FIRST FIVE-YEAR REVIEW REPORT FOR
STANDARD MINE SUPERFUND SITE
GUNNISON COUNTY, COLORADO

Prepared by

U.S. Environmental Protection Agency
Region 8
Denver, Colorado

BETSY SMIDINGER
Digitally signed by BETSY SMIDINGER
Date: 2020.06.10 19:05:14 -06'00'

Betsy Smidinger, Director
Superfund and Emergency Management Division

Date

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LIST OF ABBREVIATIONS AND ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
ATV	All-terrain Vehicle
BERA	Baseline Ecological Risk Assessment
BHHRA	Baseline Human Health Risk Assessment
CCR	Colorado Code of Regulations
CDPHE	Colorado Department of Public Health & Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Chemical of Concern
DRMS	Division of Reclamation, Mining and Safety
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FYR	Five-Year Review
IC	Institutional Control
ln	Natural Log
µg/L	micrograms per liter
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MEMCO	Mount Emmons Mine Company
MRL	Method Reporting Limit
mg/L	milligrams per liter
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OLEM	Office of Land and Emergency Management
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PA	Preliminary Assessment
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SI	Site Inspection
USFS	United States Forest Service
USGS	United States Geological Survey
UU/UE	Unlimited Use and Unrestricted Exposure
WQCC	Water Quality Control Commission
WQS	Water Quality Standard

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the first FYR for the Standard Mine Superfund site (the Site). The triggering action for this statutory review is the on-site construction start date of the remedial action. The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of one sitewide operable unit (OU). The sitewide OU includes all contaminated media present at or discharging from the Site. This FYR addresses the sitewide OU.

The EPA remedial project manager (RPM) Andrew Schmidt led the FYR. Participants included EPA community involvement coordinator (CIC) Katherine Jenkins, Colorado Department of Public Health & Environment (CDPHE) project manager Ross Davis, Jeff Graves from the Colorado Division of Reclamation, Mining and Safety (DRMS), Curtis Cross from the United States Forest Service (USFS), and Treat Suomi and Jill Billus from EPA FYR support contractor Skeo. The review began on August 30, 2019.

The EPA has determined in the FYR Report that the cleanup at the Standard Mine Superfund site will be protective upon completion. This means that the remedy, once fully implemented, will be protective of human health and the environment and allow for recreational reuse.

Appendix A provides a list of documents reviewed as part of this FYR Report. Appendix B provides a chronology of major site events.

Site Background

The Site is in Gunnison County, Colorado, approximately 5 miles west of the town of Crested Butte (Figure 1). The Site is an abandoned hard rock mine located in a remote area of west central Colorado at an elevation of approximately 10,900 to 11,600 feet above mean sea level. It is located within the boundaries of the Gunnison National Forest and includes about 10 acres of land disturbed by mining activity situated on a combination of USFS and privately-owned land. The Site also includes impacted surface water downstream of the mine. The Site consists primarily of the Standard Mine (also historically known as the Micawber Mine) and includes the smaller Elk Lode Mine (referenced as Level 98). The Standard Mine operated between 1951 and 1974; the Elk Lode Mine operated between 1880 and 1882. Historic mining activities contaminated soil and sediment and focused the discharge of heavy-metals-laden groundwater to surface water.

Before cleanup occurred, the Site had waste piles along with open and unmarked adits and mine shafts. The Site included several discrete areas of mining disturbance, or levels into the mine: Level 1, Level 2, Level 3, Level 4, Level 5 and Level 98. Appendix C summarizes the characteristics of each area prior to cleanup. Figure 1 shows the locations of the mine feature points as well as the mine waste repository constructed as part of the Site's cleanup. Figure C-1 in Appendix C is a cross-section interpretation of the mine workings.

The Site is currently abandoned and unoccupied. The Site is in a remote area in Gunnison National Forest and is adjacent to the Oh-Be-Joyful Wilderness Area to the north. The area in the vicinity of the Site is used for

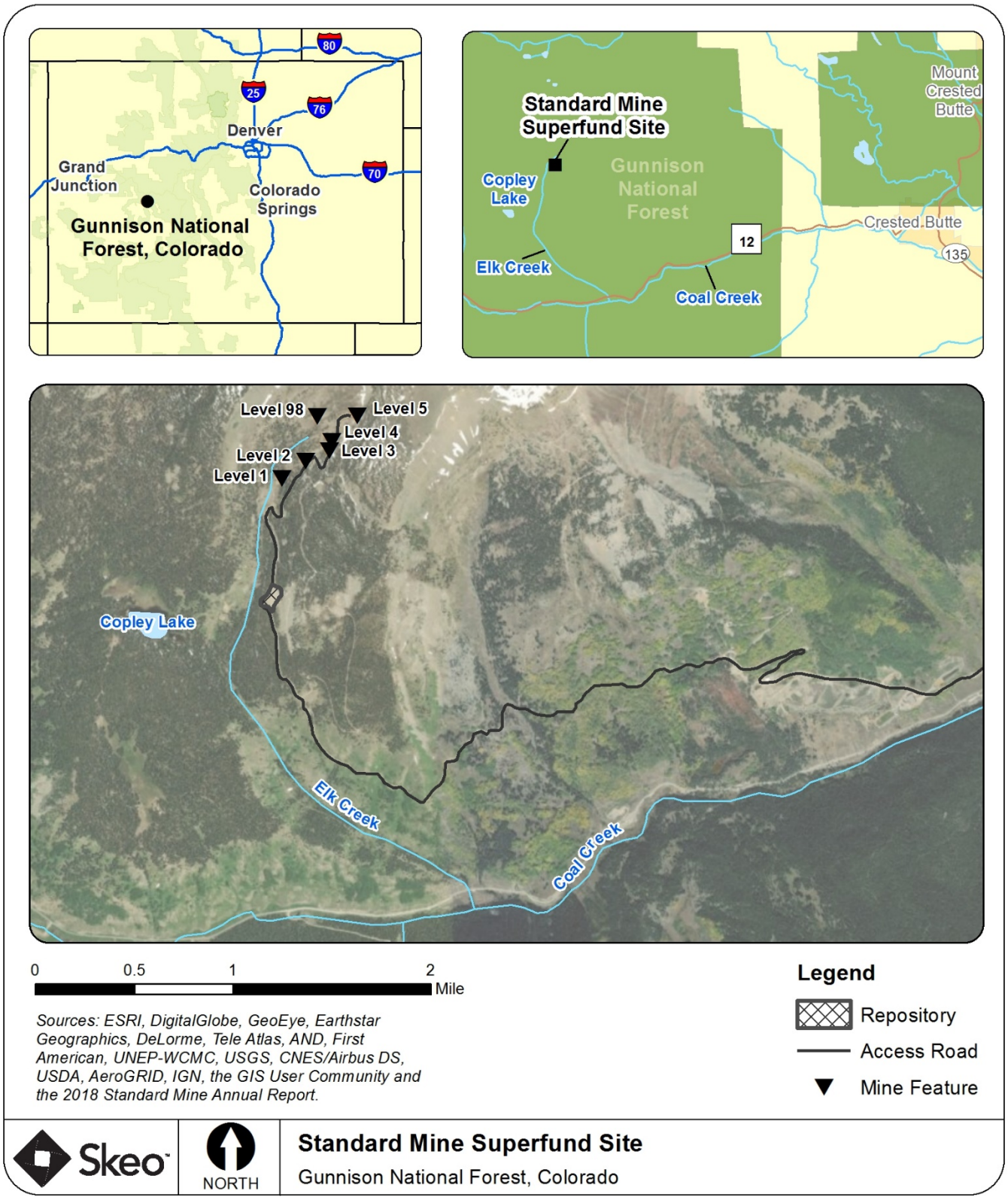
recreational purposes such as hiking, biking and camping in the summer and skiing, snowshoeing and snowmobiling in the winter. Vehicular access to the Site is restricted, thus limiting site use. The only viable road to the Site passes through several gates on the Mt. Emmons Project property that are controlled by Mt. Emmons Mining Company.

The Site extents are wholly within Elk Creek Basin. Elk Creek forms on site and flows southward to Coal Creek, the drinking water source for Crested Butte (Figure 1). The Crested Butte municipal water intake is located on Coal Creek approximately two miles downstream of the confluence with Elk Creek. Both Elk Creek and Coal Creek are designated as a water supply and Coal Creek is also used for recreational purposes, mainly fishing. There are no current or anticipated future uses of the limited groundwater present at the Site. No drinking water wells are located within or adjacent to the Site, and the nearest drinking water well is located about 4 miles from the Site.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Standard Mine		
EPA ID: CO0002378230		
Region: 8	**State:** COLORADO	**City/County:** Gunnison National Forest/Gunnison
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the Site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: EPA		
Author name: RPM Andrew Schmidt, with contractor support provided by Skeo		
Author affiliation: EPA Region 8 and Skeo		
Review period: 8/30/2019 – 6/15/2020		
Date of site inspection: 9/18/2019		
Type of review: Statutory		
Review number: 1		
Triggering action date: 6/15/2015		
Due date *(five years after triggering action date)*: 6/15/2020		

Figure 1: Site Vicinity Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The EPA's baseline human health risk assessment (BHHRA) evaluated risks for on-site recreational visitors and recreational visitors along site drainages (which included surface streams flowing from the Site). The only increased risk to human health from exposure to site contaminants documented in the pre-removal action BHHRA was for exposure of child all-terrain vehicle (ATV) riders to inhalation of manganese dust at the Site. The risk to child ATV riders exposed to site soils present after the removal action was reevaluated in the 2009 BHHRA Addendum using new soil data. The BHHRA Addendum concluded that there are no remaining unacceptable human health risks to recreational visitors posed by site soil after the removal actions.

The EPA's baseline ecological risk assessment (BERA) indicated unacceptable risks to fish and benthic organisms exposed to Elk Creek surface water and sediment. The BERA also indicated potential risks to plants, soil invertebrates, birds and mammals; however, the BERA further noted it is unlikely the existing contamination is significantly affecting birds or mammals given the small size of the Site, the compromised habitat and the abundance of quality habitat adjacent to the Site. Additionally, while risks to plants and invertebrates may be present, the presence of vegetation over most of the Site and the conservative nature of the assessment do not suggest unacceptable risk levels for the Site as a whole.

The primary chemicals of concern (COCs) at the Site are cadmium, lead and zinc in surface water.

Response Actions

The EPA conducted a preliminary assessment (PA) and expanded site inspection (SI) in 1999 to determine whether the risks posed by the Site were significant enough to warrant listing on the Superfund program's National Priorities List (NPL). The EPA added the Site to the NPL in September 2005 based on elevated concentrations of metals in site soils and in Elk Creek. Using the data collected by the EPA for the PA/SI, USFS conducted an engineering evaluation/cost analysis (EE/CA) in 2002 to determine the feasibility of various cleanup alternatives at the Site. The EE/CA concluded that further evaluation was needed prior to selecting a removal alternative.

The EPA conducted a removal assessment in 2005 and 2006 and identified risks to human and environmental receptors from adit discharges, waste rock and an eroding tailings impoundment. To address the most imminent threats, the EPA conducted time-critical removal actions at the Site in 2006 and 2007. The removal actions are addressed in more detail in the Removal Actions section below.

Between 2005 and 2010, the EPA, other federal and state agencies, and a local watershed group conducted multiple investigations in support of a remedial investigation (RI) and feasibility study (FS) for the Site. The work also included mapping of the mine workings (2006 to 2009) and a pilot-scale passive treatment system (2007). The EPA finalized the RI Report in May 2010. The RI Report included a BHHRA and a BERA. The risk assessments in the RI Report included addenda to BHHRA and BERA originally prepared in 2008. The BHHRA Addendum and BERA Addendum, prepared in 2008 and 2010, respectively, reflected post-removal action conditions.

Removal Actions

The EPA signed an Action Memorandum in June 2006 documenting the need for a removal action at the Site. The 2006 memorandum cited elevated levels of contamination in waste piles and the tailings impoundment, erosion of the tailings impoundment, and the potential for a failure of the tailings impoundment that could cause mass loading of metals into Elk Creek and subsequently into Coal Creek and Crested Butte's water supply. Table 1 summarizes the actions completed under the 2006 Action Memorandum.

The EPA signed a second Action Memorandum in July 2007 to address additional items identified at the Site during a 2007 EE/CA. Table 1 summarizes the actions completed under the 2007 Action Memorandum prior to the completion of the removal actions.

Table 1: Removal Action Activities

Year	Removal Action Activities
2006 Action Memorandum	• Installation of erosion controls and sediment catch basins on Elk Creek to reduce the impact of site activities on water quality in the creek. • Installation of surface water controls to minimize contamination of Elk Creek from erosion and leaching of site wastes. • Treatment of surface water from the tailings impoundment with subsequent discharge to Elk Creek. • Demolition of mining-related structures, with debris recycled or disposed of in a nearby landfill.
2007 Action Memorandum	• Road improvements. • Removal of general on-site debris (non-waste material) from work areas. • Construction of a permanent waste repository and associated infrastructure. The repository is a 1.6-acre landfill located 0.3 miles south of Level 1 (shown on Figure 1). • Mixing of tailings material with waste rock to help solidify the liquefied tailings prior to transport to the site repository. • Excavation of tailings and waste rock, with placement and compaction in the on-site repository. • Capping of the repository with 12 inches of compacted soil and 12 inches of riprap from a nearby borrow source. • Site grading and installation of erosion control features to support construction and stabilization efforts and to reduce scouring or erosion of soil and sediment into Elk Creek. • Treatment of excavated areas and other impacted areas with lime, fertilizer, compost and/or borrow soil and seeding to provide stability from erosion and a vegetative cap. • Realignment and stabilization of Elk Creek in a natural configuration similar to that found upstream and downstream of the Site; included tailings removal from creek. • Construction of wetlands along the realigned Elk Creek channel.

