UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region8

Ref: 8SEM-EMR

ACTION MEMORANDUM

SUBJECT: Approval and Funding for a Removal Action at the North Star Mine Portal 7 Beaver Dam Removal Site in San Juan County, Colorado

FROM: Kerry Guy
Federal On-Scene Coordinator

THRU: Laura Williams, Chief
Emergency Response Section

Deirdre Rothery, Chief,
Emergency Management Branch

TO: Betsy Smidinger, Director
Superfund and Emergency Management Division

Site ID #B861

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of a removal action at the North Star Mine Site (Site) in San Juan, Colorado. The purpose of this time-critical removal action is to address a beaver dam obstruction to the level 7 portal. The beaver pond impounds up to 250,000 gallons of acid mine drainage at the portal to a depth of 4 feet. This removal action will also address necessary repairs or removal of a soil berm in the portal, installed at the time the mine was closed, that the beaver colony has breached. This removal action will also repair and/or replace the adit closure gate with a new graded adit grate/gate in coordination with the Colorado Division of Reclamation, Mining and Safety (DRMS). The removal action will also include maintenance and repair of the drainage channel from the level 7 portal drainage into Mineral Creek, as well as repair and establishment of surface water controls necessary to stabilize the Site.

The adit portal closure is not currently pressurized from mine drainage. The debris and beaver activities, though, could eventually plug the closure pipes. Pressurization of the mine drainage behind the closure at the level 7 portal could then occur. Conditions existing at the Site present a threat to public health or welfare or the environment and meet the criteria for initiating a removal action under 40 CFR 300.415(b)(2) of the National Contingency Plan (NCP). A sudden release from the beaver dam and the impounded water would result in a significant discharge of acid mine drainage. The associated mine drainage sediments would cause significant erosion of waste pile

sediments to be carried into Mineral Creek. The Region has categorized the proposed work under this action memorandum as 3N, indicating the Region has conducted studies or investigations and has determined that the fluid hazard is known or probable. The Region's planned site activities will not affect or change the fluid release hazard at the mine.

This removal action involves no nationally significant or precedent-setting issues. This time-critical removal action will not establish any precedent for how future response actions will be taken and will not commit the US Environmental Protection Agency (EPA) to a course of action that could have a significant impact on future responses or resources.

II. SITE CONDITIONS AND BACKGROUND

Site Name:	North Star Mine
Superfund Site ID (SSID):	B861
NRC Case Number:	N/A
CERCLIS Number:	CON000821039
Site Location:	San Juan County, Colorado
Lat/Long:	37.8075426666667; -107.681795166667
Potentially Responsible Party (PRP):	
NPL Status:	Non-NPL
Removal Start Date:	TBD FY 2020/4Qtr - 2021/1Qtr

A. Site Description

1. Removal Site Evaluation

The North Star Mine Site has historically been associated with the Animas Mining District which is part of the San Juan National Forest. Attachment 1 shows a map of the North Star Mine, located just southwest of Silverton, Colorado. Figure 2 shows the general layout of the Site. The Site consists of an old mill site on the east side of the mine workings. Historically, access to the mine workings was by two portals, level 6 and level 7. These two portals are noted on Figure 2.

Portal 6, just above level 7, is collapsed with no visual drainage. Mine drainage exits in the North Star Mine at portal level 7. From portal 7, a drainage channel was intended to convey mine drainage around the west side of the large waste rock into Mineral Creek. This large waste rock pile is actively being eroded and cut away beyond angle of repose by Mineral Creek. The North Star Mine level 7 portal was closed sometime in the 1980s, by placing a backfill wedge into the portal which was underlain by pipes in order to maintain drainage into the constructed channel. A closure gate was placed on the portal entrance.

In 2019, an active beaver colony was observed building a dam within 50 feet below the level 7 draining portal. The beaver colony is assumed to be living somewhere inside the portal gate. The beaver dam impedes flow to the drainage channel and is currently impounding water at a depth of up to 4 feet with an estimated 250,000 gallons of

impounded mine drainage water. Mine water discharges over the crest of the 60 to 70 foot-wide dam, then cuts into the large waste rock pile in several places. This discharge results in metals and sediment loading into the adjacent Mineral Creek and subsequently into the Animas River.

