface  
Water,  
Sediments, and  
Biology

EPA Draft

September 2015

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## I. Background – Gold King Mine Release Incident and Animas River Watershed Historic Conditions

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On August 5, 2015, EPA was conducting an investigation of the Gold King Mine (GKM) near Silverton, Colorado to assess the on-going water releases from the mine, treat mine water, and assess the feasibility of further mine remediation. While excavating above an old adit, pressurized water began leaking above the mine tunnel, spilling about three million gallons of water stored behind the collapsed material into Cement Creek, a tributary of the Animas River (<http://www2.epa.gov/goldkingmine>). The Animas River originates in the mountain peaks northeast of Silverton, in San Juan County, Colorado. It ends in Farmington, New Mexico, where it empties into the San Juan River terminating in Lake Powell in Utah. The conceptual monitoring strategy outlined in this document is designed to collect data in these surface waterbodies potentially impacted by the GKM Release Incident. Because this watershed has been historically impacted by mining releases and natural mineralization and these releases continue today, difficulties exist in identifying and distinguishing potential impacts of the GKM Release Incident from the many other ongoing sources of impacts described in this section.

The upper reaches of the Animas watershed are heavily impacted by historic mining activities and natural mineralization. Many abandoned mines exist within a two-mile radius in the headwaters including: the Upper Gold King, American Tunnel, Grand Mogul, Mogul, Red and Bonita, Eveline, Henrietta, Joe and John, and Lark mines. Some of these mines have acid mine drainages that produce flows of between 30 and 300 gallons per minute that directly or indirectly enter Cement Creek and eventually reach the Animas River. These flows were occurring prior to the GKM Release Incident and are ongoing. As a result, numerous remediation activities have been initiated in the watershed. The Animas River Stakeholder Group, the Bureau of Land Management, the Colorado Division of Reclamation/Mining and Safety, and EPA Region 8 have completed remediation projects in the watershed (*EPA Region 8, Upper Animas Mining District: Draft Baseline Ecological Risk Assessment*, <http://www2.epa.gov/region8/upper-animas-mining-district-draft-baseline-ecological-risk-assessment>). The Colorado Department of Public Health and the Environment has developed more than twenty-five Total Maximum Daily Loads (restoration plans required for waterbody segments considered impaired under the Clean Water Act) to help guide restoration activities towards meeting water quality standards. However, for some waters, including Cement Creek, the State has followed procedures under the Clean Water Act to remove aquatic life support as a designated use for the waterbody because it is not an attainable goal (*Colorado Department of Public Health & Environment*, <https://www.colorado.gov/pacific/cdphe/tmdl-san-juan-and-dolores-river-basins>).

Though restoration activities and plans have been underway in the watershed, aquatic life uses in numerous segments of the watershed remain impaired by heavy metals (*Colorado Department of Public Health & Environment*, <https://www.colorado.gov/pacific/sites/default/files/Regulation-93.pdf>). The Animas River Stakeholders Group (ARSG), which updated a watershed plan for remediating historical mining sites in the Upper Animas River Basin in 2013, estimates that in recent years untreated acid mine drainage from Cement Creek alone has been in the range of 600-800 gallons per minute or about 314-420 million gallons per year, with increases in metals loadings observed 40 miles downstream

in the Animas River

([http://ofmpub.epa.gov/apex/grts/f?p=110:700:13401198170892::NO:RP,700:P700\\_PRJ\\_SEQ:62860](http://ofmpub.epa.gov/apex/grts/f?p=110:700:13401198170892::NO:RP,700:P700_PRJ_SEQ:62860)).

This document describes post-release surface water quality, sediment quality, and biological community monitoring that will occur over the course of the year following the GKM Release Incident. Data collected over the next year will support an assessment of the changes in surface water and sediment quality since the GKM Release Incident across the full range of seasonal flow conditions. While this plan focuses on surface water and sediment quality, EPA is exploring a sampling regime for private drinking water wells. As part of its response to the GKM Release Incident, EPA has collected and tested more than 650 samples from private drinking water wells. The EPA is following up on 3 wells with exceedances of maximum contaminant limits (MCLs) for drinking water to determine if there is any connection to the GKM release. Currently, sampling of drinking water wells is not included in this plan. Recognizing continued interest, EPA is taking comment and input on whether further action is needed on private wells. The EPA would like stakeholder input on the frequency, duration, location and scientific basis for continuing sampling of private wells.

## **II. Context for Conceptual Monitoring Plan and Data Uses**

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This is a conceptual monitoring plan in that it outlines the objectives, boundaries, and guiding principles for this effort. This allows for stakeholder review and input prior to finalization of more detailed documents. It is not intended to replace a Quality Assurance Project Plan (QAPP) or Sampling and Analysis Plan; but rather, serves to direct the development of such.