Remedy Selection

The EPA selected a remedy for the Site in a September 2011 Record of Decision (ROD). The selected remedy addresses all contaminant sources remaining at the Site after the 2006 through 2009 removal actions. The selected remedy consists of two phases, with monitoring performed after the first phase to determine the success of the Phase 1 remedy and to determine the need for Phase 2. The remedy also includes long-term monitoring and maintenance activities for those areas addressed during the removal actions. Table 2 summarizes the media-specific remedial action objectives (RAOs) defined in the ROD as well as the major remedy components.

Table 2: RAOs and Remedy Components

Media	RAO[a]	Remedy Component[b]
Surface Water	• Reduce in-stream metal concentrations and sediment loading to the extent practicable in Elk Creek to lessen water quality impacts and maximize reasonably attainable water uses in Elk Creek. • Reduce water flow through mine workings and contaminated soils to reduce metal loading to Elk Creek.	*Phase 1: Source control and interim monitoring* • Level 3 contaminant controls (sealing contaminant sources, including the raises/winzes to Level 4 and Level 2, and directing water out of the mine). • Construction of a flow-through bulkhead in Level 1. • Waste rock stabilization and implementation of adit discharge controls at Levels 5 and 98. • Institutional controls to prevent excavation into contaminated soils, sediments and mine waste material and to prevent disturbance of the elements of the removal and remedial actions. • Interim water quality monitoring to determine if Phase 2 is necessary. • Signage and fencing as needed to protect remedial components. *Phase 2: Water treatment (if necessary)* • Passive water treatment system. • Signage and fencing as needed to protect remedial components. *Long-term operation and maintenance of the following remedy components:* • Mine waste repository and areas impacted by repository construction. • Revegetated/stabilized/armored residual soils and waste rock at Levels 1, 2, 3, 5 and 98. • Reconstructed Elk Creek channel and run-on/runoff and erosion controls. • Level 3 contaminant controls. • Flow-through bulkhead in Level 1. • Institutional controls. • Passive water treatment system, if implemented.
Soil and Waste Rock/ Tailings	• Control and/or reduce run-on and runoff from tailings/waste rock piles to minimize generation of contaminated runoff and groundwater and to reduce sediment loading of streams. • Reduce human exposure to dust and ecological impacts from impacted soils and waste rock by maintaining the vegetative cover over treated soils and waste rock.	

Notes:
a. RAOs defined in Section 8 of the 2011 ROD.
b. Remedy components defined in Section 12 of the 2011 ROD.

Colorado Water Quality Control Commission (WQCC) Regulation 35 defines the stream classifications and standards regulating surface water quality at the Site. The applicable stream segment for Elk Creek is Upper Gunnison River Basin Segment 11. Table 3 summarizes the Site's surface water cleanup levels identified in the ROD, based on the applicable acute and chronic standards for cadmium, lead and zinc in effect at the time.

In addition to the water quality standards (WQS), maximum contaminant levels (MCLs) under the Safe Drinking Water Act also apply to Segment 11 due to its designation as a drinking water supply. MCLs for all site contaminants are less stringent than WQS. Therefore, surface water cleanup levels are based on WQS for ecological COCs. All surface water cleanup levels are a function of water hardness.

Table 3: 2011 ROD Surface Water Cleanup Levels for Elk Creek and Coal Creek[a]

COC	Cleanup Level (micrograms per liter, µg/L)		Basis	Assessment Endpoint
Cadmium	Chronic	$1.10162-[\ln(\text{hardness})*0.041838)] * e^{0.7998[\ln(\text{hardness})]-4.4451}$	WQS[b]	Presence of a fish population in lower Elk Creek
	Acute	$1.136672-[\ln(\text{hardness})*0.041838)] * e^{0.9151[\ln(\text{hardness})]-3.6236}$		
Lead	Chronic	$1.46203-[\ln(\text{hardness})*0.145712)] * e^{1.273[\ln(\text{hardness})]-4.705}$		
	Acute	$1.46203-[\ln(\text{hardness})*0.145712)] * e^{1.273[\ln(\text{hardness})]-1.46}$		
Zinc	Chronic	$0.986e^{(0.8525[\ln(\text{hardness})] + 0.9109}$		
	Acute	$0.978e^{(0.8525[\ln(\text{hardness})] + 1.0617)}$		

Notes:
a. Cleanup levels defined in Table 18 of the 2011 ROD as "COC Concentrations Expected to Provide Adequate Protection of Ecological Receptors."
b. WQS – Water Quality Standard, 5 Colorado Code of Regulations (CCR) 1002-35, Stream Segment 11, Upper Gunnison River Basin; chronic.
ln = natural log.

Section 12.4.1 of the ROD states that cleanup levels were not established for aquatic receptors exposed to sediments because it was determined that sediment contamination would be addressed by reducing the source of sediments rather than by reducing contaminant concentrations in existing sediments. Cleanup levels also were not developed for terrestrial receptors due to the presence of elevated metal concentrations in non-impacted portions of the Site and the uncertainties in the risk evaluation.

Status of Implementation

The EPA Region 8 is the lead agency for the cleanup of the Site and CDPHE is the support agency. Because the Site is partially located on USFS property, the EPA and CDPHE are coordinating with USFS on all cleanup activities.

The construction of major Phase 1 components for source control occurred between 2015 and 2017. The work completed included:

- Construction of a bypass adit adjacent to and north of the Level 1 adit. The bypass adit allowed access and dewatering of Level 1. Construction of the bypass adit rendered extensive rehabilitation of Level 1 unnecessary. The original Level 1 portal was closed permanently in 2017.
- Rehabilitation of the Level 1 adit to the selected bulkhead location (less extensive than originally anticipated).
- Installation of a flow-through bulkhead in Level 1. The bulkhead is a concrete plug with a valve used to stop or control the flow of water from Level 1. Remedy elements associated with the bulkhead include flow monitoring devices and pressure monitoring instrumentation. Remote access to the data from the instrumentation is available through a telemetry system and solar power charging setup (installed in 2018).
- Implementation of Level 3 contaminant controls, including rehabilitation of the Level 3 adit, plugging and installing seals on raises/winzes to prevent the flow of seepage from Level 3 from passing through mineralized areas on its way to lower levels, and sealing select areas of the Level 3 adit floor. Although not required by the ROD, the shaft of Level 4 was also backfilled.
- Re-opening the site repository to accept waste rock and soils. The repository was closed again in 2017.

USFS is implementing the remedial components at Levels 5 and 98. Surface work at Level 5 and Level 98 (waste rock stabilization, adit discharge controls and some revegetation) was completed by the fall of 2019. Additional revegetation, including installation of about a half-acre of wetland plants, is planned for the summer of 2020.

Following completion of the Phase 1 source controls, an operation and maintenance (O&M) program for the installed components of the remedy began. The EPA also implemented the interim monitoring program to collect data to assist in the decision of whether Phase 2 of the remedial action should be implemented. The EPA will also determine the need for signage and fencing if Phase 2 of the remedial action is implemented.

The first year of interim monitoring occurred in 2018. Between April and October 2018, the Level 1 bulkhead was closed for 180 days to conduct pressure testing and contact grout inspections of the bulkhead, and to ensure the bulkhead was functioning as intended. Bi-weekly monitoring was conducted during the closure. Minimal seepage was detected around the bulkhead during the monitoring period. Additionally, results of interim monitoring did not show signs of flow or quality changes as a result of the bulkhead closure. The Data Review section of this FYR Report discusses the water quality data collected in 2018.

On October 9, 2018, the bulkhead was opened to allow impounded water to drain from the mine workings. By November 13, 2018, all impounded water had been discharged. Approximately 1,250,000 gallons of water drained from the bulkhead during the discharge.

In 2019, the second year of the interim monitoring program, the bulkhead valve remained fully open. Results from 2019 were not available for review in time for this report. The bulkhead will also remain fully open for the third year of the interim monitoring program. Operation of the bulkhead will be managed adaptively based on the first three years of monitoring, achievement of WQS and potential design needs for Phase 2. Adaptive management could include various bulkhead valve settings, ranging from fully open to fully closed.

The key component to the decision of whether Phase 2 should be implemented is water quality in Elk Creek and the degree to which discharge from the Site degrades Elk Creek water quality.

Institutional Control (IC) Review

The 2011 ROD required institutional controls in the form of land use restrictions to prevent excavation into contaminated soils, sediments and mine waste material and to prevent disturbance of the elements of the removal and remedial actions. The ROD further noted that land use restrictions would be implemented by landowners through the use of Environmental Covenants or Notices of Environmental Use Restrictions pursuant to Colorado's Environmental Covenants Statue, C.R.S. Section 25-15-317 *et seq*.

Institutional controls have not yet been implemented at the Site (Table 4). The EPA plans to develop an institutional control implementation and assurance plan to document the activities associated with implementing and ensuring the long-term stewardship of institutional controls for the Site.

Table 4: Summary of Planned Institutional Controls (ICs)

Media, Engineered Controls, and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Contaminated soils, sediment and mine waste (including waste repository)	Yes	Yes	Parcels with contaminated soils, sediment and mine waste (including waste repository)	To prevent tilling, excavation, grading, construction or any activity that disturbs the ground surface or subsurface or that would in any manner interfere with or adversely affect the implementation, integrity or protectiveness of the remedial action.	Not yet implemented

Operation and Maintenance (O&M)

Although CDPHE is responsible for the O&M phase of the remedial action, the EPA is responsible for implementing the interim monitoring program and is financially responsible for vegetation monitoring through 2020. CDPHE conducts O&M consistent with the February 4, 2019, Final Operation & Maintenance Plan (O&M Plan). The O&M Plan includes appendices for an O&M Manual, a Vegetation Monitoring Plan, an Interim Monitoring Plan and a Communication Plan.

O&M includes inspection and maintenance of remedy components, vegetation monitoring and interim water quality monitoring. CDPHE inspects the following site features annually, and conducts maintenance as necessary:

- Site repository
- Site vegetation
- Level 1 and bypass adit ground control
- Bulkhead, valve and instrumentation
- Level 3 ground control and slab closures
- Level 1 and 3 portal structures and utilities

The EPA and State contractors, in cooperation with the United States Geological Survey (USGS), conduct monitoring consistent with the March 2019 Final Interim Monitoring Plan. In addition to monitoring Level 1 bulkhead operations, contractors collect data from multiple monitoring stations to assess water quality and flow rates at and downgradient of the Site. Monitoring stations ELK-08, ELK-05, ELK-00 in Elk Creek are used to ascertain the effectiveness of the remedy. Other monitoring locations include:

- Level 3 Mine Discharge, monitored to provide an understanding of the metal concentrations and load from Level 3
- Level 1 Mine Discharge, monitored at the bypass adit, and Level 1 Near the Bulkhead, monitored to provide an understanding of the metal concentrations and total loads from Level 1
- Level 1 Outfall, located where discharge from Level 1 enters Elk Creek
- ELK-11, located upgradient of the Level 1 Outfall