On July 24, 2020, a site inspection by the EPA On-Scene Coordinator (OSC) was performed which included extending a camera through what appeared to be an animal burrow hole located near the top of the portal closure fill. The camera was extended far enough into the tunnel to determine that the portal closure was not pressurized (approximately 12 feet). The back-side slope of the fill could be observed along with water at the bottom of the slope. Timber and fresh aspen twigs were observed, apparently brought in by the beavers. The opening appeared to be used by the beavers to access the portal. The abundance of wood and freshly cut aspen twigs suggests the beavers are residing inside the portal. One beaver has been trapped and relocated to date. On August 20, 2020 a camera was again extended into the animal burrow hole for the purpose of estimating the depth of water behind the soil berm (see Attachment 4). A picture taken inside the adit berm shows the wood cribbing intact. By subtracting the number of 8-inch cribbing boards above the water line in front of the berm, (15 from ceiling to waterline) to that behind the berm (14) a water differential of 8 inches was determined (the water being 8 inches higher behind the berm inside the portal). Adding the water depth of 18 inches in front of the berm, a water depth of 26 inches behind the berm was determined.

Elevated metals including aluminum, cadmium, iron, manganese, and zinc are present in the acid mine water discharge from the portal. Elevated concentrations of arsenic, lead, and manganese are present in waste pile material. Water quality and mine waste soil/sediment information associated with the North Star Mine and surrounding water bodies are shown in Attachment 2.

2. Physical Location

The North Star Mine is adjacent to Mineral Creek. It is ¾ mile above its confluence with the Animas River and below the Town of Silverton, Colorado. Entrance to the site is off U.S. Hwy 550, approximately one-half mile south of Silverton (See Figure 1). The Site lies at the northern foot of Sultan Mountain, at an elevation of 9,400 feet. The Site is situated on privately owned patented lode mining claims at Latitude N37° 48'25", Longitude W107 ° 40'55".

Silverton is immediately upstream of the confluence of Mineral Creek and the Animas River. The City of Durango is approximately 45 miles downstream of Silverton. From Durango, the Animas River flows approximately 36 miles into New Mexico past the Aztec Ruins National Monument and then joins the San Juan River near Farmington, NM. As noted in the 2018 Census, the population of Silverton was 694 individuals.

3. Site Characteristics

Background: The North Star Mine was started in 1876 and was initially developed by adits high in Belcher Gulch at an elevation of approximately 9,927 feet. . The development of crosscut adits from the Mineral Creek drainage on the northern slope of Sultan Mountain permitted extensive production from the North Star Vein. By 1881, the North Star Mine became the most productive silver mine in San Juan County.

The lowest adit, the No. 7 Level crosscut at an elevation of 9,390 feet, was completed in 1890. In 1899, the mine ceased operations due to increased costs of hoisting ore from below the No. 7 Level, pumping water from lower levels of the mine, and a decrease in silver prices.
Mineral Creek is adjacent to the mine waste rock and tailings pile and is impacted by the adit discharge and run off. Mineral Creek joins the Animas River approximately ¾ mile downstream from the mine. The Animas River is considered a Gold Medal fishery near Durango and is heavily recreated and fished by residents and tourists. In addition, the Animas River supports native fish species including bluehead sucker, flannelmouth sucker, white sucker, speckled dace, and mottled sculpin. The Colorado Division of Wildlife (CDW) manages two segments of the middle Animas River between Durango and the Colorado/New Mexico border, providing a high-quality recreational fishery of brown and rainbow trout.

Geology: The North Star Mine lies on the southern margin of the Silverton Caldera, a regionally prominent, Tertiary-aged, volcanic center. Workings were driven southwesterly into a locally extensive, porphyritic, intrusive quartz monzonite of Oligocene age. This intrusive body of rock lies along the southern margin of the caldera extending south to comprise Sultan Mountain. The intrusive body is separated from massive rhyodacite caldera flows and breccia on the north side of Mineral Creek by a graben-like, ring-fault system beneath the valley floor.

Numerous mineralized fault and fissure veins in Sultan Mountain trend parallel and sub-parallel with the adjacent ring-fracture pattern, most showing similar sense of displacement. Sulphide minerals found on the waste rock and the tailings pile include pyrite, sphalerite, chalcopyrite, and galena. There is little alteration of the granitic country rock here and therefore limited buffering carbonate minerals are present in the gangue. Gangue minerals consisted mostly of quartz with very minor calcite and rhodochrosite.