The monitoring effort described in this document will gather comprehensive data that span the watershed potentially affected by the GKM Release Incident. These data may be useful for a variety of purposes for the EPA, States, Tribes, and stakeholders and serve to increase our understanding and characterization of conditions across the watershed. A variety of media will be sampled and the objectives of this study are described in Section III. This monitoring and associated assessment will not constitute characterization for the Clean Water Act (CWA) Section 303(d) and 305(b) assessment determinations or site assessment/remedial investigation purposes under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); however, these data may support such efforts. The EPA may use a variety of regulatory and response authorities to conduct studies, initiate cleanup actions, facilitate public participation, and otherwise contribute to the cleanup of watersheds contaminated with hazardous substances and wastes. The EPA has developed guidance for federal and state program managers on integrating waste and water program to restore watersheds, which can be found here: <http://www.epa.gov/superfund/resources/pdfs/cross-program.pdf>

This monitoring study is designed to collect data in the surface waterbodies potentially impacted by the GKM Release Incident to determine if water and sediment quality trends are similar to trends observed before the GKM release. While the latest monitoring information after the GKM Release Incident shows contaminant levels have returned to pre-spill levels, this study's monitoring information will serve to inform if these findings remain consistent across the range of annual flow conditions.

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It is important to recognize that the information collected for this monitoring study may not be sufficient to attribute elevated contaminant levels or possible biological metrics to the August 5, 2015, GKM release. The limits of this study's data to provide release-specific attribution follow from the many years of historic mine drainage releases from the GKM, the ongoing acid mine drainage releases from other mines into the Animas River (and downstream water bodies) and the limited availability of pre-release water quality conditions.

Monitoring and assessment efforts occurring prior to the GKM Release Incident identified pre-existing impairments to water quality, sediment quality, and biological communities in this watershed. Numerous sources of metals contamination are present that have impacted environmental quality before the GKM Release Incident and continue to impact environmental quality post GKM Release Incident. Therefore, our ability to determine if current environmental impacts relate to the GKM Release Incident is confounded by the presence of these other sources, and typical conditions in many areas of this watershed are not pristine nor free of impairments. Any new data that are gathered can only be understood with respect to the GKM Release Incident by a comparison to previous conditions that reflect historic impairment sources. Hence, the ease of interpretation of data gathered under this strategy greatly depends on the amount and quality of historic data that are available for comparison. Sites, media, and analytes for which there are robust historic datasets for pre- and post-release comparison will be the most useful in understanding whether typical conditions in this watershed are being maintained after the GKM Release Incident. A comparison of current data to data collected under pre-release/historic conditions should allow for an understanding of whether there are changes in water quality and sediment quality trends post-GKM Release Incident over the next year or whether typical conditions are witnessed. Biological data are being collected as well; however, historic datasets are more limited and biological data are more difficult to interpret and compare. Therefore, the primary media to be used in determining maintenance of pre-release or historic conditions are surface water and sediment.

Some sites that do not have robust datasets will be sampled because they are necessary to provide a more complete geographic distribution of data collection under this strategy. Data for sites, media, and analytes, for which there is not a historic dataset for comparison, will not be useful for determining changes in environmental quality as a result of the GKM Release Incident and should not be used to this end. However, these data are important for increasing our understanding and characterization of the watershed with respect to the many complex existing contaminant sources and stressors that have been and continue to be present. These data serve to inform stakeholders of the environmental conditions across the wider watershed, begin the development of a historic data set for more locations in the watershed, and provide valuable information for decision makers.

After completing one year of monitoring under this plan, if results indicate a return to pre-release/historic trends, monitoring efforts under this plan will end and routine monitoring will continue per State, Tribal, and Federal program strategies and priorities. If pre-release/historic trends across the watershed are not maintained at some locations in the watershed, the EPA will conduct additional site-specific investigations as appropriate and use its authorities to work with other federal agencies, States, Tribes, and local entities to address these problems. The EPA is coordinating with its regulatory partners and affected stakeholders to understand other organizations' monitoring efforts, prevent duplication, and promote data sharing.

### III. Objectives and Study Questions

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This document outlines EPA's proposed conceptual monitoring strategy, assessment goals and general methods for evaluating surface waters, sediments, and biological communities downstream of the GKM Release Incident. This document outlines monitoring to be undertaken by the EPA and key stakeholders or regulatory partners that will support collaborative assessment of the pre- and post-release conditions. States and Tribes may consider this a framework for additional sampling that they wish to undertake.

The objectives of the monitoring strategy are limited in scope by the availability of historic or pre-release data. In this document pre-release data include results of sampling that occurred just prior to the GKM Release Incident. Historic data include longer term data sets that reflect many years of sampling and contaminant trends. Pre-release and historic data for metals in sediment, metals in water and biological assemblages are available for the Animas River in Colorado and Southern Ute Indian Reservation due to proximity of mine locations and past and continued interest in the effects of mining run-off. However, pre-release and historic data for both metals in sediment and water as well as biological information are less abundant further downstream on the Animas and San Juan River in New Mexico, Ute Mountain Ute Reservation, the Navajo Nation, and Utah. Due to the discrepancy of available pre-release and historic data and potential challenges faced by downstream states in assessing pre-release/historic trends with post-release conditions, two objectives for this study are proposed:

- **Objective A:** Identify changes in surface water or sediment quality trends since the GKM Release Incident in Cement Creek, Animas River, and the San Juan River by comparing post-release data against pre-release or historic trends. Only data that meet the requirements of Objective A, in that pre-release and post-release comparisons can be made, will be used to assess the changes since the GKM Release Incident.
- **Objective B:** Assess *only* current conditions of Cement Creek, Animas River, San Juan River, and Lake Powell where historic or pre-release data are absent or limited. Data solely collected to meet Objective B will not be sufficient in assessing the changes since the GKM Release Incident without additional information.