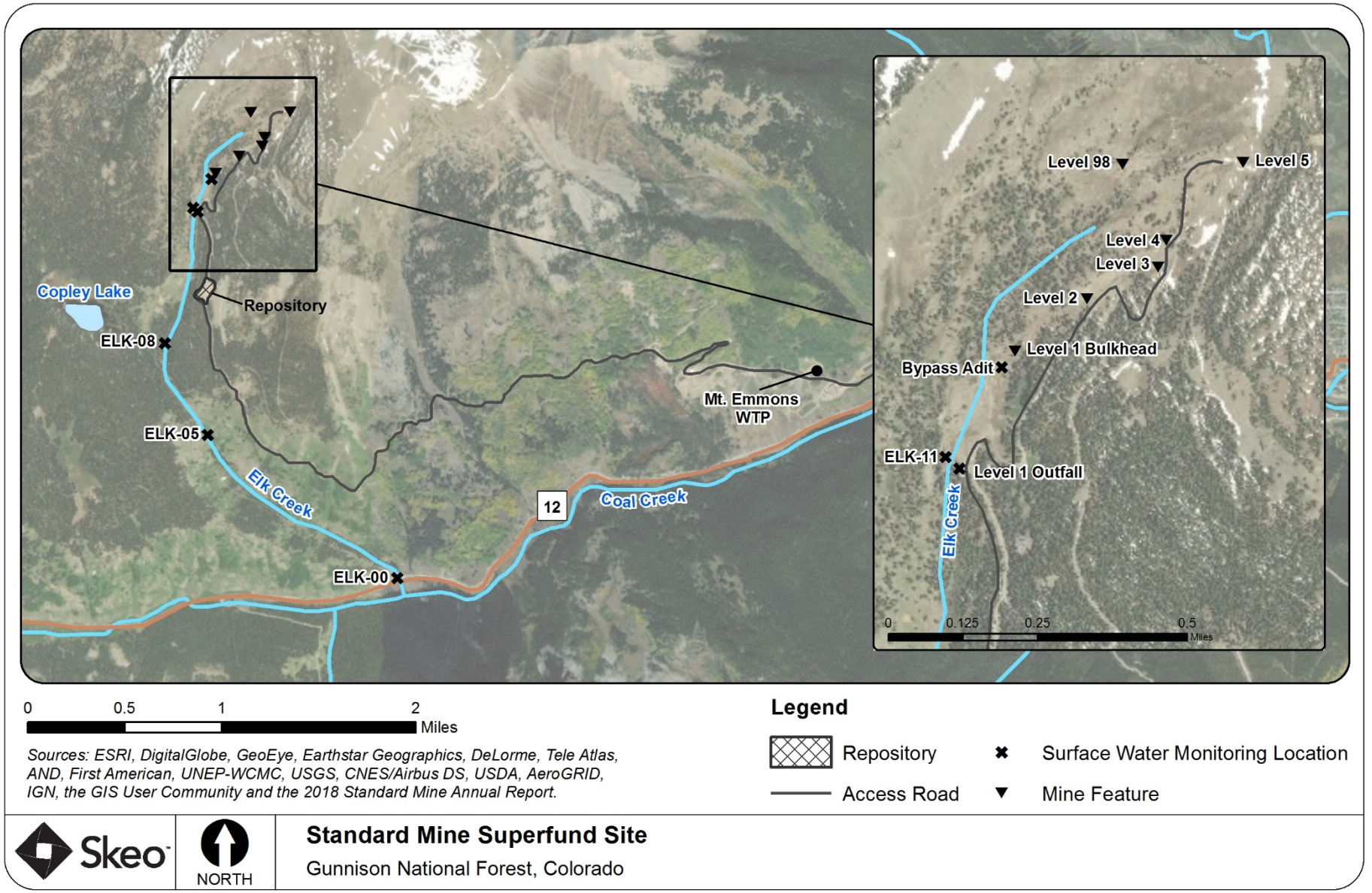
Figure 2 shows the monitoring locations included in the interim monitoring program. USGS collects water samples at ELK-08, ELK-05, ELK-00, Level 3 Mine Discharge and Level 1 Mine Discharge using MiniSipper instruments deployed twice a year. MiniSippers are automated sample collection devices that allow for high-frequency, long-duration water quality sample collection. The MiniSippers collect low-volume water samples at a programmable frequency. Once retrieved, the samples from the MiniSippers are analyzed for dissolved metals. EPA contractors also collect grab samples twice a year, in June (high-flow stream conditions) and September (low-flow conditions), from all locations. Grab samples are analyzed for total and dissolved metals, as well as field and other water quality parameters.[1]

The Final Interim Monitoring Plan also states that hand-collected grab samples may also be collected periodically by the State of Colorado and the Coal Creek Watershed Coalition. Analytical results from these periodic samples will be added to the interim monitoring data and will be used to evaluate the quality of the data provided by the analysis of the MiniSipper samples.

The Final Interim Monitoring Plan states that results will be presented and evaluated in annual reports.

[1] The Final Interim Monitoring Plan notes that metals to be reported included (at a minimum) cadmium, calcium, copper, iron, lead, manganese, magnesium, zinc, sulfate and calculated hardness. Water quality parameters include pH, turbidity, specific conductance, resistivity and dissolved oxygen.

Figure 2: Site Monitoring Locations



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

III. PROGRESS SINCE THE PREVIOUS REVIEW

This is the first FYR for the Site.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A public notice was published in the *Crested Butte News* on September 13, 2019 (Appendix D). It stated that the FYR was underway and invited the public to submit any comments to the EPA. The notice also informed the public of a community listening session held at the Crested Butte Town Hall on September 18, 2019. There were no community members at the community listening session.

The results of the review and the FYR report will be made available at the Site's information repository, the Crested Butte Old Rock Library, located at 504 Maroon Avenue, Crested Butte, Colorado 81224 and the EPA Superfund Records Center, located at 1595 Wynkoop Street, Denver, Colorado 80202.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy implemented to date**.** The interviews are summarized below. Appendix E includes the completed interview forms.

Ross Davis, CDPHE project manager, has a favorable impression of the phased ROD for the Site, and noted that remaining risks with the Site, including waste left in place in the repository, are well documented. Phase 1 is performing as anticipated. The bulkhead reduces the risk of a surge event from Level 1 and by doing so, provides environmental benefit. As the EPA's counterpart representing the State of Colorado, CDPHE is involved in all site-related activities. Mr. Davis noted that the community is well-informed of Site activities. A local stakeholder group has been contracted to conduct and report on water quality in Elk Creek following Phase 1 activities.

Jim Schmidt, the mayor of Crested Butte, has a positive impression of the project and believes the EPA has done a detailed and thorough cleanup thus far. The EPA has a good relationship with the town and provides notification of any issues, such as the small spill that occurred in 2015, as they arise. He also noted that the presentations the EPA periodically conducts for the public, as well as notifications in the local newspaper, are the best way to communicate site-related information to the community. Mr. Schmidt has concerns about what may happen if the mine fills with water and puts pressure on the mine workings that were closed.

Shea Earley, public works director for Crested Butte and also a member of the Coal Creek Watershed Coalition, noted that remedial activities at the Site have been progressing in the right direction over the past 18 months; however, there are still long-term uncertainties. Specifically, Mr. Earley noted that there needs to be a plan for sampling that allows for better data evaluation, one that considers all the variables that may affect the results. Another major concern for the town is that the state recently lowered the town's water treatment plant's discharge standard for zinc. The town is concerned that the state did not consider the upstream contribution of zinc from the Site. Mr. Earley also offered suggestions for community outreach, including additional public meetings before the start of work at the Site and after work is complete to provide a status update.

Ashley Bembenek, a member of the Coal Creek Watershed Coalition, noted that selection of the remedy was a collaborative process that included input from several groups, including the Coal Creek Watershed Coalition. She noted that the remedy's goal for surface water to attain the aquatic life standards in Elk Creek may be ambitious. Overall, she had a positive impression of the implemented remedy, but noted that it will take time to determine if the remedy is working as expected. She noted that the EPA's response following a small spill (i.e., notifications to the town) was appreciated, but that the EPA could also improve communication by updating the EPA's Standard Mine profile web page with information about public meetings and a schedule for future EPA communication. If the EPA proposes a change to water quality standards, she noted that outreach to the community will be needed to keep the community engaged in the process and provide information. She also stressed the importance of

increasing communication and data sharing among all the groups that are gathering data about the Site (EPA and state contractors, USGS, Coal Creek Watershed Coalition), so the available data can be evaluated from a sitewide perspective.

Curtis Cross from USFS noted that remedial efforts at the Site have helped to control flow rates, but they have not improved water quality. He noted that passive treatment of the adit discharge may need to be explored. He also indicated that USFS has coordinated surface reclamation efforts with Colorado DRMS. He is unaware of any complaints or inquiries from residents, and there have been no issues of trespassing or vandalism at the Site.

Travis Snyder from HDR Inc., the remedial action contractor, had a favorable impression of the Site's cleanup. He noted that levels of metals in Elk Creek have decreased since the ROD but further evaluation is needed for a solid understanding of what more can be done to meet WQS, given background conditions at the Site. He noted that monitoring data have some gaps due to the extreme conditions at the Site and unreliable equipment deployed year-round. O&M is performed during semi-annual sampling events and annual inspections. A telemetry system also allows for remote monitoring. Mr. Snyder also suggested a shared electronic repository for Site documents, including O&M plans, to share information with personnel involved in the project.

Data Review

The EPA completed the Phase 1 remedial action in 2017. The first year of the three-to-five-year interim monitoring program was 2018. Therefore, this data review presents and evaluates data collected in 2018. To provide context for the 2018 data, this FYR also presents historical water quality data from Elk Creek at ELK-00, collected between 2010 to 2015 prior to the remedial action. The 2018 data and summary of historical data were presented in the Standard Mine Interim Monitoring Program, Water Year 2018 Annual Report, February 2020, prepared by the Coal Creek Watershed Coalition (2018 Annual Report).

Field staff initially deployed MiniSippers in October 2017; staff replaced and deployed MiniSippers again on June 29, 2018, and October 2, 2018. Field staff also collected water quality grab samples on June 29, 2018, and October 2, 2018. The grab samples collected in June, although identified as a high-flow sample, occurred approximately seven weeks after peak runoff conditions. The timing of the high-flow sampling event was limited by high snowpack and the inability to access sampling locations at an earlier date. The Level 1 bulkhead, initially closed in April 2018, remained closed during collection of the grab samples in 2018.

The MiniSippers deployed at ELK-05 and ELK-08 both failed at various times in 2018, which resulted in fewer samples collected than anticipated. Because the MiniSipper samples collected June 29, 2018, and October 2, 2018, were rejected, it was not possible to validate the MiniSipper samples using the grab sample results collected on the same day. The 2018 Annual Report compared the MiniSipper samples to additional grab samples collected by the Coal Creek Watershed Coalition and found that, overall, there was a relatively strong correlation between the grab and MiniSipper samples. However, this data review focuses primarily on the grab sample results collected for interim monitoring.

Tables F-1 and F-2 in Appendix F present a summary of dissolved metals concentration data from ELK-00 collected between 2010 and 2015 prior to Phase 1 remedial action. The samples were originally collected by the Coal Creek Watershed Coalition. Table F-3 presents a summary table of the grab sample total and dissolved metals results collected from upgradient location ELK-11, the Level-1 Outfall and Elk Creek locations ELK-08, ELK-05 and ELK-00 in 2018 as part of the interim monitoring program. When comparing the pre-remedial results at ELK-00 to the 2018 results at ELK-00, all dissolved metals concentrations collected in June 2018 were lower than the average and maximum concentrations from the April-to-June 2010-2015 concentrations (high-flow conditions). All dissolved metals concentrations collected in October 2018 were lower than the average and maximum concentrations from the July-to-March 2010-2015 concentrations (low-flow condition). However, with only one year of interim monitoring data, it is too early to determine if the decrease in concentrations is a result of the remedial efforts, closure of the Level 1 bulkhead, variability in spring runoff and resulting changes in contaminant loading, another variable or a combination of variables.

2011 ROD Surface Water Cleanup Standards Evaluation
Metals concentration data from monitoring stations ELK-08, ELK-05 and ELK-00 in Elk Creek are used to ascertain the effectiveness of the remedy. Tables F-4 and F-5 in Appendix F compare the 2018 dissolved cadmium, lead and zinc concentrations at ELK-08, ELK-05 and ELK-00 as well as ELK-11 (upgradient of Level-1) to the acute and chronic surface water cleanup levels selected in the 2011 ROD.

During the June 2018 and October 2018 grab sampling events, all locations in Elk Creek exceeded the 2011 ROD cadmium chronic surface water cleanup level. Two locations in Elk Creek (ELK-11 and ELK-08) exceeded the acute cadmium cleanup level. ELK-05 and ELK-00, located in the lower reaches of Elk Creek, attained the acute cadmium cleanup level during both 2018 sampling events.

All locations in Elk Creek exceeded the 2011 ROD chronic and acute cleanup levels for dissolved zinc during both 2018 sampling events.

All locations in Elk Creek attained the 2011 ROD chronic and acute cleanup levels for dissolved lead except for upgradient location ELK-11 in June 2018. The dissolved lead concentration at ELK-11 (0.94 J µg/L) slightly exceeded the 2011 ROD chronic surface water cleanup level for lead of 0.9 µg/L during the June 2018 sampling event but was below the 2011 ROD acute surface water cleanup level.

2018 Water Quality Standards Evaluation
The March 2019 Final Interim Monitoring Plan specifies that surface water data be compared to applicable state WQS. Metals concentration data from the June and October 2018 sampling events were compared to the 2018 WQS in effect at the time of sampling (Tables F-6 and F-7 in Appendix F). Results for cadmium, copper, lead and zinc are compared to acute and chronic aquatic life criteria; iron and manganese are compared to domestic water supply secondary MCLs. Although cadmium, lead and zinc were the only COCs identified in the ROD, copper, iron and manganese are included in the evaluation because these constituents were detected historically in waste rock samples at the Site and/or data from these constituents may be used during design of a passive treatment system, if implemented.

During the June 2018 grab sampling event, all locations in Elk Creek exceeded the cadmium chronic WQS. Two in four locations in Elk Creek exceeded the acute cadmium WQS. ELK-05 and ELK-00, located in the lower reaches of Elk Creek, attained the acute cadmium WQS. All locations in Elk Creek exceeded the chronic and acute aquatic life WQS for dissolved zinc.