Current Conditions: The Site consists of the North Star Mine workings (8 levels); a large and expansive waste rock pile below the level 7 portal extending to and abutting Mineral Creek; a collapsed historic mill; a mine drainage channel (running from the level 7 portal, along the west side of the large waste rock pile discharging into Cement Creek); and two large metal buildings. Mine levels 6 and 7 have adit portals.

An upper adit level 6, at an elevation of 9,520 feet, is collapsed and has no surface discharge. This adit consists of a moderate-sized waste rock pile thought to contain

approximately 3,500 cubic yards. The lower main mill-level adit (level 7) historically discharged up to 560 gallons per minute (gpm) through a drainage pipe down a partially lined channel directly into Mineral Creek. Due to the beaver dam, it is difficult to accurately determine the current flow rate. Based on visual observations, though, it appears the flows are greater than 300 gpm. The waste pile below level 7 has been reported by others at 40,000 cubic yards. Significantly elevated concentrations of aluminum, cadmium, iron, manganese, and zinc are the primary metals being discharged in surface water from the North Star Mine. Arsenic, lead and manganese in the waste pile are elevated above background and regional screening levels.

Several mine buildings remain at the Site. A permitted prospecting operation was conducted at this mine in the recent past and several of the buildings are modern and in good condition. A collapsed loadout exists on the northeast edge of the historic waste pile adjacent to the creek.

A mine blowout or significant surge in flows from the mine drainage would directly impact Mineral creek and subsequently the Animas River. The discharge would occur below Silverton and flow towards Durango, 45 miles downstream. From Durango, the Animas River flows 36 miles into New Mexico past the Aztec Ruins National Monument and then joins the San Juan River near Farmington, NM. Historically, discharges from other mines above Silverton have resulted in downstream impacts on the Navajo Nation in New Mexico, and on farmers and other communities along the 126-mile-reach of the Animas River in Colorado to the confluence with the San Juan River in New Mexico.

4. Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant

The beaver dam at the North Star Mine portal is impounding a relatively substantial volume of water. The dam depth of 3-4 feet is also likely backing up water in the portal for 300-400 feet given a portal gradient of 1 percent. It is conservatively estimated that the water in the beaver pond and in the portal is 250,000 gallons. Photos of the beaver dam conditions are in Attachment 3.

The metals concentrations of the mine discharge are above acute and chronic aquatic life water quality standards. There is also potential for ecological risks associated with wildlife species, including insectivorous birds in the wetlands downstream of the North Star Mine. A sudden release of metals-laden impounded mine water has the potential to increase these impacts to aquatic life.

Arsenic and lead in the mine waste piles are also significantly elevated above EPA Residential and Industrial Regional Screening Levels (RSLs) (See Attachment 2). Heavy metals concentrations in the waste piles are also above Ecological Soil Screening Levels (EcoSSLs) for many wildlife species including plants, invertebrates, birds, and mammals observed at and around the North Star Mine Site.

The dam and impounded acid mine drainage prevents free drainage from the level 7 portal and poses a threat of a sudden release of acid mine drainage and resulting sludge. Furthermore, the active beaver colony behind the portal may be causing conditions that could ultimately cause blockage of the drainage pipes that are intended to carry water out of the adit to an adjacent constructed channel. Plugging the portal drainage pipes could lead to the pressurization of the portal soil berm closure, creating the potential for a sudden release. Such a release from either scenario could result in human and ecological exposure to contaminated water and sediments discharged to surface water, stream and riverbed substrates. An uncontrolled release would cause a significant increase of heavy metals loading from both soil and surface water runoff. This would result in additional migration of metals from the Site, primarily aluminum, cadmium, manganese, iron, and zinc in water, as well as, arsenic and lead in waste pile soils that could cause further migration downstream. Arsenic, cadmium, lead, manganese, and zinc are listed hazardous substances in 40 CFR 302.4.

The Agency for Toxic Substances and Disease Registry indicates that aluminum is the most abundant metal in the earth's crust and is widely distributed. Complex geochemical reactions are based on site-specific soil and pH conditions result when aluminum reacts with soil and other metals as a result of mining operations. Oral ingestion/exposure to aluminum is usually not harmful. Evidence is inconclusive, but some studies show that people exposed to high levels of aluminum may develop Alzheimer's disease.