**Objective A:** *Identify changes in surface water or sediment quality trends since the GKM Release Incident in Cement Creek, Animas River, and the San Juan River at sites in Colorado, Southern Ute Reservation, New Mexico, Ute Mountain Ute Reservation, Navajo Nation, and Utah by comparing post-release data against pre-release or historic trends for all sampling sites possible. Only data that meet the requirements of Objective A, in that pre-release and post-release comparisons can be made, will be used to assess the changes since the GKM Release Incident. Include biological community and biological tissue data-set comparisons if historic datasets allow.*

The primary purpose of this objective is to identify changes since the GKM Release Incident that occurred on August 5, 2015 by comparing post-release data against pre-release or historic trends for each sampling location. The study questions identified below provide the context used in selecting sampling locations and analytes of interest for this objective.

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For this effort, it is necessary that data be collected at sites for which historic and/or pre-release data trends are available so that historic and/or pre-release trends may be compared to the data collected through this monitoring effort. Potential sampling locations are identified in this document with emphasis placed on those sites for which historic data are available. Pre-release and historic data availability are understood for most of these potential sites or will be compiled and analyzed prior to final site selection. Stakeholders may have alternative (replacement) sites of interest for those identified in Table 2.

Assessment Objective A:

Compare pre-release (or historic) and post-release surface water data, sediment data and biological data of Cement Creek, the Animas River, and the San Juan River.

Study Questions – Objective A:

1. Have water and sediment quality trends in Cement Creek, the Animas River, and the San Juan River changed since the GKM Release Incident?
  - a. What are the water column and sediment metals concentrations/loadings and how do they compare to pre-release or historic trends?
  - b. What are the conditions of the biological communities, macroinvertebrates and fish, and how do the indices used to assess them compare to pre-release or historic conditions?
2. If post-release conditions are of lower quality than pre-release/historic trends, are water quality standards or screening levels exceeded for human health (including recreation and fish consumption), agricultural, and aquatic life uses in the watershed?

If metals concentrations in sampled media are higher than pre-release/historic trends, are they meeting screening levels identified as acceptable for recreation, agriculture, and aquatic life? Screening levels that may be used by EPA include those benchmarks identified as part of the GKM Release Incident emergency response and other water quality standards that apply.

**Objective B:** Assess *only* current conditions of the Animas River, San Juan River, and Lake Powell at locations in Colorado, Southern Ute Reservation, New Mexico, Ute Mountain Ute Reservation, Navajo Nation, and Utah at sites in which historic or pre-release data are absent or limited. Data solely collected to meet Objective B will not be sufficient in assessing the changes since the GKM Release Incident without additional information.

At stations that lack historical or pre-release data, a general assessment is proposed for Cement Creek, Animas River, San Juan River and including Lake Powell. The general assessment will not identify changes since the release but can be used to better understand overall conditions at these sites, which reflect all previous releases, discharges, spills, stormwater runoff and erosion over previous decades.

Assessment Objective B:

Identify current conditions of Cement Creek, Animas River, San Juan River and Lake Powell through the collection of surface water, sediment, and biological samples at multiple locations.

Study Questions – Objective B:

1. Do surface water and sediment in Cement Creek, Animas River, San Juan River and Lake Powell demonstrate exceedances of current criteria for metals and/or screening levels?
  - a. What are current metals in water concentrations and how do they compare to state water quality standards and/or screening levels?
  - b. What are current metals in sediment concentrations and how do they compare to recreational screening levels?
  - c. What is the current assessment of biological communities (macroinvertebrates and fish) for locations in which State/Tribal assessment methods are available?
  - d. How do current assessments compare to previous assessments (if available)?

#### **IV. Monitoring Frequency and Analytes of Interest**

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The EPA anticipates that the sampling under this strategy will occur during the first year after completion of the GKM Release Incident response monitoring activities conclude. This monitoring and assessment effort will end after approximately one year if data confirm that pre-release trends or screening levels are maintained. A one-year monitoring duration was selected so that data may be collected across the full range of seasonal flow conditions. After completing one-year of monitoring under this plan, if results indicate a return to pre-release/historic trends, monitoring efforts under this plan will end and routine monitoring will continue per State, Tribal, and Federal program strategies and priorities. If pre-release trends are not attained and screening levels are exceeded, monitoring activities will be focused site specifically on areas of interest with the purpose of identifying sources and developing corrective actions. Potential sampling locations are identified below in Table 2, Section VI.

Table 1 summarizes the expected frequency of monitoring under this plan as well as the type of data to be collected. The full suite of metals that were monitored during the emergency response will be monitored under this strategy for consistency. However, not all of the metals monitored during the emergency response (and through this effort) are expected to be present in the GKM discharge. The primary metals of interest associated with the GKM include: aluminum, cadmium, copper, iron, lead, manganese, and zinc.