The dissolved lead concentration at ELK-11 exceeded the chronic WQS. However, the measured concentration was estimated. All other samples collected from Elk Creek on June 29, 2018, attained the chronic and acute lead WQS. All locations attained the chronic and acute copper standards, and iron and manganese water supply standards, during the June 2018 sampling event.

During the October 2018 grab sampling event, all locations in Elk Creek exceeded the chronic cadmium WQS. Similar to the June 2018 sampling event, two in four locations in Elk Creek exceeded the acute cadmium WQS. ELK-05 and ELK-00, located in the lower reaches of Elk Creek, attained the acute cadmium standard. Similar to the June 2018 sampling event, all locations exceeded the chronic and acute aquatic life WQS for dissolved zinc. All locations attained the chronic and acute copper and lead standards, and iron and manganese water supply secondary MCLs, during the October 2018 sampling event.

Metals concentrations in ELK-00, located just upstream of the confluence of Elk Creek and Coal Creek, were also compared to federal MCLs since Coal Creek is a source of drinking water for the town of Crested Butte. Table F-8 in Appendix F shows that all metals (total and dissolved) at ELK-00 were either non-detect or well below MCLs during the 2018 grab sampling events.

Site Inspection

The site inspection took place on September 18, 2019. In attendance were EPA RPM Andrew Schmidt, Ross Davis from CDPHE, Jeff Graves from Colorado DRMS, Travis Snyder and August Morgan from HDR (EPA contractor) and Treat Suomi and Jill Billus from Skeo (EPA FYR contractor). The purpose of the site inspection was to assess the protectiveness of the remedy. Appendix G is the completed site inspection checklist. Appendix H includes photographs from the site inspection.

Site inspection participants met at the Mt. Emmons Mining Company (MEMCO) Treatment Plant parking lot, off County Road 12. Vehicle access to the Site required traveling 1.5 miles through MEMCO private property and then 2.7 miles over Forest Development Road 732. Site inspection participants observed the following areas during the site inspection: the repository, the Level 1 adit and bulkhead, surface work at Level 3, Level 5 and Level 98, and surface water sampling point ELK-00.

The repository was in good condition with no signs of bulging or subsiding areas. Drainage channels were clear and dry at the time of the inspection. Some minor staining was observed on riprap in the drainage channel. Revegetated areas around the repository were in good condition. Canadian thistle, an invasive species, located along the access road to the repository had recently been sprayed for weed control and was beginning to wither.

The Level 1 portal closure appeared undisturbed. The Level 1 bypass adit portal gate was secured upon arrival; water was observed freely flowing from the portal gate. The Level 1 adit was in good condition with no issues of concern noted. Site inspection participants entered the adit and observed the bulkhead and valve mechanism inside. The bulkhead valve was open during the inspection, closed briefly to observe its performance and re-opened fully by the inspectors before exiting the adit. The flumes directing flow appeared to be functioning as intended. The exterior tower for the telemetry system appeared in good condition.

No issues of concern were noted at the exterior areas of Level 3, Level 5 and Level 98, or at surface water sampling location ELK-00. Surface work at Level 3 and Level 5 was complete at the time of the inspection; however, some additional revegetation may occur at Level 5. Revegetation work at Levels 5 and 98 is expected to be completed in 2020.

Following the site inspection, the EPA RPM and CIC conducted community interviews and held a community listening session at the Crested Butte Town Hall, with Skeo personnel providing support.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

Phase 1 of the remedy – contaminant controls, construction of a concrete flow-through bulkhead at Level 1, waste rock stabilization, adit discharge controls and interim monitoring – has been implemented, as specified in the 2011 ROD. The first year of interim monitoring to evaluate the effectiveness of the source control measures occurred in 2018. Additional data will be needed to determine if the source control measures are functioning as intended by the decision documents, or if Phase 2 – passive water treatment – will be needed. The EPA expects to determine the need for passive water treatment following completion of the three-to-five-year interim monitoring program.

The source control remedy was designed to reduce water flow through mine workings and contaminated soils to reduce metals loading to Elk Creek, to lessen water quality impacts and maximize reasonably attainable water uses in Elk Creek. The remedy was also designed to reduce human exposure to dust and ecological impacts from impacted soils and waste rock. Rehabilitation work at Levels 1, 3, 5 and 98 has occurred, which effectively reduces direct human and ecological exposures to contaminated soil and waste rock and better manages adit discharge. The site repository is inspected regularly and is well maintained. The flow-through bulkhead at Level 1 is operating as designed and allows the EPA to control discharge rates. Data from the first year of interim

monitoring in 2018 show that cadmium and zinc concentrations continue to exceed the 2011 ROD surface water cleanup levels as well as current WQS in Elk Creek. Although concentrations were lower in 2018 than in years before the source control actions, with only one year of interim monitoring data, it is too early to determine if the decrease in concentrations is a result of the remedial efforts, closure of the Level 1 bulkhead, variability in spring runoff and resulting changes in contaminant loading, another variable or a combination of variables. The EPA may continue to adjust discharge flow rates from the Level 1 bulkhead and will monitor the effect of these changes on downstream water quality.

O&M of the completed remedy components, including inspections of the site repository, vegetation, Level 1 bulkhead, and Level 1 and 3 adit restorations, is occurring as specified in the 2019 O&M Plan. Maintenance of surface features (revegetated/stabilized/armored residual soils and waste rock) at Levels 5 and 98 were not included in the 2019 O&M Plan because these areas are managed by USFS. The EPA will coordinate efforts with USFS to ensure that inspections and maintenance of Levels 5 and 98 occur in the future.

Several issues arose during the first year of interim monitoring in 2018. The MiniSippers deployed at ELK-05 and ELK-08 both failed at various times in 2018, which resulted in fewer samples collected than anticipated. The EPA is working with USGS, the state, and EPA and state contractors to improve data collection efforts and coordination among all parties involved with the Site.

Institutional controls have not yet been implemented at the Site. The EPA plans to develop an institutional control implementation and assurance plan to document the activities associated with implementing and ensuring the long-term stewardship of institutional controls for the Site.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection still valid?

Question B Summary:

The exposure assumptions and RAOs used at the time of the remedy selection remain valid. The Site is in an unoccupied and remote area of Gunnison National Forest and on private property. There are no current direct human or ecological exposures to contaminated soils or mine waste rock.

The 2011 ROD selected surface water cleanup levels based on Colorado WQS for Elk Creek as designated in the 2007 Colorado Code of Regulations (CCR 1002-35), Stream Segment 11, Upper Gunnison River Basin. The WQS are applicable or relevant and appropriate requirements (ARARs) for the Site. The WQS are considered protective for aquatic receptors and are a function of water hardness. Colorado amended the WQS in August 2017 and again in June 2019 (CCR 1002-35). Table I-1 in Appendix I compares the 2011 ROD surface water cleanup levels to the June 2019 Colorado WQS for site COCs. Table I-1 shows that the current June 2019 acute and chronic WQS are the same as or less stringent for all COCs based on a hypothetical hardness of 100 mg/L as calcium carbonate, with one exception; the acute value for zinc is slightly more stringent in 2019 versus 2011.[2] The EPA may consider revising the Site's surface water cleanup levels to reflect the most current ARARs for surface water; however, the 2011 ROD surface water cleanup levels remain protective.

In addition to the WQS, the 2011 ROD states that the MCLs under the Safe Drinking Water Act apply to Stream Segment 11 due to its designation as a drinking water supply. The EPA selected the WQS as surface water cleanup levels because the MCLs are less stringent than WQS. Table I-2 in Appendix I compares the 2011 ROD surface water cleanup levels to current federal and state MCLs to determine if this remains valid. The 2011 ROD surface water cleanup levels are more stringent than the MCLs, except for the acute surface water cleanup level for lead, when using a default hardness of 100 mg/L as calcium carbonate in the surface water cleanup level

[2] The current WQS and 2011 ROD surface water cleanup goals are hardness-based standards. A hypothetical hardness of 100 mg/L calcium carbonate was used to demonstrate the relative difference between the current WQS and the 2011 ROD surface water cleanup goals. The resulting numeric values from this assessment should not be construed as the site-specific standards and surface water cleanup values.

equation. There have been no changes to the MCL for lead since the 2011 ROD, therefore, the surface water cleanup level for lead remains valid.

Although the 2011 ROD only designated cadmium, lead and zinc as COCs, the interim monitoring program also monitors copper, manganese and iron because these metals have historically been found in mine discharge water.

The Site recently completed the first and second year of interim monitoring to determine if the Phase 1 source control measures alone would be able to meet site RAOs. Data from Year 1 (2018) have shown that cadmium and zinc in surface water of Elk Creek do not attain ROD surface water cleanup levels; however, there are insufficient data to determine if the cleanup levels can be met in the near future or if Phase 2 of the remedy (passive treatment) will be needed. Additionally, further data are needed to determine if the natural mineralization in Elk Creek Basin may prevent attainment of the cleanup levels for cadmium and zinc. The EPA will determine the need for further remedial action at the Site following completion of the three-to-five-year interim monitoring program.

The RAOs defined in the 2011 ROD to reduce human and ecological exposures to impacted soils and waste rock and to reduce metals loading to Elk Creek remain valid. Current and anticipated future land, water and groundwater uses at the Site have not changed since the 2011 ROD in a manner that would affect the RAOs for the remedial action.

In 2016, the EPA's Office of Land and Emergency Management (OLEM) released directive 9200.2-167, which updates the scientific considerations to be used at lead cleanups conducted according to the EPA's 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (Office of Solid Waste and Emergency Response [OSWER] Directive 9355.4-12) and the 1998 update to the 1994 guidance. A copy can be found at https://semspub.epa.gov/work/08/1884174.pdf.

Since issuing the 1994 and 1998 guidance, the EPA's experience has demonstrated that lead-contaminated soil responses are more effective when they employ a multi-pathway approach. The 2016 directive highlights current science and risk assessment tools that the EPA may consider when implementing lead cleanups.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
None.

Issues and Recommendations Identified in the FYR:

OU(s): OU1 (Sitewide)	Issue Category: Institutional Controls			
	Issue: An institutional control implementation and assurance plan has not been prepared for the Site.			
	Recommendation: Develop an institutional control implementation and assurance plan to document the activities associated with implementing and ensuring the long-term stewardship of institutional controls for the Site.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA/State	6/15/2021

OU(s): OU1 (Sitewide)	Issue Category: Institutional Controls			
	Issue: Institutional controls have not been implemented as required by the ROD.			
	Recommendation: Implement institutional controls consistent with the ROD and the institutional control implementation and assurance plan.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA/State	6/15/2023

OU(s): OU1 (Sitewide)	Issue Category: Operations and Maintenance			
	Issue: O&M of Levels 5 and 98 is not included in the 2019 O&M Plan.			
	Recommendation: Coordinate with USFS to ensure that inspection and maintenance procedures for Levels 5 and 98 are included in an O&M Plan and regularly conducted.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	USFS	EPA/State	6/15/2022

OTHER FINDINGS

Several additional findings were identified during the FYR.

- The Colorado water quality standards, which are the basis of the Site's surface water cleanup levels, have changed since the 2011 ROD was issued. The EPA will consider revising the Site's surface water cleanup levels to reflect the most current ARARs for surface water.
- Several community members offered suggestions for community outreach, including additional public meetings and updates to the EPA's online site profile page.
- Interim monitoring program sampling efforts and data collection activities should be coordinated and shared among all the parties involved in data collection and evaluation, and any issues with sample collection methods resolved (i.e. MiniSippers).

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: OU1 (Sitewide)	*Protectiveness Determination:* Will be Protective
Protectiveness Statement: The remedy at the Standard Mine Superfund Site is expected to be protective of human health and the environment upon completion. In the interim, there are no current direct human or ecological exposures to contaminated soils or mine waste rock above levels of concern. The EPA will determine the need for further remedial action at the Site following completion of the three-to-five-year interim monitoring program for surface water.	

VIII. NEXT REVIEW

The next FYR Report for the Standard Mine Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Final Interim Monitoring Plan, Standard Mine Superfund Site, Remedial Action Phase I, Gunnison County, Colorado, Revision 1. Prepared by HDR. March 25, 2019.

Final Operation & Maintenance Plan, Standard Mine Superfund Site, Phase I – Source Control. Prepared by HDR. February 4, 2019.

Memorandum, Recommendation to Approve Standard Mine Remedial Action Completion. Prepared by the EPA. September 14, 2017.

Memorandum, Standard Mine Vegetation Annual Inspection (2018). Prepared by AlpineEco. March 14, 2019.

Record of Decision, Standard Mine Superfund Site, Gunnison County, Colorado. Prepared by the EPA. September 30, 2011.

Remedial Investigation Report, Standard Mine, Gunnison County, Colorado. Prepared by URS Operating Services, Inc. May 14, 2010.

Standard Mine Inspection Checklist, 2018. Prepared by HDR Engineering, Inc. April – November 2018.

Standard Mine Interim Monitoring Program, Water Year 2018 Annual Report. Prepared by Coal Creek Watershed Coalition. December 2019.

Standard Mine Site, 2018 Update. Prepared by the EPA. 2018.

Standard Mine Vegetation Monitoring Plan, Gunnison County, Colorado. Prepared by AlpineEco. April 2, 2018.

APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
Mining operations ceased.	1974
The EPA conducted a PA and an expanded SI.	1999
USFS conducted an EE/CA.	2002
The EPA proposed the Site for listing on the NPL.	April 2005
The EPA listed the Site on the NPL.	September 2005
The EPA began the RI.	June 2006
The EPA performed a removal action.	June to October 2006
The EPA issued an Administrative Order for site access.	April 2007
The EPA performed a removal action.	July 2007 to September 2008
The EPA issued the BBHRA Report and BERA Report.	March 2008
The EPA, the State, the U.S. Department of Interior and the U.S. Department of Agriculture entered into a Consent Decree with Standard Metals.	February 2009
The EPA issued the Community Involvement Plan.	March 2010
The EPA issued the RI Report.	May 2010
The EPA issued a Settlement Agreement with a PRP.	October 2010
The EPA finalized the combined RI/FS; EPA signed the ROD.	September 2011
The EPA began the remedial design.	August 2012
The EPA began Phase 1 of the remedial action.	June 2015
The EPA finished the remedial design.	October 2016
The EPA finished Phase 1 of the remedial action.	March 2018
The interim monitoring program began.	January 2018

APPENDIX C – SITE AREAS

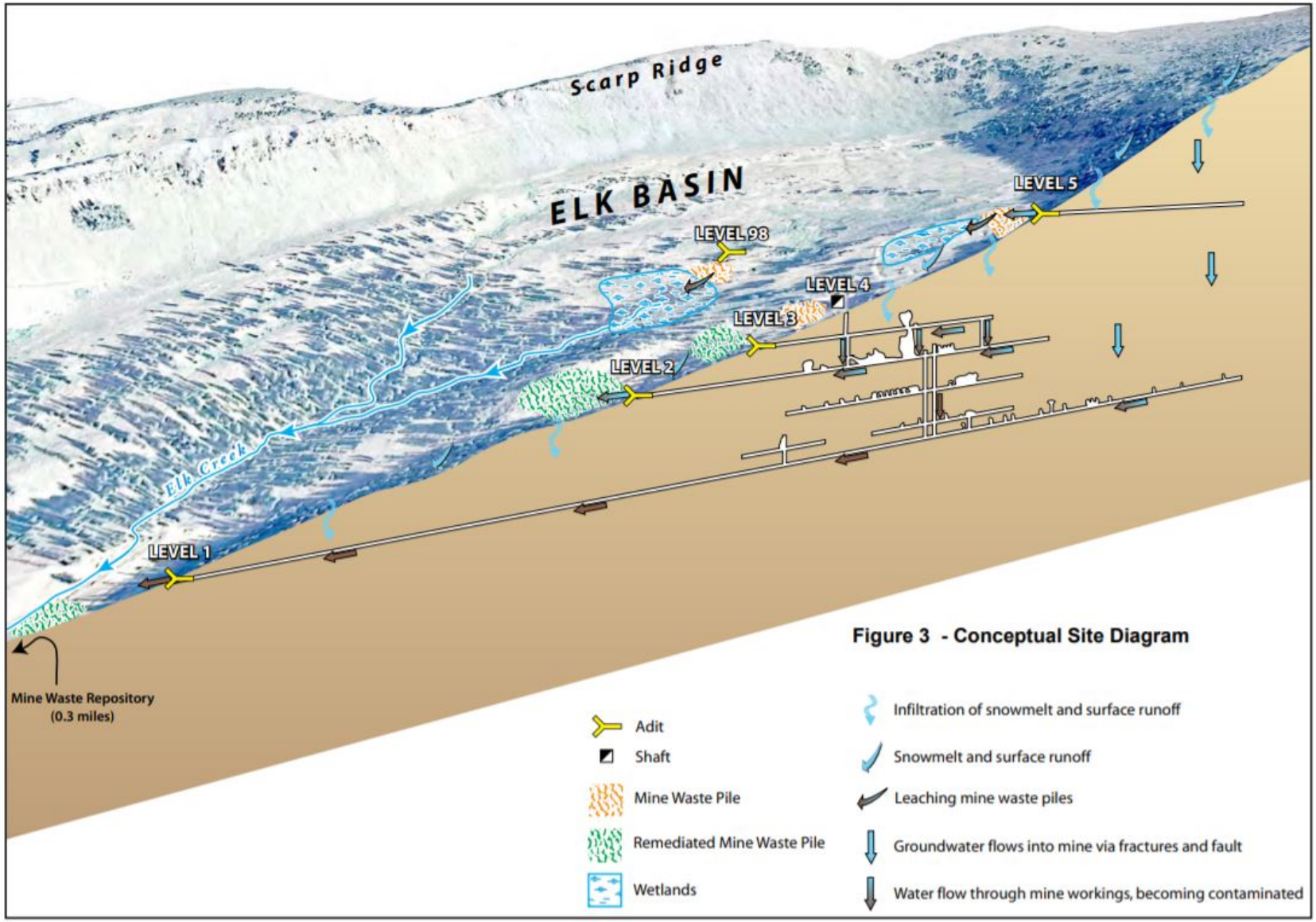
Table C-1 describes the areas disturbed by past mining activities at the Site, as described in the ROD. Figure 1 of this FYR Report shows the locations of these areas within the Site. Levels 1, 2, and 3 were interconnected through a series of raises and sublevels. Level 4 consisted of two vertical shafts that connected to the Level 3 workings. Levels 5 and 98 were not connected to Levels 1 through 4 or each other.

Figure C-1 is a cross-section of the mine workings. Removal and remedial actions at the Site addressed these areas.

Table C-1: Disturbed Areas

Mine Area	Description
Level 1	Contained a discharging adit, revegetated residual soils and waste rock, Elk Creek, one-half acre of wetlands, erosion control ditches and a pilot-scale bioreactor.
Level 2	Consisted of a collapsed adit and a small amount of residual soil and waste rock located over bedrock. A small amount of adit discharge water flowed from the collapsed adit over the reclamation area, but the discharge was not channelized or controlled in any manner.
Level 3	Consisted of a non-discharging adit, revegetated residual soil that had been under the excavated waste rock prior to the removal actions, and revegetated waste rock left in place due to the presence of a steep slope between Level 2 and Level 3 that prevented the complete excavation of waste materials due to slope stability concerns.
Level 4	Consisted of two partially-collapsed twin compartment shafts and small waste rock piles.
Level 5	Consisted of a discharging adit and steep pile of waste rock. A blockage is located far within the workings. Water that is discharged from the adit flows over the waste rock, across an old access road, and into a wetland.
Level 98	Consisted of a discharging adit with very low flow and a waste rock pile. Water that is discharged from the adit flows over the southernmost segment of the waste rock pile prior to entering a wetland. A smaller tributary, which combines with other small tributaries from Elk Creek further downstream, flows adjacent to the waste rock pile. Several wetlands are located adjacent to the waste rock pile at this level.

Figure C-1: Mine Cross-section of Mine Workings[3]



[3] Source: 2011 ROD.

APPENDIX D – PRESS NOTICE

Published in the *Crested Butte News* on September 13, 2019

The U.S. Environmental Protection Agency, Region 8 Announces the First Five-Year Review for the Standard Mine Superfund Site, Gunnison County, Colorado

The U.S. Environmental Protection Agency (EPA), in cooperation with the Colorado Department of Public Health and Environment (CDPHE), is conducting the first five-year review of the Standard Mine Superfund site (the Site) in Gunnison County, Colorado. The purpose of the five-year review is to make sure that the cleanup actions completed to date are adequately protecting human health and the environment. The five-year review is scheduled to be completed by June 2020.

The Site is an abandoned hard rock mine located in west central Colorado, about 5 miles west of the town of Crested Butte. It is located within the boundaries of the Gunnison National Forest and includes approximately 10 acres situated on a combination of both U.S. Forest Service (USFS) land and private mining claims. EPA added the Site to the National Priorities List (NPL) in 2005. Historic mining activities are known to have caused releases of heavy metals to soil, and surface water.

As of August 2019, EPA has implemented Phase 1 of the cleanup. Phase 1 included source control measures, interim monitoring and institutional controls.

We want to hear from you!

Community members are always encouraged to share information that may help EPA make determinations regarding the protectiveness and effectiveness of the remedies at the site. On September 18, 2019 from 5:00 to 6:00 pm, EPA staff will be hosting in-person interviews at the Crested Butte Town Hall, located at 508 Maroon Avenue, Crested Butte, Colorado 81224.

You may also contact EPA if you would like to send your comments:

Katherine Jenkins, EPA Community Involvement Coordinator
Phone: 303-312-6351 Email: jenkins.katherine@epa.gov
Mailing Address: U.S. EPA Region 8 (EPR-SR)
1595 Wynkoop Street, Denver, CO 80202-1129

Additional site information is available at:

Crested Butte Old Rock Library
504 Maroon Avenue
Crested Butte, Colorado 81224
(970) 349-6535

EPA Superfund Records Center
1595 Wynkoop Street
Denver, CO 80202-1129
303-312-7273

Or online at: www.epa.gov/superfund/standard-mine

APPENDIX E – INTERVIEW FORMS

Standard Mine SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Standard Mine	
EPA ID: CO0002378230	
Interviewer name: Andrew Schmidt, RPM	**Interviewer affiliation:** EPA
Subject name: Ross Davis	**Subject affiliation:** CDPHE
Subject contact information: 303-692-3362	
Interview date: October 28, 2019	**Interview time:** 11:30 a.m.
Interview location: CDPHE via email	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: Colorado Department of Public Health and Environment	

1. What is your overall impression of the remedial activities at the Site?

   Generally, I think that is was a good idea to develop a phased ROD for the Site. Phase 1, source control, included minimizing water entering mine workings and provided surge protection in the form of a bulkhead. Phase 1 activities have been completed. Phase 2 includes passive water treatment if needed.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   Can you think of anything EPA could have done during the cleanup to better communicate if there were any risks associated with the site (as appropriate, if individual was present during cleanup)?

   I think the remaining risks associated with the site were well documented. This includes waste left in place within the repository.

3. How do you learn about what's happening at the site now?

   As the State project manager for the Site, there is an open line of communication with EPA regarding Site status and activities. We regularly email, have phone conversations and in-person meetings to discuss the Site.

4. Do you feel like EPA does a good job explaining the difference between whether there are risks to people and whether the cleanup is working well?

   I think EPA has done well to present a before and after remedial action representation of the Site. They have highlighted the fact that there is no water treatment at the Site yet. Phase 1 activities have provided environmental benefit.

5. What is your assessment of the current performance of the remedy in place at the Site?

   I feel the Phase 1 remedy is performing as anticipated at the Site. The bulkhead reduces the risk of a surge event from Level 1 and by doing so, is providing environmental benefit.

6. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

As the EPA counterpart representing the State of Colorado for this Site, our office has had a great deal of involvement in all site-related activities.

7. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   I am not aware of any.

8. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   There have been no unusual activities at the Site.

9. Do you feel the community is well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   I feel the community is very well-informed regarding Site activities. A local stakeholder group, Coal Creek Watershed Coalition, has been contracted to conduct and report on water quality following Phase 1 activities. Furthermore, an annual public meeting is conducted to provide the community with an update.

10. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

    None.

11. Do you consent to have your name included along with your responses to this questionnaire in the FYR report?

    Yes.

Standard Mine SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Standard Mine	
EPA ID: CO0002378230	
Interviewer name: Andrew Schmidt, RPM Katherine Jenkins, CIC	**Interviewer affiliation:** EPA
Subject name: Jim Schmidt	**Subject affiliation:** Town of Crested Butte
Subject contact information: jschmidt@crestedbutte-co.gov	
Interview date: September 18, 2019	**Interview time:** 3:00 p.m.
Interview location: Town of Crested Butte municipal office	
Interview format (circle one): (In Person) Phone Mail Email Other:	
Interview category: Local Government	

1. What is your overall impression of the remedial activities at the Site?

   EPA did a detailed and thorough job. The presentations EPA gave were very helpful in understanding what is going on at the Site. EPA has a good relationship with the town. When there was a small spill a few years ago, the town was notified quickly, which was much appreciated.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   I have a very positive impression of the project. I'm not sure about reuse activities other than reestablishing a natural environment.

3. Can you think of anything EPA could have done during the cleanup to better communicate if there were any risks associated with the Site (as appropriate, if individual was present during cleanup)?

   Nothing.

4. How do you learn about what's happening at the Site now?

   Presentations to the town.

5. Do you feel like EPA does a good job explaining the difference between whether there are risks to people and whether the cleanup is working well?

   Yes, a very good job. The Coal Creek Coalition people are also helpful.

6. What is your assessment of the current performance of the remedy in place at the Site?

   It seems to be working so far. A concern is if the mine fills with water and puts pressure on the closed parts.

7. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   Only when there was the minor spill about four years ago. People were concerned about water quality. We shut off the intake and tried to quell any concerns.

8. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   No.

9. Do you feel the community is well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   Presentations to the town and the newspaper are the best ways to communicate site-related information. Typically, if people do not come to the town council with concerns, it is not an issue.

10. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

    Are there still mining claims at the Site? Who owns it now? If someone is hiking there, are there no trespassing signs?