People who have kidney disease store a lot of aluminum resulting in bone or brain diseases that may be linked to excess aluminum. Studies in animals show that the nervous system is a sensitive target of aluminum toxicity. Obvious signs of damage were not seen in animals at high doses, but tests that measured grip strength and movement indicated low performance. Effects of aluminum on wildlife is highly dependent on soil pH and EPA Ecological Soil Screening guidance indicate it is only evaluated as a concern when soil pH is less than 5.5. Toxic levels of aluminum effects roots, height, density of plants, and is shown to decrease the uptake and utilization of phosphorus and calcium in plants. Lower soil pH significantly increased aluminum toxicity to soil invertebrates.

The toxicity of aluminum has been studied extensively in fish, less so in invertebrates, amphibians, and birds. At moderate acidity (pH 5.5 to 7.0) fish and invertebrates may be stressed due to aluminum adsorption onto gill surfaces causing loss of osmoregulatory function and subsequent asphyxiation.

Arsenic is a naturally occurring ubiquitous element with concentrations in soils reflecting the geology of the region. Toxicity of arsenic is related to its chemical form, with inorganic forms being considered more toxic than the organic form. According to the Agency for Toxic Substances and Disease Registry (ATSDR), ingestion of lower levels of inorganic arsenic causes irritation of the stomach and intestines, with symptoms such as nausea, vomiting and diarrhea. Other effects include decreased production of red and white blood cells, which may cause fatigue, abnormal heart

rhythm, blood-vessel damage resulting in bruising and impaired nerve function. Long-term ingestion of inorganic arsenic causes a pattern of skin changes including patches of darkened skin and small warts. Skin cancer may also develop. Swallowing arsenic has also been reported to increase the risk of cancer in the liver, bladder, and lungs.

The Department of Health and Human Services has determined that inorganic arsenic is known to be a human carcinogen. Eisler wildlife publication indicates that it poses potent ecological dangers and oral doses of elevated arsenic are fatal to birds and animals. Chronic exposure to arsenic via diet and other roots have been associated with liver, kidney, and heart damage. A comprehensive review in Ecotoxicology and Environmental Safety indicates that wildlife toxicity resulting from arsenic exposure is linked to an imbalance between pro-oxidant and antioxidant homeostasis that results in oxidative stress.

According to Beyers and Clements, arsenic is a toxic trace element that can induce physiological and biochemical changes in fish that lead to growth inhibition. Arsenic exposure in the aquatic environment causes bioaccumulation in aquatic organisms and can lead to physiological and biochemical disorders such as poisoning, liver lesions, decreased fertility, cell and tissue damage and cell death.

According to the Agency for Toxic Substances and Disease Registry, cadmium is a cumulative toxin and has a very long half time in the body. Children exposed in even low amounts may have long-term consequences. Animals can accumulate cadmium in their bodies which can bioaccumulate and biomagnify in the food chain. Studies in animals suggest that children may be more susceptible than adults on cadmium-induced bone damage. In laboratory animals, cadmium causes decreases in fetal or pup body weight, skeletal malformations, and behavioral alterations. Cadmium-induced effects associated with oral intake by wildlife include nephrotoxicity, possible effects on the liver, reproductive organs, and the hematopoietic, immune, skeletal, and cardiovascular systems.

Toxicity to aquatic organisms from exposure to elevated levels of cadmium is often found together with zinc in conjunction with lead-containing ores, such as at this Site. These metals typically coexist in the aquatic environment as a salt of the +2 valence state or as a metal. Many cadmium and zinc salts are soluble in freshwaters with low organic carbon levels. The free divalent ion of these metals is thought to be primarily responsible for their toxicity to aquatic organisms. The mechanism varies slightly by metal but generally occurs by competitive disruption of calcium receptors on the surface of the gill. This inhibits oxygen absorption and the ability of the organism to maintain ionic balance with the surrounding environment. Additional toxicities from chronic cadmium exposures can result in negative alterations to the gill, kidney, liver, increased free radical production and immune suppression.