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<b>Table 1. Sampling and Monitoring Schedule For Potential Sampling Sites Listed in Table 2</b>					
<b>SAMPLING AND MONITORING SCHEDULE:</b>	<b>FALL 2015</b>	<b>MARCH 2016</b>	<b>SPRING/ JUNE 2016</b>	<b>SUMMER 2016</b>	<b>FALL 2016</b>
<b>WATER COLUMN</b> - dissolved and total recoverable metals <sup>1</sup> , dissolved organic carbon (DOC), total organic carbon (TOC), hardness	1 event	1 event: pre-snow melt	1 event: snowmelt runoff		1 event: low flow
<b>SEDIMENT</b> – total recoverable metals	1 event	1 event: pre-snow melt			1 event: low flow
<b>BENTHOS AND FISH TISSUE</b> – metals; Collect and assess in locations where historic data are available so that release effects can be assessed.					1 event: timeframe comparable to historic data
<b>BIOLOGICAL COMMUNITY</b> – benthic macroinvertebrate and fish populations – Collect and assess in locations where historic data are available and State/Tribal assessment methods are developed so that release effects can be assessed.	1 event				1 event
<b>STORMWATER SAMPLING</b> - dissolved and total recoverable metals <sup>1</sup> and dissolved organic carbon (DOC) – Collect at sites on Animas in CO, Southern Ute, NM	1-2 (total across Fall 2015 and Summer 2016)			1-2 (total across Fall 2015 and Summer 2016)	
<b>PHYSICAL HABITAT</b>	Collected once at each site sampled for macroinvertebrates and fish – likely at fall event				
<b>FIELD PARAMETERS</b> –	All sampling events will include field parameters (pH, temperature, dissolved oxygen (DO), conductivity and turbidity) measured with a probe/sonde.				
<b>FLOW</b> –	Flow data will be measured via stream gage if present or by flow meter for all events.				
<sup>1</sup> Aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silver, sodium, thallium, uranium, vanadium, and zinc					

## V. Site Selection and Assessment Approach

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The following summarizes the site selection and general assessment approach for the watershed.

### **Sampling and monitoring location selection:**

Currently, the EPA has identified 23 potential monitoring locations along Cement Creek, the Animas River, the San Juan River, and Lake Powell based upon locations used in the emergency response and long-term data availability. Reference/background sites necessary for state or tribal assessments may be necessary and require stakeholder input for identification. The detailed list of potential sampling locations is provided in Section VI, Table 2.

### **Assessment Summary:**

For data interpretation, post-release monitoring data will be compared against historic data, pre-release metals levels, risk-based screening levels and/or applicable water quality standards. Biological community information will be compared against pre-release/historic data using State/Tribal assessment methods. Data assessment methods will be developed for each site based upon the quantity and quality of the historic data. For sites with more abundant historic data, a statistical analysis of pre- and post-release conditions may be possible. Sites with limited historic data may not be suitable for a statistical comparison of pre- and post-release conditions and may provide only a qualitative understanding of changes in water and sediment quality. For these sites, changes in impairment status under the Clean Water Act pre- and post-release may serve to inform whether further study is warranted for confirmation. It is anticipated that the following decision rules will apply:

#### General Decision Rules (primarily to be based on metals concentrations in water and sediment):

- **If the one-year monitoring study indicates that pre-release water quality and sediment trends are similar to trends observed prior to the GKM release:**
  - End monitoring under this plan and continue monitoring per State, Tribal, and Federal program strategies and priorities.; and
  - Communicate waterbody condition in comparison to water quality standards and/or screening level benchmarks to stakeholders.
- **If the one-year monitoring study indicates that pre-release water quality and sediment trends have degraded since the GKM release AND screening levels or water quality standards are exceeded:**
  - The EPA will conduct additional site-specific investigations as appropriate and use its authorities to work with other federal agencies, States, Tribes, and local entities to address these problems.
- **If the monitoring data for any site cannot be compared to pre-release conditions/historic data:**
  - Communicate waterbody condition in comparison to water quality standards and/or screening level benchmarks to stakeholders. Conditions will not be attributable to GKM Release Incident using these data alone.

**Screening Levels and Water Quality Standards:**

Screening levels that were used for the GKM Release Incident response decisions will be used in data assessment under this strategy as well. Federally approved applicable State and Tribal water quality standards can be found at:

- State of Colorado –
  - [ftp://ft.dphe.state.co.us/wqc/wqcc/Current%20Water%20Quality%20Standards/Currently%20Effective%20Standards/34\\_SanJuan\\_Effective\\_06-30-2015/34\\_2015\(06\)SBP.pdf](ftp://ft.dphe.state.co.us/wqc/wqcc/Current%20Water%20Quality%20Standards/Currently%20Effective%20Standards/34_SanJuan_Effective_06-30-2015/34_2015(06)SBP.pdf)
- Navajo Nation –
  - <http://www.navajonationepa.org/Pdf%20files/Navajo%20Nation%20Surface%20Water%20Quality%20Standards%202007.pdf>
- Southern Ute Tribe -
  - Contact the tribe - <https://www.southernute-nsn.gov/environmental-programs/water-quality/> or EPA Region 8 – 303-312-6947
- State of New Mexico –
  - <http://164.64.110.239/nmac/parts/title20/20.006.0004.pdf>
- State of Utah –
  - <http://www.rules.utah.gov/publicat/code/r317/r317-002.htm>
- Ute Mountain Ute Tribe –
  - [http://www.utemountainuteenvironmental.org/umep/assets/File/Water/Surface%20Water%20Standards/UMU\\_WQS\\_2011Revision\\_042011\\_supplimental.pdf](http://www.utemountainuteenvironmental.org/umep/assets/File/Water/Surface%20Water%20Standards/UMU_WQS_2011Revision_042011_supplimental.pdf)

**VI. Potential Sampling Locations**

Table 2 includes potential sampling locations for the monitoring described in this plan. Final site selection will be based upon the assessment needs and goals of EPA, key stakeholders and regulatory partners. Replacement sites with pre-release or historic data may also be considered. Section XI provides associated maps for these locations. Maps will be finalized once site selection is complete.