11. Do you consent to have your name included along with your responses to this questionnaire in the FYR Report?

    Yes.

Standard Mine SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Standard Mine	
EPA ID: CO0002378230	
Interviewer name: Andrew Schmidt, RPM Katherine Jenkins, CIC	**Interviewer affiliation:** EPA
Subject name: Shea Earley	**Subject affiliation:** Town of Crested Butte Public Works
Subject contact information: searley@crestedbutte-co.gov	
Interview date: September 18, 2019	**Interview time:** 3:45 p.m.
Interview location: Town of Crested Butte municipal office	
Interview format (circle one): (In Person) Phone Mail Email Other:	
Interview category: Local Government	

1. What is your overall impression of the remedial activities at the Site?

   Things have been going in the right direction over the past one-and-a-half years; however, there are a lot of questions for the long term. I'm also part of the Coal Creek Watershed Coalition. I feel like we're making headway. Contractors working at the Site are responsive to the town's permitting and other requirements.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   There needs to be a plan for moving forward for sampling in a consistent manner to allow for better data evaluation. During sampling in the past, there have been too many changing variables (big winters, open valve/closed valve at the bulkhead, etc.) so it is too difficult to determine what variable is affecting the data.

3. Can you think of anything EPA could have done during the cleanup to better communicate if there were any risks associated with the Site (as appropriate, if individual was present during cleanup)?

   I don't think so. When the pond blew out several years ago, the town was contacted right away.

4. How do you learn about what's happening at the Site now?

   I email Andrew with EPA.

5. Do you feel like EPA does a good job explaining the difference between whether there are risks to people and whether the cleanup is working well?

   Yes.

6. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   Not specifically for residents, but from the town's perspective, we were just issued a new discharge permit from the state that lowered the treatment plant's discharge standard for zinc to 71 µg/L. It is very frustrating for the town because it seems as if the state is not considering the fact that there is a Superfund site 4 miles upstream of the intake (which has much higher zinc levels). It's a major concern for the town.

7. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   Not that I'm aware of.

8. Do you feel the community is well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   Yes. When there is a lot of work going on at the Site, it would be helpful to have more public meetings, so people aren't caught off guard.

9. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

   It would be helpful to have public meetings before the start of work at the Site, and then after the work is done in the fall to provide an update. Other possible ways to stay updated on activities would be to talk directly with me and I can provide an update/memo to the town. There can also be work session before a town council meeting.

10. Do you consent to have your name included along with your responses to this questionnaire in the FYR Report?

    Yes.

Standard Mine SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Standard Mine	
EPA ID: CO0002378230	
Interviewer name: Andrew Schmidt, RPM Katherine Jenkins, CIC	**Interviewer affiliation:** EPA
Subject name: Ashley Bembenek	**Subject affiliation:** Coal Creek Watershed Coalition
Subject contact information: abembenek@yahoo.com	
Interview date: September 18, 2019	**Interview time:** 4:30 p.m.
Interview location: Town of Crested Butte municipal office	
Interview format (circle one): (In Person) Phone Mail Email Other:	
Interview category: Community	

1. What is your overall impression of the remedial activities at the Site?

   The remedial activities at the Site are fairly extensive and have been underway for close to a decade. It's been a collaborative process. The remedy's goal to obtain aquatic life standards in Elk Creek may be ambitious.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The source water control for Level 3 is interesting, but it will take time to understand if the outcome is what is expected. I'm glad the remedy included the bulkhead and remote monitoring capabilities. The repository created as part of the remedy seems like it was built with a very large flow in mind. The revegetation around the creek is also good. I hope the revegetation and monitoring efforts continue.

3. Can you think of anything EPA could have done during the cleanup to better communicate if there were any risks associated with the Site (as appropriate, if individual was present during cleanup)?

   I think it's important to clarify to a community when there is a risk to aquatic life or risk to human health. The Gold King spill and the small spill at the Site were learning opportunities about emergency response. I think the small spill at the Site was a useful fire drill and would be good to carry forward to other projects.

4. How do you learn about what's happening at the Site now?

   I attend the public meetings. I'm also a technical coordinator for the Standard Mine Technical Assistance Group and attend those meetings as well.

5. Do you feel like EPA does a good job explaining the difference between whether there are risks to people and whether the cleanup is working well?

   I feel it is too early to answer that as the work was just completed in 2017. We just don't have the results yet to determine if it is working well.

6. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   Other than when the small spill occurred, nothing. There is some curiosity from the community about the water quality standards and how the bulkhead is operated.

7. Do you feel the community is well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   In general, yes. The response following the small spill was appreciated. EPA's website for Standard Mine could be improved. It would be helpful if the website included information about upcoming public meetings. It would also be helpful if the Standard Mine Technical Assistance Group was updated with a schedule on when it might hear from EPA again.

8. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

   In the long term, the community will likely be concerned about changes in water quality standards, if that is the approach pursued by EPA. If EPA proposes such a change, a sound outreach to the community will be needed to keep the community engaged in the process and to provide information.

   Also, it would be helpful if there was increased communication from those parties gathering data about the Site so that all available data can be evaluated from a site-wide perspective. Data from management of the bulkhead (flows, etc.) should be evaluated in relation to the interim monitoring surface water data. There are opportunities for increased communication in this regard.

   I also think the community sometimes confuses Standard Mine with Keystone Mine. It will be important to key into geographical differences to avoid confusion.

9. Do you consent to have your name included along with your responses to this questionnaire in the FYR Report?

   Yes.

Standard Mine SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Standard Mine	
EPA ID: CO0002378230	
Interviewer name: Andrew Schmidt, RPM	**Interviewer affiliation:** EPA
Subject name: Curtis Cross	**Subject affiliation:** USFS
Subject contact information: 970-874-6667	
Interview date: October 8, 2019	**Interview time:** N/A
Interview location: N/A	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: U.S. Forest Service	

1. What is your overall impression of the remedial activities at the Site?

   Work is incomplete.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   Efforts have helped to control flow rates but have not improved water quality.

3. Can you think of anything EPA could have done during the cleanup to better communicate if there were any risks associated with the Site (as appropriate, if individual was present during cleanup)?

   Not present very much.

4. How do you learn about what's happening at the Site now?

   Updates from Andrew Schmidt.

5. Do you feel like EPA does a good job explaining the difference between whether there are risks to people and whether the cleanup is working well?

   EPA does a good job explaining what is being done. Not sure how much discussion has occurred with regards to risks to people.

6. What is your assessment of the current performance of the remedy in place at the Site?

   Unclear as to whether water quality has improved but flow rates can now be moderated.

7. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   We have coordinated surface reclamation efforts with Colorado DRMS.

8. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

No.

9. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   No.

10. Do you feel the community is well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

    We may need to revisit the goals for the Site.

11. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

    Passive treatment of the adit discharge should be explored.

12. Do you consent to have your name included along with your responses to this questionnaire in the FYR Report?

    Sure.

Standard Mine SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Standard Mine	
EPA ID: CO0002378230	
Interviewer name: Andrew Schmidt, RPM	**Interviewer affiliation:** EPA
Subject name: Travis Snyder	**Subject affiliation:** HDR Inc.
Subject contact information: 720-838-6065, travis.snyder@hdrinc.com	
Interview date: October 5, 2019	**Interview time:** 11:00 a.m.
Interview location: Remote	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: HDR, Inc. – Remedial Action Contractor	

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   Project went very well. Minimal working season and 6 weeks of standby time due to external factors (Gold King in 2015) caused an extra mobilization year in 2017. Otherwise, project stayed on schedule and completed successfully. Cleanup has been pretty comprehensive as far as what is stated in the ROD. Some orphan piles still exist in Elk Creek drainage. Maintenance activities are in their second year so things are still relatively new but have held up well both underground and on the surface through extreme winter conditions.

2. What is your assessment of the current performance of the remedy in place at the Site?

   I look back at the levels of metals that were present in Elk Creek noted in the ROD to where we are now and the multiple orders of magnitude that the levels have dropped and feel confident about the how well the remedy has performed to date. There could be some technologies developed to get us to meet the WQS, but further evaluation is needed to have a solid understanding of how much more can really be accomplished given background site conditions.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?

   Monitoring data has some gaps due to the extreme conditions and unreliable equipment deployed year-round. To date we are still trying to meet WQS for cadmium and zinc and have not seen drastic improvements even with hydraulic controls implemented. Spring flush is the major factor. If this can be controlled, there is a chance that the WQS could be met. Low flow conditions seem to be consistent whether the valve is open or closed again referring back to the background levels for Elk Creek.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.

   No. O&M is performed during semi-annual surface water sampling events with full inspection occurring each fall. Site data loggers can be monitored daily via the ERT Viper system receiving data via satellite telemetry. Perform inspection of items on O&M checklist, apply desiccant to electronic equipment, calibrate devices, cleanout precipitate within flumes, download stored data and lubricate mechanical equipment.

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

   Telemetry system installed in first year of O&M allows for remote monitoring. O&M of telemetry equipment added to list of maintenance responsibilities but did not affect schedules or sampling routines. Allows for monitoring pressures and flows at the bulkhead when the valve is open or closed respectively.

6. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.

   Researching issues with satellite communication during August and September 2019 where the system did not transmit for several days but reconnected on its own. Costs were not affected.

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

   O&M activities have been optimized by effective winterizing of the Site to withstand heavy snow and protect from sub-zero temperatures (air curtains to prevent ice accumulation, placement of batteries and data logging equipment underground where conditions rarely change). Sampling activities have been scheduled around weather and snow accumulation (sometimes up to 3 weeks of delay) to assure safe and effective operations. Still looking at how to optimize Minisipper sampling to support analysis from semi-annual sampling events, as well as work out issues of data gaps due to automated sampling equipment malfunctions.

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

   Communication between State and EPA has been very good from project completion through the Interim Monitoring Period and as we progress through the O&M. As long as the personnel stay consistent the O&M should continue to run smoothly. Just need to make sure documents and work plans are updated in case new personnel are introduced and the State takes further control of the Site. Maybe create a repository (possibly an FTP or share drive) for the documents to be shared by all involved.

9. Do you consent to have your name included along with your responses to this questionnaire in the FYR report?

   Yes.

APPENDIX F – DATA REVIEW TABLES

Table F-1: Dissolved Metal Concentrations in ELK-00, High-Flow Conditions (April to June, 2010 to 2015)[a,b]

Chemical	MDL	MRL	Minimum	Average	85th Percentile	Maximum	Number of Samples
Cadmium	0.1	0.2	1.07	1.08	1.37	1.45	9
Copper	0.5	2	2.2	2.94	4.42	4.71	9
Lead	0.1	0.1	<0.1[c]	0.63	1.81	2.21	9
Zinc	10	20	241	256	325	334	9
Iron	100	250	<100[d]				9
Manganese	2	5	<2	11	23	23	9

Notes:

a. Source is Table 1 of the 2018 Annual Report.
b. Estimated results were used in the summary tables and to calculate statistics.
c. Where <X is reported, the analyte was not detected in a majority of the results and the value of the MDL is presented.
d. Dissolved iron was less than 100 µg/L in all samples.

Metals results reported in micrograms per liter (µg/L).
MDL = method detection limit
MRL = method reporting limit

Table F-2: Dissolved Metal Concentrations in ELK-00, Low-Flow Conditions (July to March, 2010 to 2015)[a,b]

Chemical	MDL	MRL	Minimum	Average	85th Percentile	Maximum	Number of Samples
Cadmium	0.1	0.2	0.94	1.12	1.37	1.38	14
Copper	0.5	2	<2[c]	<2	4.03	4.67	14
Lead[d]	0.1	0.1	<0.1			1.9	14
Zinc	10	20	184	244	308	326	14
Iron[e]	100	250	<100			113	14
Manganese[f]	2	5	<2	<2	4.46	5.77	14

Notes:

a. Source is Table 2 of the 2018 Annual Report.
b. Estimated results were used in the summary tables and to calculate statistics.
c. Where <X is reported, the analyte was not detected in a majority of the results and the value of the MDL is presented.
d. In 11 of 14 samples, dissolved lead was less than 0.1 µg/L.
e. In 13 of 14 samples, dissolved iron was less than 100 µg/L.
f. In nine of 14 samples, dissolved manganese was less than 2 µg/L.

Metals results reported in µg/L.

Table F-3: 2018 Grab Sample Results

Parameter	ELK-11		LEVEL-1 OUTFALL		ELK-08		ELK-05		ELK-00	
	6/29/18	10/2/18	6/29/18	10/2/18	6/29/18	10/2/18	6/29/18	10/2/18	6/29/18	10/2/18
Hardness (mg/L)	38	95	96	168	65	101	60	80	60	77
Dissolved cadmium	2.23	7.38	5.76	24.5	2.34	2.74	0.98	1.16	0.91	0.865
Total cadmium	2.16	8.22	5.91	27.3	2.52	3.07	0.918	1.28	0.95 J	1.00 J
Dissolved copper	3.33	2.42	7.92	7.61	2.18	2.48	1.12	1.47	1.2	1.02
Total copper	3.27 J	3.31 J	9.56	12.9	3.74	2.65	<2.5	1.31	<2.5	<2.5
Dissolved lead	0.94 J	0.17 J	0.88	0.491	<0.1	0.22	<0.1	0.151 J	<0.1	<0.1
Total lead	1.98	1.04	1.89	7.31	5.66	0.60	<0.5	0.14	<0.5	<0.5
Dissolved zinc	652	2,210	1,000	5,600	516	598	200	236	191	168
Total zinc	630	2,100	995	5,810	572	607	203	234	193	175
Dissolved iron	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Total iron	<100	<100	<100	<100	102	<100	<100	<100	<100	<100
Dissolved manganese	20.6	31.9	76	423	<2	2.54	<2	1.4	<2	<2
Total manganese	21.3	32.3	77	437	50.5	4.3	2.28	1.58	<2	<2

Notes:

a. Source is Table 4 of the 2018 Annual Report.