The Agency for Toxic Substances and Disease Registry indicates that lead is a naturally occurring element but is not considered an essential nutrient to humans or wildlife species. Once exposed, lead is widely distributed throughout the body and toxic effects

of lead have been observed in every organ system that has been studied. Health effects include neurological, renal, cardiovascular, hematological, immunological, reproductive, and developmental effects. Neurological effects of lead are of greatest concern because effects are observed in infants and children and may result in life-long decrements in neurological function. Neurological effects include decreased cognitive function; memory, altered mood and behaviors that may contribute to learning deficits; altered neuromotor and neurosensory function, peripheral neuropathy, and encephalopathy. Many other severe effects to animals are associated with lead poisoning including behavioral, heme, rapid labored breathing, anorexia, weight loss, decreased mild production, dehydration, emaciation, fetal death, paraplegia, impaired postnatal growth, reduced pregnancy rate, and interference with resistance to infectious disease.

Dissolved lead is acutely toxic to aquatic invertebrates and fish, with young stages of fish more susceptible to lead than adults or eggs. Typical signs of lead toxicity include spinal deformity and blacking of the caudal region. The acute toxicity of lead is highly dependent on presence of other ions in solution.

The Agency for Toxic Substances and Disease Registry indicates that like aluminum, Iron is an abundant metal in earth's crust and a commonly occurring metallic element. Iron is recognized as an essential micronutrient and necessary for plant growth. Significant amounts of iron may be released due to mining operations which results in iron being exposed to air and water to form hydroxide precipitates. This process releases dissolved ferrous iron into mine drainage which reacts with oxygen to form ferric iron. Ferric iron hydrolyzes to a form of insoluble ferric hydroxide ($FeOH_3$) which, through continued chemical processes, ultimately precipitates out in mines and streams and reacts with pyrite to generate soluble ferrous iron.

Site-specific conditions such as iron's interaction and complexing with other heavy metals which determines the chemical form, solubility, and availability of iron to plants, invertebrates, and animals. Ingestion of excess iron salts in humans results in abdominal pain, diarrhea, vomiting and possible liver damage. According to the EPA Ecological Soil Screening Level for Iron, the flocculated iron covers the soil surface, smothering any plants and microbial communities. Iron precipitate can also run off into adjacent rivers and streams filling interstitial pore space causing concretion of the stream sediment and resulting in impacts to benthic invertebrates. The main concern from an ecological risk perspective for iron is not direct chemical toxicity, but the effect of iron as a mediator in the geochemistry of other potentially toxic metals and the physical hazard of depositing flocculent.

Large amounts of iron promote growth of algae, which can block sunlight from other plants and can disrupt habitats and aquatic feeding practices. High concentrations of iron sometimes result in increased acidity of water killing or otherwise harming aquatic life. Excess or elevated concentrations of iron in surface water will damage the gills of fish or cause the irritation of the gill tissues leading to damage and secondary bacterial and fungal infections.

The Agency for Toxic Substances and Disease Registry has found that although low levels of manganese are necessary for human health, exposures to high levels are toxic and can produce significant health effects. Infants and children are potentially more sensitive to manganese toxicity than adults. Available studies in animals suggest that ingestion of increased concentrations of manganese may result in adverse neurological effects. An accumulating body of evidence suggests that exposure to excess levels of manganese via ingestion may lead to neurological deficits in children. These include poor school performance, impaired cognitive function, abnormal performance on neurobehavioral tests, and increased oppositional behavior and hyperactivity. High levels of manganese may produce neurotoxic responses such as hypoactivity, nervousness, tremors, and ataxia. Other reported effects include liver damage and decreased growth.

Toxicity to freshwater aquatic organisms from exposure to elevated levels of manganese is influenced by the total hardness of the water which has a direct correlation on impacts to aquatic life. Manganese acute toxicity decreases with increasing hardness. Effects to fish include mortality, the decreased survival of larvae, a reduction in growth as measured by decreased body weights observed in laboratory testing. Manganese was found to accumulate in brown trout tissue, especially the liver, and to a lesser extent gills, kidneys, epidermal muscle, skin, fins, and bones. Tissue concentrations do not appear to accumulate to levels that would represent a substantial risk to predatory organisms.

According to the Agency for Toxic Substances and Disease Registry, zinc is an essential nutrient and important in proper growth and development of young children and in maintaining human health. However, ingestion of too much zinc is known to cause health effects in animals including anemia and injuries to the pancreas and kidneys. Ingestion of zinc-containing compounds has resulted in a variety of systemic effects in gastrointestinal and hematological systems and alterations in the blood lipid profile in humans and animals. In addition, lesions have been observed in the liver, pancreas, and kidneys of animals. Zinc excess in avian species is associated with decreased body weight, gizzard and pancreatic lesions, and biochemical changes. Mammalian studies have shown zinc exposure causing vomiting, depressed growth rate, purgation, and ataxia.