<b>Table 2. Potential site names, description and type</b>				
<b>Site Name</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Description/Location</b>	<b>Importance/Rationale</b>
<b>CC48 (EPA) / 09358550 (USGS)</b>	37.819984	-107.663275	Cement Creek upstream of Silverton	Historic, long-term data record and release data available
<b>A68 (EPA) / 09358550 (USGS)</b>	37.811202	-107.659167	Animas River above Cement Creek in Silverton	Reference condition for this release; historic, long-term data record and release data available
<b>A72 (EPA) / 82 (WQCD) /09359020 (USGS) / 3611 (RW)</b>	37.79027	-107.667578	Animas River at gage below Silverton, downstream of confluence with Mineral Creek	Historic, long-term and release data record available

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<b>A73 (EPA) / 3442 (RW)</b>	37.72215833	-107.65482778	Animas River upstream of Elk Creek	Historic, long-term data available; characterizes Animas before tributary influence
<b>A75D (EPA) / 3438 (RW)</b>	37.59793424	-107.77532681	Animas River upstream of Cascade Creek	Historic, long-term data record; characterizes Animas before tributary influence
<b>Bakers Bridge (EPA) / GKM02 (EPA) / 88 (RW)</b>	37.454134	-107.801601	Animas River at Bakers Bridge (CO Hwy. 250)	Historic, long-term and release data record available; pre-release water quality data available
<b>9426 (WQCD) / 89 (RW)</b>	37.38506	-107.83686	Animas River near Trimble at CO Hwy 252 Bridge	Historic, long-term data record available; mid-way between Bakers Bridge and Durango
<b>32nd St. Bridge (EPA) / 3577 (RW) / 3717591075 20601 (USGS)</b>	37.299991	-107.868199	Animas River in Durango at 32 <sup>nd</sup> St. Bridge	Historic, long-term and release data record available
<b>Animas – Rotary Park (EPA) / 91 (RW) / 09361500 (USGS)</b>	37.280718	-107.876927	Animas River at Rotary Park in Durango	Historic, long-term and release data record available
<b>GKM05 (EPA)</b>	37.268704	-107.885857	Animas River, south end of Durango near intersection of 160 and 550 above confluence with Lightner Creek	Release response site; unclear if long-term data available
<b>GKM01 (EPA) / AR19-3 (SUIT) / Purple Cliffs (EPA) / 3713191075 15001 (USGS) / 3430 (RW) / 92 (RW) / NAR1 (SUIT)</b>	37.221542	-107.859455	Animas River at Southern Ute Reservation boundary	Release response site; at CO/S. Ute Reservation border
<b>AR 7-2 (SUIT) / NAR4 (SUIT)</b>	37.084992	-107.878383	Animas River above confluence with Florida River	Historic data available
<b>NAR 6 (SUIT)</b>	37.024806	-107.8738	Animas River on Southern Ute Reservation just downstream of Heaven on Earth Road	Long-term data available, pre-release data available

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<b>ADW-022 (EPA)</b>	36.920559	-107.909909	Animas River at the Aztec Domestic Water System Intake	Pre-release data available
<b>ADW-010 (EPA) / 09364010 (USGS) / 28.1 (NM) / 27.8 (NM)</b>	36.837463	-107.991684	Animas River, mid-way between Southern Ute boundary and confluence with San Juan River	Pre-release data available
<b>FW-040 (EPA)</b>	36.783635	-108.102111	Animas River at confluence with San Juan River	USGS historic data available
<b>SJLP (EPA)</b>	36.73588701	-108.2539868	San Juan River below confluence with Animas River	Pre-release data available
<b>SJFP (EPA) / NMRM-1005 (EPA) / 09367540 (USGS)</b>	36.74815602	-108.4120157	San Juan River near Farmington, NM	Pre-release data available; historic data (National Rivers and Streams Monitoring Assessment) available
<b>SJSR (EPA) / 09368000 (USGS)</b>	36.78162422	-108.6927838	San Juan River near Shiprock, NM	Pre-release data available
<b>SJ4C (EPA) / 09371010 (USGS) / 4954000 (UT)</b>	37.000777	-109.029577	San Juan River just north of Four Corners on Ute Mountain Ute Reservation	Pre-release data available
<b>SJME (EPA) / UTR9-0901 (EPA)</b>	37.21681097	-109.19615	San Juan River near the confluence of McElmo Creek	Historic data (National River and Streams Monitoring Assessment) available; pre-release data available
<b>SJBB (EPA) / UTRM-1009 (EPA) / 4953250 (USGS)</b>	37.257527	-109.618941	San Juan River at Bluff, UT	Historic data available (National Rivers and Streams Monitoring Assessment and State of Utah); pre-release and response data available
<b>SJIN (EPA) / 3712481103 - 95301 (USGS) / 5952590 (UT)</b>	37.2536	-110.6632	Lake Powell site near San Juan inlet	Lake Powell site

Table 3 identifies historic data availability by site data type. Data availability will be confirmed prior to final site selection.