Metals results reported in µg/L; hardness reported as noted.
J = estimated result; concentration was between the MDL and MRL.
mg/L = milligrams per liter

Table F-4: Comparison of June 2018 Surface Water Results to 2011 ROD Surface Water Cleanup Levels

Samples collected on June 29, 2018[a]					
Parameter	**Monitoring Location**	**ELK-11**	**ELK-08**	**ELK-05**	**ELK-00**
	Segment	**11**			
Hardness (mg/L)		38	65	60	60
Cadmium (µg/L)	Dissolved Cadmium	2.23	2.34	0.98	0.91
	Chronic Aquatic Life Cleanup Level	0.20	0.31	0.29	0.29
	Acute Aquatic Life Cleanup Level	0.73	1.17	1.09	1.09
	Attains Chronic Cleanup Level	**No**	**No**	**No**	**No**
	Attains Acute Cleanup Level	**No**	**No**	Yes	Yes
Lead (µg/L)	Dissolved Lead	0.94 J	<0.1	<0.1	<0.1
	Chronic Aquatic Life Cleanup Level	0.9	1.6	1.4	1.4
	Acute Aquatic Life Cleanup Level	22	40	37	37
	Attains Chronic Cleanup Level	**No**	Yes	Yes	Yes
	Attains Acute Cleanup Level	Yes	Yes	Yes	Yes
Zinc (µg/L)	Dissolved Zinc	652	516	200	191
	Chronic Aquatic Life Cleanup Level	54	86	80	80
	Acute Aquatic Life Cleanup Level	63	99	93	93
	Attains Chronic Cleanup Level	**No**	**No**	**No**	**No**
	Attains Acute Cleanup Level	**No**	**No**	**No**	**No**

Notes:

a. Data source is Table 5 of the 2018 Annual Report.

Numeric cleanup levels were calculated using paired hardness results and the acute and chronic surface water cleanup level equations set in the 2011 ROD. All cleanup levels refer to the dissolved sample fraction.

"Yes" indicates the result attained the 2011 ROD cleanup level. "**No**" indicates the result exceeded the 2011 ROD cleanup level.

J = estimated result; concentration was between the MDL and MRL.

Table F-5: Comparison of October 2018 Surface Water Results to 2011 ROD Surface Water Cleanup Levels

Samples collected on October 2, 2018[a]					
Parameter	**Monitoring Location**	**ELK-11**	**ELK-08**	**ELK-05**	**ELK-00**
	Segment	**11**			
Hardness (mg/L)		95	101	80	77
Cadmium (µg/L)	Dissolved Cadmium	7.38	2.74	1.16	0.87
	Chronic Aquatic Life Cleanup Level	0.41	0.43	0.36	0.35
	Acute Aquatic Life Cleanup Level	1.63	1.72	1.40	1.36
	Attains Chronic Cleanup Level	**No**	**No**	**No**	**No**
	Attains Acute Cleanup Level	**No**	**No**	Yes	Yes
Lead (µg/L)	Dissolved Lead	0.17 J	<0.1	0.15 J	<0.1
	Chronic Aquatic Life Cleanup Level	2.4	2.5	2.0	1.9
	Acute Aquatic Life Cleanup Level	61	65	51	49
	Attains Chronic Cleanup Level	Yes	Yes	Yes	Yes
	Attains Acute Cleanup Level	Yes	Yes	Yes	Yes
Zinc (µg/L)	Dissolved Zinc	2,210	598	236	168
	Chronic Aquatic Life Cleanup Level	119	125	103	99
	Acute Aquatic Life Cleanup Level	137	145	119	115
	Attains Chronic Cleanup Level	**No**	**No**	**No**	**No**
	Attains Acute Cleanup Level	**No**	**No**	**No**	**No**

Notes:

a. Data source is Table 6 of the 2018 Annual Report.

Numeric cleanup levels were calculated using paired hardness results and the acute and chronic surface water cleanup level equations set in the 2011 ROD. All cleanup levels refer to the dissolved sample fraction.

"Yes" indicates the result attained the 2011 ROD cleanup level. "**No**" indicates the result exceeded the 2011 ROD cleanup level.

J = estimated result; concentration was between the MDL and MRL.

Table F-6: Standards Evaluation of Grab Samples Collected from Elk Creek on June 29, 2018

Standards Evaluation for Elk Creek on June 29, 2018[a,b]					
Parameter	**Monitoring Location**	**ELK-11**	**ELK-08**	**ELK-05**	**ELK-00**
	Segment	**11**			
Hardness (mg/L)		38	65	60	60
Cadmium (µg/L)	Dissolved Cadmium	2.23	2.34	0.98	0.91
	Chronic Aquatic Life Standard	0.35	0.52	0.49	0.49
	Acute Aquatic Life Standard	0.7	1.2	1.1	1.1
	Attains Chronic Standard	**No**	**No**	**No**	**No**
	Attains Acute Standard	**No**	**No**	Yes	Yes
Copper (µg/L)	Dissolved Copper	3.33	2.18	1.12	1.2
	Chronic Aquatic Life Standard	3.9	6.2	5.8	5.8
	Acute Aquatic Life Standard	5.4	9.0	8.3	8.3
	Attains Chronic Standard	Yes	Yes	Yes	Yes
	Attains Acute Standard	Yes	Yes	Yes	Yes
Lead (µg/L)	Dissolved Lead	0.94 J	<0.1	<0.1	<0.1
	Chronic Aquatic Life Standard	0.9	1.6	1.4	1.4
	Acute Aquatic Life Standard	22	40	37	37
	Attains Chronic Standard	**No**	Yes	Yes	Yes
	Attains Acute Standard	Yes	Yes	Yes	Yes
Zinc (µg/L)	Dissolved Zinc	652	516	200	191
	Chronic Aquatic Life Standard	50	82	76	76
	Acute Aquatic Life Standard	66	108	101	101
	Attains Chronic Standard	**No**	**No**	**No**	**No**
	Attains Acute Standard	**No**	**No**	**No**	**No**
Iron (µg/L)	Dissolved Iron	<100	<100	<100	<100
	Domestic Water Supply Standard[c]	300			
	Attains Water Supply Standard	Yes	Yes	Yes	Yes
Manganese (µg/L)	Dissolved Manganese	20.6	<2	<2	<2
	Domestic Water Supply Standard[c]	50			
	Attains Water Supply Standard	Yes	Yes	Yes	Yes

Notes:

a. Source is Table 5 of the 2018 Annual Report.

b. All standards refer to the dissolved sample fraction. Where appropriate, standards were calculated using paired hardness results. State WQS in effect in 2018.

c. Values for iron and manganese are secondary MCLs. Secondary MCLs are not enforceable, but are intended as guidelines that represent reasonable goals for drinking water quality.

"Yes" indicates the result attained the standard. "**No**" indicates the result exceeded the standard. The Colorado Water Quality Control Commission (WQCC) evaluates water quality data to determine formal attainment with applicable water quality standards. Official attainment information is provided in WQCC Regulation 93. Results that are less than the MRL are considered in attainment of the standard if the appropriate practical quantitation limit is used.
J = estimated result; concentration was between the MDL and MRL.

Table F-7: Standards Evaluation of Grab Samples Collected from Elk Creek on October 2, 2018

Standards Evaluation for Elk Creek on October 2, 2018[a,b]					
Parameter	**Monitoring Location**	**ELK-11**	**ELK-08**	**ELK-05**	**ELK-00**
	Segment	**11**			
Hardness (mg/L)		95	101	80	77
Cadmium (µg/L)	Dissolved Cadmium	7.38	2.74	1.16	0.87
	Chronic Aquatic Life Standard	0.69	0.72	0.61	0.59
	Acute Aquatic Life Standard	1.7	1.8	1.5	1.4
	Attains Chronic Standard	**No**	**No**	**No**	**No**
	Attains Acute Standard	**No**	**No**	Yes	Yes
Copper (µg/L)	Dissolved Copper	2.42	2.48	1.47	1.02
	Chronic Aquatic Life Standard	8.6	9.0	7.4	7.2
	Acute Aquatic Life Standard	12.8	13.6	10.9	10.5
	Attains Chronic Standard	Yes	Yes	Yes	Yes
	Attains Acute Standard	Yes	Yes	Yes	Yes
Lead (µg/L)	Dissolved Lead	0.17 J	<0.1	0.15 J	<0.1
	Chronic Aquatic Life Standard	2.4	2.5	2.0	1.9
	Acute Aquatic Life Standard	61	65	51	49
	Attains Chronic Standard	Yes	Yes	Yes	Yes
	Attains Acute Standard	Yes	Yes	Yes	Yes
Zinc (µg/L)	Dissolved Zinc	2,210	598	236	168
	Chronic Aquatic Life Standard	116	122	99	96
	Acute Aquatic Life Standard	153	161	131	126
	Attains Chronic Standard	**No**	**No**	**No**	**No**
	Attains Acute Standard	**No**	**No**	**No**	**No**
Iron (µg/L)	Dissolved Iron	<100	<100	<100	<100
	Domestic Water Supply Standard[c]	300			
	Attains Water Supply Standard	Yes	Yes	Yes	Yes
Manganese (µg/L)	Dissolved Manganese	31.9	2.54	1.4	<2
	Domestic Water Supply Standard[c]	50			
	Attains Water Supply Standard	Yes	Yes	Yes	Yes

Notes:

a. Source is Table 6 of the 2018 Annual Report.

b. All standards refer to the dissolved sample fraction. Where appropriate, standards were calculated using paired hardness results. State WQS in effect in 2018.

c. Values for iron and manganese are secondary MCLs. Secondary MCLs are not enforceable, but are intended as guidelines that represent reasonable goals for drinking water quality.

"Yes" indicates the result attained the standard. "**No**" indicates the result exceeded the standard. The Colorado WQCC evaluates water quality data to determine formal attainment with applicable water quality standards. Official attainment information is provided in WQCC Regulation 93. Results that are less than the MRL are considered in attainment of the standard if the appropriate practical quantitation limit is used.

J = estimated result; concentration was between the MDL and MRL.

Table F-8: Drinking Water Standards Evaluation for ELK-00 – 2018

Parameter	MCL/Secondary MCL[a]	ELK-00[b]	
		6/29/2018	10/2/2018
Dissolved cadmium	5	0.91	0.865
Total cadmium		0.95 J	1.00 J
Dissolved copper	1,300	1.2	1.02
Total copper		<2.5	<2.5
Dissolved lead	15	<0.1	<0.1
Total lead		<0.5	<0.5
Dissolved zinc	5,000	191	168
Total zinc		193	175
Dissolved iron	300	<100	<100
Total iron		<100	<100
Dissolved manganese	50	<2	<2
Total manganese		<2	<2

Notes:

a. MCLs/Secondary MCLs obtained from https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations (accessed April 29, 2020). Values reported for zinc, iron and manganese are secondary MCLs.

b. Source is Table 4 of the 2018 Annual Report.

Concentrations reported in µg/L.

J = estimated result; concentration was between the MDL and MRL.

APPENDIX G – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Standard Mine	**Date of Inspection:** 09/18/2019
Location and Region: Gunnison National Forest, Colorado, 8	**EPA ID:** CO0002378230
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature:** Sunny and 50 degrees Fahrenheit

Remedy Includes: (check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other: Mine source controls: Phase 1 - Level 3 contaminant controls, flow-through bulkhead in Level 1, waste rock stabilization and adit discharge controls at Levels 5 and 98; Phase 2 (if necessary) passive water treatment

The ROD also requires monitoring of the following site features:

- Mine waste repository and areas impacted by repository construction.
- Revegetated/stabilized/armored residual soils and waste rock at Levels 1, 2, 3, 5 and 98.
- Reconstructed Elk Creek channel and run-on/runoff and erosion controls.
- Level 3 contaminant controls.
- Flow-through bulkhead in Level 1.
- Institutional controls.
- Passive water treatment system, if implemented.

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone : _____
   Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone : _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

   Agency Town of Crested Butte
   Contact Jim Schmidt (Name) Mayor (Title) 09/18/2019 (Date)
   Problems/suggestions ☐ Report attached: Interview form included as appendix to this FYR Report

   Agency Town of Crested Butte Public Works
   Contact Shea Earley (Name) Director (Title) 09/18/2019 (Date)
   Problems/suggestions ☐ Report attached: Interview form included as appendix to this FYR Report

Agency CDPHE
Contact Ross Davis
Name _____ Title _____ Date _____ Phone No.
Problems/suggestions ☐ Report attached: Interview form included as appendix to this FYR

4. **Other Interviews** (optional) ☒ Report attached: Interview forms included as appendix to this FYR

Ashley Bembenek, community member

Curtis Cross, USFS

Travis Snyder, HDR Inc.