Toxicity to aquatic organisms from exposure to elevated levels of zinc is influenced by several chemical factors including total waiter hardness and pH. Zinc severity and chronic toxicity decreases with increased water hardness. The free divalent ion of zinc and other metals is thought to be primarily responsible for aquatic organism toxicity. The mechanism varies slightly by metal but generally occurs by competitive disruption of calcium receptors on the surface of the gill. This inhibits oxygen absorption leading to hypocalcemia and eventually death. Chronic exposures result in the ability of the organism to maintain ionic balance with the surrounding environment impacting behavior and survivability. Zinc toxicity in aquatic organisms is known to impair growth, reproduction, hatching, and reduced survival of young.

5. NPL Status

This Removal Site is not part of any National Priorities Listed Site but is near the Bonita Peak Mining District Superfund Site.

6. Maps, Pictures, Other Geographic Representations

A map of the Site is included as Attachment 1. Relevant Site photos are in Attachment 3.

B. Other Actions to Date

1. Previous Actions

The North Star Mine has been subject to several sampling and assessment activities to determine its impacts on Mineral Creek. Two assessment activities were led by the EPA in 2019. Additionally, the Colorado DRMS has conducted regular inspections of the North Star Mine Site to document compliance with an existing operating permit within the Sultan mining operations.

2. Current Actions

There are no current activities on the Site beyond actions discussed in this memorandum.

C. State and Local Authorities' Role

1. State and Local Actions to Date

The Bureau of Land Management is currently trapping and relocating beavers within the Site area. Local authorities have helped when possible, providing surrounding road maintenance and, when required, snow removal to allow access. Colorado Department of Public Health and Environment (CDPHE) is also being consulted on removal activities.

2. Potential for Continued State/Local Response

State and local entities do not have the resources to conduct this removal action in the required timeframe. DRMS will remain involved in a consultation role only.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Conditions at the Site present a threat to public health and the environment and meet the criteria for initiating a removal action under 40 CFR 300.415(b)(2) of the NCP.

EPA has considered all the factors described in 40 CFR 300.415(b)(2) of the NCP and determined that the following factors apply at the Site:

> *"(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, or pollutants or contaminants:"*

EPA and other agencies/organizations observed an imminent threat which exists due to water impoundment within the North Star Mine as a result of the beaver dam and beaver activities behind the soil berm closure at the portal. This impounded water could result in a mine blowout adversely affecting the Animas River and downstream users in the flow path. The impact of a release will affect Mineral Creek and may detrimentally impact the Animas River.

The Animas River is widely known as a trout fishery with the stretch of river downstream of Silverton near Durango carrying a Gold Medal designation. It is heavily fished by residents and tourists alike. The potential for aquatic risks in lower Mineral Creek downstream of the Site include the following: impaired benthic macroinvertebrate aquatic life with low density and diversity; risk to the aquatic community from chronic exposure to aluminum, cadmium, iron and zinc in surface water; risks from lead and other metals based on active and heavy use; and exposures to birds and other wildlife that use the riparian and wetland areas downgradient from the mine and adjacent to Mineral Creek.

Due to recent mine discharges in the vicinity, downstream communities, including the Navajo Nation, the State of New Mexico, farmers, and national environmental groups are sensitive to potential impacts. Federally Threatened or Endangered species that may be relevant to downstream impacts from this Site include the Colorado Pikeminnow, Razorback sucker, and the Southwestern Willow Flycatcher. If the North Star Mine beaver dam is left unaddressed, a large sudden uncontrolled release could occur resulting in heavy metals exposure to residents and wildlife downstream and, potentially, recreators and visitors to the Site.

> *"(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released:"*

High flow or runoff in spring seasons could add to the volume and pressure on the mine pool behind the beaver dam making an uncontrolled release more likely.

> *"(viii) The availability of other appropriate federal or state mechanisms to respond to the release:"*

Local and state governments do not have the capability to conduct the action in a timely manner. DRMS will remain involved in a consultation role only.