<b>Table 3. Summary of historic data availability by site. Asterisks indicate immediately pre-release data are available.</b>						
<b>Site</b>	<b>Water column - metals</b>	<b>Sediment - metals</b>	<b>Fish tissue - metals</b>	<b>Benthic tissue - metals</b>	<b>Macro-invertebrate population</b>	<b>Fish population</b>
CC48	Yes	Yes	TBD	TBD	TBD	TBD
A68	Yes	Yes	TBD	Yes	Yes	TBD
A72	Yes	Yes	TBD	Yes	Yes	TBD
A73	Yes	Yes	TBD	TBD	TBD	TBD
A75D	Yes	Yes	TBD	Yes	Yes	TBD
Bakers Bridge	Yes*	Yes	TBD	Yes	Yes	TBD
9426	Yes	No	No	No	Yes	TBD
32nd St. Bridge	Yes*	Yes	No	No	Yes	TBD
Animas – Rotary Park	Yes	Yes	TBD	TBD	Yes	TBD
GKM05	Yes	TBD	No	TBD	TBD	TBD
GKM01	Yes*	TBD	No	TBD	TBD	TBD
AR7-2	Yes	Yes	TBD	TBD	Yes	TBD
NAR6	Yes*	TBD	TBD	TBD	TBD	TBD
ADW-022	TBD	TBD	TBD	TBD	TBD	TBD
ADW-010	Yes*	TBD	TBD	TBD	TBD	TBD
SJLP	Yes*	TBD	TBD	TBD	TBD	TBD
FW-040	TBD	TBD	TBD	TBD	TBD	TBD
SJFP	Yes*	TBD	Yes	TBD	Yes	Yes
SJSR	Yes*	TBD	TBD	TBD	TBD	TBD
SJ4C	Yes*	TBD	TBD	TBD	TBD	TBD
SJME	Yes*	TBD	Yes	TBD	Yes	Yes
SJBB	Yes*	TBD	Yes	TBD	Yes	Yes
SJIN	TBD	TBD	TBD	TBD	TBD	TBD

## VII. Methods

The following analytical and field methods are proposed for sample collection and analysis under this monitoring strategy:

1. Dissolved metals in water:
  - ICP-MS Dissolved Metals in Water (EPA 200.8) and ICP Dissolved Metals in Water (EPA 200.7)
2. Total recoverable metals in water:
  - ICP-MS Total Metals in Water (EPA 200.8) and ICP Total Metals in Water (EPA 200.7)

3. Mercury:
  - EPA 245.1
4. Dissolved organic carbon (DOC):
  - EPA 415.2
5. Total organic carbon (TOC):
  - EPA 415.1
6. Hardness:
  - SM 2340B
7. Total recoverable metals in sediment:
  - ICP-MS Total Metals in Soil (EPA 200.8) and ICP Total Metals in Soil (EPA 200.7)
8. Field methods:
  - EPA Sampling Standard Operating Procedures: Emergency Response Team (ERT) Standard Operating Procedures (SOPs) for surface water and sediment.
  - EPA Region 8 Water Sampling Standard Operating Procedure (SOP) and Sediment Sampling SOP.
  - EPA ERT SOPs general website: [http://www.epaosc.org/site/site\\_profile.aspx?site\\_id=2107](http://www.epaosc.org/site/site_profile.aspx?site_id=2107)
  - Surface water sampling SOP: <http://www.epaosc.org/sites/2107/files/2013-R00.pdf>
  - Sediment sampling SOP: <http://www.epaosc.org/sites/2107/files/2016-R00.pdf>
  - Macroinvertebrate sampling options – methods may vary by location
    - Use method used for historical data collection for historical comparability
    - Use EPA’s National Rivers and Streams Survey Methods for longitudinal comparability
  - Fish community sampling options – methods may vary by location
    - Use method used for historic/pre-release data collection for pre-release/historic comparability
    - Use EPA’s National Rivers and Streams Survey Methods for longitudinal comparability
  - Habitat Assessment options – methods may vary by location
    - Use method used for historical data collection for historic comparability
    - EPA’s National River and Streams Survey Methods for longitudinal comparability
  - Fish tissue sampling – methods may vary by location
    - Use method used for historic data collection for historic comparability

## VIII. Quality Assurance/Quality Control

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A QAPP will be developed to describe the data quality objectives, the detailed sampling and analysis plan, field and laboratory quality control requirements, data handling and storage, standard operating procedures for field and laboratory activities, and other quality assurance requirements for this monitoring plan. This QAPP will conform to *QA/R-5 EPA Requirements for Quality Assurance Project Plans*.