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

2. **Site-Specific Health and Safety Plan**	☒ Readily available	☒ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

3. **O&M and OSHA Training Records**	☒ Readily available	☐ Up to date	☐ N/A

Remarks: _____

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☐ N/A

Remarks: _____

10. **Daily Access/Security Logs** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: Vehicular entry via MEMCO must sign in

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for state

☐ PRP in-house ☐ Contractor for PRP

☐ Federal facility in-house ☒ Contractor for EPA/state

☐ _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☒ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: _____ To: _____ _____ ☐ Breakdown attached
Date Date Total cost

From: _____ To: _____ _____ ☐ Breakdown attached
Date Date Total cost

From: _____ To: _____ _____ ☐ Breakdown attached
Date Date Total cost

From: _____ To: _____ _____ ☐ Breakdown attached
Date Date Total cost

From: _____ To: _____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A

Remarks: _____

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Locked adit portal gates and the access road has locked gates preventing access to the area.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A*

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A*

Type of monitoring (e.g., self-reporting, drive by): _____

Frequency: _____

Responsible party/agency: _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☒ N/A*

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A*

Specific requirements in deed or decision documents have been met* ☐ Yes ☒ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A*

Other problems or suggestions: ☐ Report attached

*ICs have not yet been implemented

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☒ N/A*

Remarks: *Institutional controls have not yet been implemented.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☐ N/A

Remarks: None

3. **Land Use Changes Off Site** ☐ N/A

Remarks: None

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

Waste Rock Repository

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☒ Settlement not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident

Lengths: _____ Widths: _____ Depths: _____

Remarks: _____

3.	**Erosion**	☐ Location shown on site map	☒ Erosion not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
4.	**Holes**	☐ Location shown on site map	☒ Holes not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☐ Grass	☐ Cover properly established
	☐ No signs of stress	☐ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: Not applicable; riprap cover		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☐ N/A
	Remarks: Appeared in good condition		
7.	**Bulges**	☐ Location shown on site map	☒ Bulges not evident
	Area extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Area extent: _____
	☐ Ponding	☐ Location shown on site map	Area extent: _____
	☐ Seeps	☐ Location shown on site map	Area extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Area extent: _____
	Remarks: _____		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☒ No evidence of slope instability		
	Area extent: _____		
	Remarks: _____		
B. Benches		☐ Applicable ☒ N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
C. Letdown Channels		☒ Applicable ☐ N/A	
	(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement** (Low spots)	☐ Location shown on site map	☒ No evidence of settlement
	Area extent: _____		Depth: _____
	Remarks: _____		
2.	**Material Degradation**	☐ Location shown on site map	☒ No evidence of degradation
	Material type:_____		Area extent: _____
	Remarks: _____		

3.	**Erosion**	☐ Location shown on site map	☒ No evidence of erosion
	Area extent: _____		Depth: _____
	Remarks: _____		
4.	**Undercutting**	☐ Location shown on site map	☒ No evidence of undercutting
	Area extent: _____		Depth: _____
	Remarks: _____		
5.	**Obstructions**	Type: _____	☒ No obstructions
	☐ Location shown on site map	Area extent: _____	
	Size: _____		
	Remarks: _____		
6.	**Excessive Vegetative Growth**	Type: _____	
	☐ No evidence of excessive growth		
	☒ Vegetation in channels does not obstruct flow		
	☐ Location shown on site map	Area extent: _____	
	Remarks: Tree saplings observed in channel		
D. Cover Penetrations		☐ Applicable	☒ N/A
E. Gas Collection and Treatment		☐ Applicable	☒ N/A
F. Cover Drainage Layer		☐ Applicable	☒ N/A
1.	**Outlet Pipes Inspected**	☐ Functioning	☐ N/A
	Remarks: _____		
2.	**Outlet Rock Inspected**	☐ Functioning	☐ N/A
	Remarks: _____		
G. Detention/Sedimentation Ponds		☐ Applicable	☒ N/A
1.	**Siltation**	Area extent: _____ Depth: _____	☐ N/A
	☐ Siltation not evident		
	Remarks: _____		
2.	**Erosion**	Area extent: _____ Depth: _____	
	☐ Erosion not evident		
	Remarks: _____		
3.	**Outlet Works**	☐ Functioning	☐ N/A
	Remarks: _____		
4.	**Dam**	☐ Functioning	☐ N/A
	Remarks: _____		
H. Retaining Walls		☐ Applicable	☒ N/A
I. Perimeter Ditches/Off-Site Discharge		☒ Applicable	☐ N/A
1.	**Siltation**	☐ Location shown on site map	☒ Siltation not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☒ Vegetation does not impede flow

Area extent: _____ Type: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident

Area extent: _____ Depth: _____

Remarks: _____

4. **Discharge Structure** ☐ Functioning ☒ N/A

Remarks: _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

Passive water treatment is Phase 2 of the remedial action and has not yet been implemented.

X. OTHER REMEDIES

If there are remedies applied at the Site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Level 1:
The Level 1 portal closure appeared undisturbed. The Level 1 bypass adit portal gate was secured upon arrival; water was observed freely flowing from the portal gate. The Level 1 adit was in good condition with no issues of concern noted. Site inspection participants entered the adit and observed the bulkhead and valve mechanism inside. The bulkhead valve was open during the inspection, closed briefly to observe its performance and re-opened fully by inspectors before exiting the adit. The flumes directing flow appeared to be functioning as intended. The exterior tower for the telemetry system appeared in good condition.

Levels 3, 5 and 98:
No issues of concern were noted at the exterior areas of Level 3, Level 5 and Level 98. Surface work at Level 3 and Level 5 was complete at the time of the inspection; however, some additional revegetation may occur at Level 5. Capping and revegetation work at Level 98 is expected to be occur soon (likely the next field season).

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).
The source control remedy is designed to reduce water flow through mine workings and contaminated soils to reduce metals loading to Elk Creek, to lessen water quality impacts and maximize reasonably attainable water uses in Elk Creek. The remedy is also designed to reduce human exposure to dust and ecological impacts from impacted soils and waste rock. Rehabilitation work at Levels 1, 3, 5 and 98 has occurred. The flow-through bulkhead at Level 1 is operating as designed. Sampling of surface water is ongoing as part of the interim monitoring program, which began in 2018. The effectiveness of the source control remedy will be evaluated using interim monitoring data over time but is expected to reduce contaminant loading to Elk Creek.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
O&M of the repository and surface features is adequate at this time. The EPA continues to adjust flow rates from the Level 1 bulkhead and is evaluating resulting changes to Elk Creek water quality. Additional coordination of data collection efforts among the various contractors and agencies should also be

	considered.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.

Site inspection participants:
Andrew Schmidt (EPA)
Ross Davis (CDPHE)
Jeff Graves (DRMS)
Travis Snyder and Austin Morgan (HDR)
Treat Suomi and Jill Billus (Skeo)

APPENDIX H – SITE INSPECTION PHOTOGRAPHS

The waste repository

The waste repository

Drainage around the waste repository

Canadian thistle along the access road near the waste repository

Level 1 new and old closed entrance

New entry to Level 1

Pond outside Level 1 adit

Level 1 bulkhead

Flume inside Level 1, near the bulkhead

Outside Level 3

Level 3 entrance

Level 5 adit

Level 98 surface work

Level 98

Headwaters of Elk Creek

Confluence of Elk Creek and Coal Creek

USGS gauging station near ELK-00

APPENDIX I – CHEMICAL-SPECIFIC ARARS

Table I-1: Comparison of 2011 ROD Surface Water Cleanup Levels to Current State WQS for Site COCs

COC		2011 ROD Surface Water Cleanup Level[a]		Current State WQS[b]		Change?
		Equation	Example value based on hypothetical 100 mg/L hardness[c]	Equation	Example value based on hypothetical 100 mg/L hardness[c]	
Cadmium	Acute	$1.136672 - [\ln(\text{hardness})*0.041838)] * e^{(0.9151[\ln(\text{hardness})]-3.6236)}$	1.70	$1.136672 - [\ln(\text{hardness})*0.041838]) * e^{(0.9789*[\ln(\text{hardness})]-3.866)}$	1.79	ROD value < Current WQS
	Chronic	$1.10162 - [\ln(\text{hardness})*0.041838)] * e^{(0.7998[\ln(\text{hardness})]-4.4451)}$	0.42	$1.101672 - [\ln(\text{hardness})*0.041838]) * e^{(0.7977*[\ln(\text{hardness})]-3.909)}$	0.72	ROD value < Current WQS
Lead	Acute	$1.46203 - [\ln(\text{hardness})*0.145712)] * e^{(1.273[\ln(\text{hardness})]-1.46)}$	65	$1.46203 - [\ln(\text{hardness})*0.145712]) * e^{(1.273[\ln(\text{hardness})]-1.46)}$	65	No Change
	Chronic	$1.46203 - [\ln(\text{hardness})*0.145712)] * e^{(1.273[\ln(\text{hardness})]-4.705)}$	2.5	$1.46203 - [(\ln(\text{hardness})*0.145712]) * e^{(1.273[\ln(\text{hardness})]-4.705)}$	2.5	No Change
Zinc	Acute	$0.978*e^{(0.8525[\ln(\text{hardness})] + 1.0617)}$	143	$0.978*e^{(0.9094[\ln(\text{hardness})] + 0.9095)}$	160	ROD value < Current WQS
	Chronic	$0.986*e^{(0.8525[\ln(\text{hardness})] + 0.9109)}$	124	$0.986*e^{(0.9094[\ln(\text{hardness})] + 0.6235)}$	121	ROD value > Current WQS

Notes:

a. Surface water cleanup levels defined in Table 18 of the 2011 ROD as "COC Concentrations Expected to Provide Adequate Protection of Ecological Receptors."

b. State surface water quality standards, effective June 30, 2019, available at https://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=8117&fileName=5%20CCR%201002-35 (accessed 1/15/2020); cadmium water quality standard is a site-specific equation for Upper Gunnison River Basin Stream Segment 11 (COGUUG11).

c. The current state WQS and 2011 ROD surface water cleanup levels are hardness-based standards. A hypothetical hardness of 100 mg/L calcium carbonate was used to demonstrate the relative difference between the current WQS and the 2011 ROD surface water cleanup levels. The resulting numeric values from this assessment should not be construed as the site-specific standards and surface water cleanup values.

All standards reported in µg/L.
ln = natural log.

Table I-2: Comparison of 2011 ROD Surface Water Cleanup Levels to Current Drinking Water Standards

COC		2011 ROD Surface Water Cleanup Level[a]		Current Drinking Water Standards (DWS)		Change?
		Equation	Example value based on hypothetical 100 mg/L hardness[b]	State Standard[c]	Federal Standard[d]	
Cadmium	Acute	$1.136672 - [\ln(\text{hardness})*0.041838)] * e^{(0.9151[\ln(\text{hardness})]-3.6236)}$	2.51	5	5	ROD value < Current State/Federal DWS
	Chronic	$1.10162 - [\ln(\text{hardness})*0.041838)] * e^{(0.7998[\ln(\text{hardness})]-4.4451)}$	0.42			ROD value < Current State/Federal DWS
Lead	Acute	$1.46203 - [\ln(\text{hardness})*0.145712)] * e^{(1.273[\ln(\text{hardness})]-1.46)}$	65	15	15	ROD value > Current State/Federal DWS
	Chronic	$1.46203 - [\ln(\text{hardness})*0.145712)] * e^{(1.273[\ln(\text{hardness})]-4.705)}$	2.5			ROD value < Current State/Federal DWS
Zinc	Acute	$0.978*e^{(0.8525[\ln(\text{hardness})] + 1.0617)}$	143	5,000	5,000[e]	ROD value < Current State/Federal DWS
	Chronic	$0.986*e^{(0.8525[\ln(\text{hardness})] + 0.9109)}$	124			ROD value < Current State/Federal DWS

Notes:

a. Surface water cleanup levels defined in Table 18 of the 2011 ROD as "COC Concentrations Expected to Provide Adequate Protection of Ecological Receptors."

b. The 2011 ROD surface water cleanup levels are hardness-based standards. A hypothetical hardness of 100 mg/L calcium carbonate was used to demonstrate the relative difference between the 2011 ROD surface water cleanup goals and current drinking water standards. The resulting numeric values from this assessment should not be construed as the site-specific surface water cleanup values, but as example values.

c. State drinking water standards, 5 CCR 1002-11, available at https://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=7862&fileName=5%20CCR%201002-11, (accessed 1/15/2020). Zinc values are secondary MCLs.

d. National primary drinking water standards available at https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations, (accessed 1/15/2020).

e. Secondary MCL; National Secondary Drinking Water Regulations are non-enforceable guidelines regarding contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. The EPA recommends secondary standards to water systems but does not require systems to comply.

All standards reported in µg/L.
ln = natural log.