"(viii) Other situations or factors that may pose threats to public health or welfare of the United States or the environment."

A sudden release coincident with obstructions in the North Star portal could result in significant metal loading of Mineral Creek and the Animas River. The release would potentially cause significant erosion of the waste pile into Mineral Creek.

IV. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed Action Description

Proposed Actions:

The overall objective of this removal action is to prevent water from impounding in the North Star Mine, which will preserve current structural conditions and prevent further pressure from building within the North Star Mine. Work will include:

- Install camera through beaver tunnel on top side of closure berm to assess conditions behind closure;
- If water levels behind berm are unchanged from previous inspections, proceed;
- If water levels have notably increased, stop and reassess;
- Enlarge beaver tunnel through soil closure berm to assess conditions inside the adit during drawdown conditions;
- Remove beaver dam(s) and debris within and in front of the North star portal level 7;
- Remove timber and debris brought into the portal by beavers to prevent the plugging of drainage pipes;
- Coordinate with DRMS and EPA headquarters on the portal closure. After coordination with DRMS and EPA headquarters, repair and stabilize the portal closure soil berm or remove the berm and repair and/or install a new graded adit grate/gate;
- Clear and repair the adit drainage channel from the mine to Mineral Creek preventing further discharge onto the waste piles, which will include removal of rock and overgrown vegetation limiting flow capacity of the existing channel;
- Restore areas damaged by heavy equipment to prevent erosion;
- Repair and re-grade the area to prevent future mine discharge onto the waste pile;
- Construct waste pile run-on controls;
- Stabilize waste pile;
- Manage timber and sediment debris from the dam removal;
- Conduct additional actions as necessary to secure adit portal, waste pile, and ensure drainage channel is functioning properly.

2. Contribution to Remedial Performance

This effort will, to the extent practical, contribute to any future remedial effort at the Site.

3. Engineering Evaluation/Cost Analysis (EE/CA)

An EE/CA is not required for a time-critical removal action.

4. Applicable or Relevant and Appropriate Requirements (ARARs)

Removal actions conducted under CERCLA are required, to the extent practicable considering the exigencies of the situation, to attain ARARs. In determining whether compliance with an ARAR is practicable, the lead agency may consider appropriate factors, including the urgency of the situation and the scope of the removal action to be conducted. A table containing potential Site-specific ARARs is provided as Attachment 5 to this Action Memorandum.

5. Project Schedule

This removal action is proposed to start in the summer of 2020 and require approximately two months. Completion is expected by October 31, 2020.

B. Estimated Costs*

	Estimated Costs
ERRS contractor	$231,000
START contractor	$41,000
Other Extramural Costs (Strike Team, other Fed Agencies)	$0
SUBTOTAL	$272,000
Contingency costs (20% of subtotal)	$54,400
Total Removal Project Ceiling	**$326,400**

*EPA direct and indirect costs, although cost recoverable, do not count toward the Removal Ceiling for this removal action. Liable parties may be held financially responsible for costs incurred by the EPA as set forth in Section 107 of CERCLA

V. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

A delay in action or no action at this Site would increase the actual or potential threats to the public health and/or the environment.

VI. OUTSTANDING POLICY ISSUES

None

VII. ENFORCEMENT

A separate Enforcement Addendum has been prepared providing a confidential summary of current and potential future enforcement activities.

VIII. RECOMMENDATIONS

This decision document represents the selected removal action for the North Star Mine Portal 7 Beaver Dam Removal Site in San Juan County, Colorado, developed in accordance with CERCLA as amended, and is not inconsistent with the NCP. This decision is based on the administrative record for the removal action.

Conditions at the Site meet the NCP section 300.415(b)(2) criteria for a removal action. The total project ceiling, if approved, will be $326,400; this amount will be funded from the Regional removal allowance.

APPROVE

BETSY SMIDINGER Digitally signed by BETSY SMIDINGER
Date: 2020.09.15 18:15:54 -06'00'

Betsy Smidinger, Director Date
Superfund and Emergency Management Division

DISAPPROVE

Betsy Smidinger, Director Date
Superfund and Emergency Management Division

Attachments:

Attachment 1: Site Maps
Attachment 2: Sampling Results
Attachment 3: Site Photos
Attachment 4: Portal Inspection August 20, 2020.
Attachment 5: Applicable or Relevant and Appropriate Requirements