The EPA anticipates using a single, National Environmental Laboratory Accreditation Conference (NELAC)-accredited lab that conforms to American National Standard ASQ/ANSI E4 quality assurance systems. Split samples may be provided to a second accredited laboratory for analytical verification.

## IX. Data Management

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The EPA anticipates using a single lab for metals analysis in order to facilitate data delivery and sharing. We also anticipate using an online SCRIBE database to share data and uploading the data to the EPA's STORET data warehouse for long-term storage.

## X. Data Assessment

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Objective A of this monitoring effort is to identify changes in metals concentrations in surface water and sediment since the GKM Release Incident in Cement Creek, Animas River, and San Juan River for at least one year after the end of the emergency response. Data assessment is described generally in Section V. Additional detail regarding data assessment approaches will be included in the Quality Assurance Project Plan and Sampling and Analysis Plan. Data assessment methods will be developed for each site based upon the quantity and quality of the historic data. For sites with more abundant historic data, a statistical analysis of pre- and post-release conditions may be possible. Sites with limited historic data may not be suitable for a statistical comparison of pre- and post-release conditions and may provide only a qualitative understanding of changes in water and sediment quality. For these sites, changes in impairment status under the Clean Water Act may serve to inform whether further study is warranted.

When completing condition assessments for either Objective A or Objective B, State and tribal assessment methods will be considered in assessing data against water quality standards. Available assessment methods include the following:

- State of Colorado –
  - <https://www.colorado.gov/pacific/sites/default/files/303dLM2016.pdf>
- State of New Mexico –
  - [https://www.env.nm.gov/swqb/protocols/documents/2016\\_FINAL\\_AP\\_062215.pdf](https://www.env.nm.gov/swqb/protocols/documents/2016_FINAL_AP_062215.pdf)
- State of Utah –
  - [http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/docs/2015/03Mar/303d\\_AssessmentMethodology.pdf](http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/assessment/docs/2015/03Mar/303d_AssessmentMethodology.pdf)

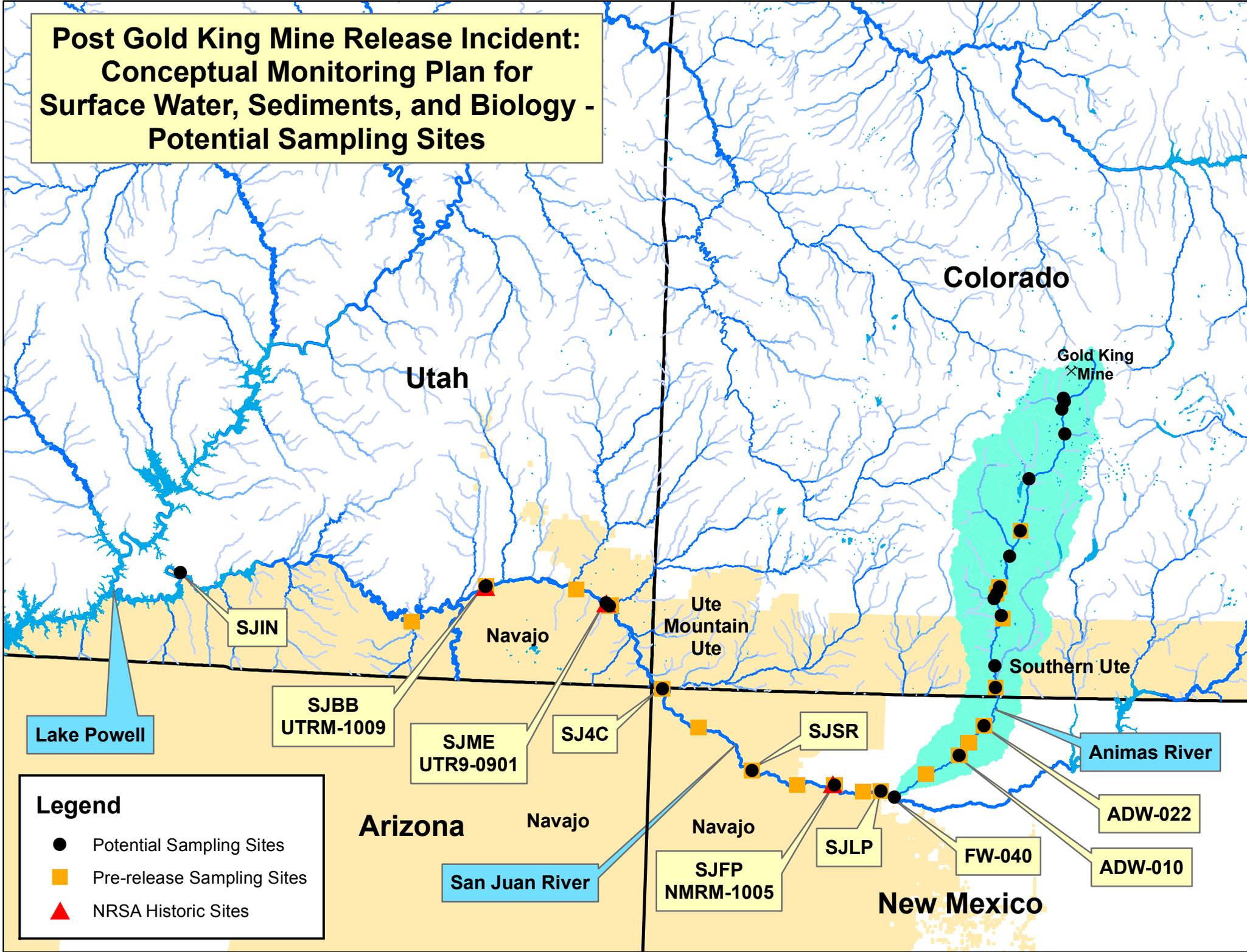
## XI. Figures

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DRAFT

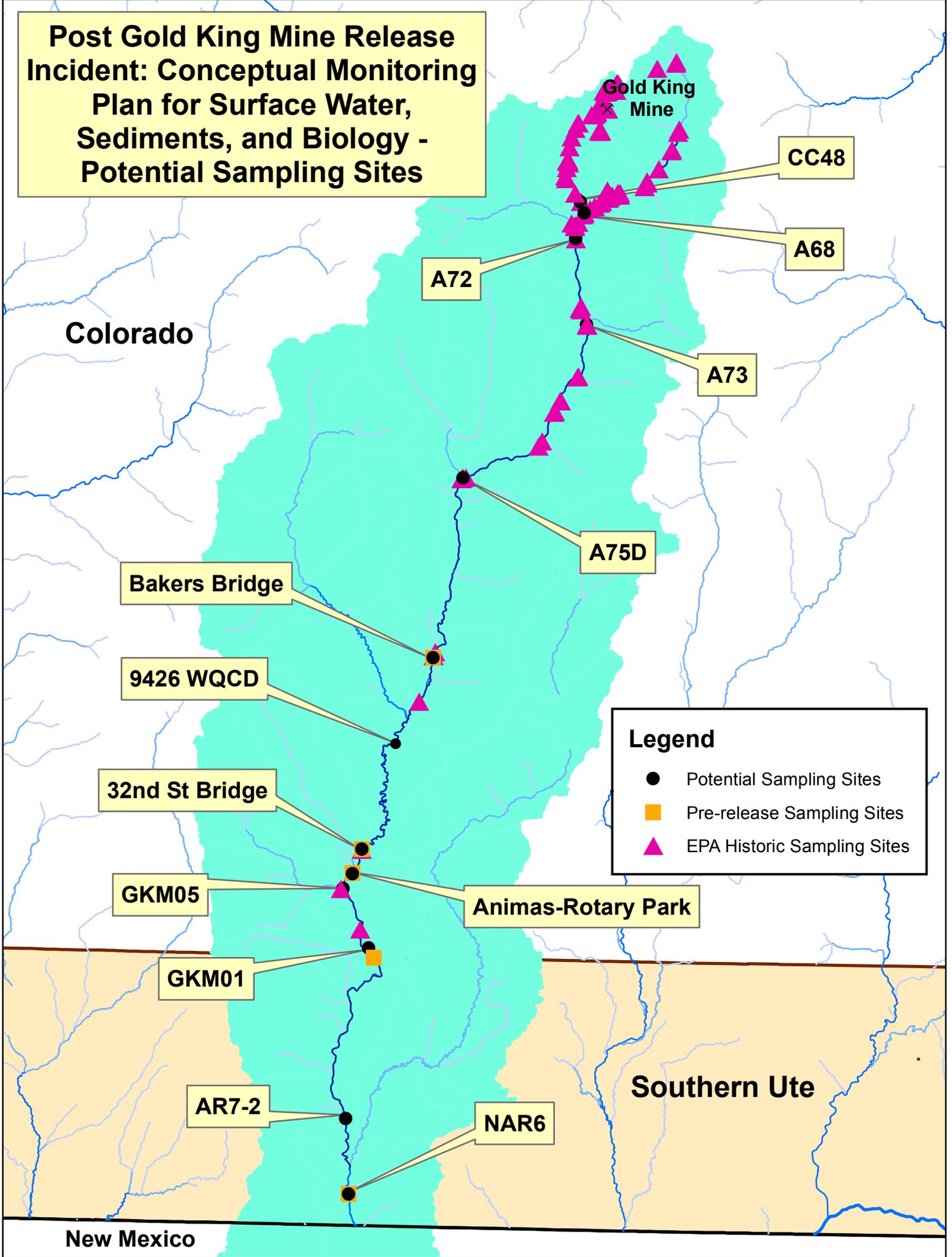
**Post Gold King Mine Release Incident:  
Conceptual Monitoring Plan for  
Surface Water, Sediments, and Biology -  
Potential Sampling Sites**



**Legend**

- Potential Sampling Sites
- Pre-release Sampling Sites
- ▲ NRSA Historic Sites

**Post Gold King Mine Release Incident: Conceptual Monitoring Plan for Surface Water, Sediments, and Biology - Potential Sampling Sites**



**Legend**

- Potential Sampling Sites
- Pre-release Sampling Sites
- ▲ EPA Historic Sampling Sites

CC48

A68

A72

A73

A75D

Bakers Bridge

9426 WQCD

32nd St Bridge

GKM05

Animas-Rotary Park

GKM01

AR7-2

NAR6

Colorado

Southern Ute

New Mexico

Gold King Mine