# INTERIM RECORD OF DECISION
# FOR
# BONITA PEAK REPOSITORY
# BONITA PEAK MINING DISTRICT SUPERFUND SITE
# SAN JUAN COUNTY, COLORADO

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The U.S. Environmental Protection Agency (EPA), with the concurrence of the Colorado Department of Public Health and Environment (CDPHE), presents this interim record of decision (IROD) for the Bonita Peak Repository within the Bonita Peak Mining District (BPMD) Superfund Site (the Site) in San Juan County, Colorado. The IROD is based on the administrative record, including the focused feasibility study (FFS), the proposed plan, the public comments received, and EPA responses. The IROD presents a summary of the Site characterization, past response actions, actual and potential risks to human health and the environment, and the selected interim remedy. EPA followed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and EPA guidance (EPA 1999) in preparing the IROD. The three purposes of the IROD are to:

1. Certify that the remedy selection process was carried out in accordance with the requirements of CERCLA, 42 United States Code § 9601 et seq., as amended, and, to the extent practicable, the NCP, 40 Code of Federal Regulations Part 300.

2. Outline the components and remediation requirements of the selected interim remedy.

3. Provide the public with a consolidated source of information about the history, characteristics, and risk posed by mining related wastes at the Site requiring disposal, as well as a summary of the repository remedial alternatives considered, their evaluation, the rationale behind the selected interim remedy, and the agencies' consideration of, and responses to, the comments received.

The IROD is organized in three distinct parts:

Part 1 (Declaration) functions as an abstract and data certification sheet for the key information in the IROD and includes the formal authorizing signature page for the IROD.

Part 2 (Decision Summary) provides an overview of the characteristics of the locations evaluated for construction of the Bonita Peak Repository at the Mayflower tailings impoundments and of waste materials considered for disposal within it, repository remedial alternatives evaluated, and the analysis of those options. It also identifies the selected interim remedy and explains how the remedy fulfills statutory and regulatory requirements.

Part 3 (Responsiveness Summary) serves the dual purpose of presenting stakeholder concerns and preferences regarding the remedial alternatives, and explaining how those concerns were addressed and how the preferences were factored into the remedy selection process.

# DECLARATION

# DECLARATION

SITE NAME AND LOCATION

The BPMD Superfund Site (Superfund Enterprise Management System [SEMS] #CON000802497) is centered in southwestern Colorado in San Juan County. There are three main drainages (Mineral Creek, Cement Creek, and Upper Animas River) within the Site, which flow into the Animas River at Silverton, Colorado. These drainages contain over 400 abandoned or inactive mines where large- to small-scale mining operations occurred. The Site listing on the National Priorities List identifies 48 mining-related sources. The 48 mining-related sources were identified as sources or potential sources for contaminated media affecting the three main drainages. In addition, two dispersed campsites have been identified that contain contaminated media.

The Site is currently organized into five operable units (OUs):

- OU1 – Sitewide. OU1 encompasses the entire BPMD Superfund Site.
- OU2 – Mayflower. OU2 includes the Mayflower tailing impoundments Nos. 1, 2, 3, and 4, and the Mayflower Mill and Tailings Study Area.
- OU3 – Bonita Peak Groundwater System. OU3 generally includes the saturated and unsaturated workings of the Sunnyside Mine, associated drainage and haulage tunnels, nearby mines not known to be connected to the Sunnyside Mine by workings (e.g., Red & Bonita Mine and Gold King Mine), and the surrounding geographic area that may be hydraulically connected or influenced by current and/or historical releases from or management of these mines.
- OU4 – Ben Franklin Mine.
- OU5 – London Mine.

EPA is taking an adaptive management approach to the Site, and the decision to initiate an interim remedial action (IRA) to construct, operate, and maintain a sitewide repository at the Mayflower tailings impoundments is being used to provide capacity for management of site-derived water treatment sludge and mine wastes associated with current and future response actions within the Site. The IRA will address the risks associated with the finite storage capacity for water treatment sludge at the Gladstone interim water treatment plant (IWTP), the risks associated with interim management of specific mine wastes removed as part of the 2019 IROD (EPA 2019a), and mine wastes yet to be generated as part of future response actions. Continued access to the properties associated with the IWTP will be needed to conduct the IRA identified in this IROD. Because the wastes being considered for disposal at the Bonita Peak Repository are generated from various locations in the BPMD, the repository is considered a sitewide action (OU1). However, the Mayflower tailings impoundments, the selected location of the Bonita Peak

Repository, are managed within OU2. The selected remedy will include components and concepts to minimize surface and subsurface contaminant transport impacts to OU2 from construction and operation and maintenance (O&M) of the Bonita Peak Repository.

## STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected interim remedy for a sitewide mine waste repository. The remedy selected in this IROD was chosen in accordance with CERCLA of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and the NCP. The decision is based on the administrative record for the Site. This document is issued by EPA Region 8, the lead agency, and CDPHE, the support agency. EPA and CDPHE concur on the selected interim remedy presented herein.

## ASSESSMENT OF SITE

The IRA selected in this IROD is necessary to protect the public health and welfare and the environment from actual or threatened releases of hazardous substances into the environment.

## DESCRIPTION OF SELECTED INTERIM REMEDY

The selected interim remedy will provide protection of human health and the environment in the short and long term and is intended to provide adequate protection until a final repository remedy is selected. The selected interim remedy will provide permanent disposal for Gladstone IWTP sludge and selected mine wastes generated throughout the Site, and would also provide a temporary solution for management of mining-influenced water (MIW) leachate generated from operation of the repository. The selected interim remedy for the Bonita Peak Repository will be a combination of Alternatives R1, R2, and R4, identified in the FFS (CDM Federal Programs Corporation [CDM Smith] 2020a), described as follows:

- **Alternative R4 (Mayflower tailings impoundment 4)**: Tailings impoundment 4 is selected as the primary location to manage wastes in holding cells and drying cells, as needed, prior to placement in waste disposal cells. Tailings impoundment 4 would also be the primary location for mine waste disposal cells. As the capacity of waste disposal cells at impoundment 4 are exhausted, EPA would evaluate and determine the need to construct and operate additional waste disposal cells at impoundments 1 and/or 2.

- **Alternatives R1/R2 (Mayflower tailings impoundments 1 and/or 2)**: Tailings impoundments 1 and 2 are selected as secondary locations for mine waste management and/or disposal cells if impoundment 4 waste disposal cell capacity is exhausted and remedial decisions require repository disposal of mining-related wastes as part of future response actions.

The selected interim remedy also includes the construction of stormwater controls, erosion and sediment control measures, access road improvements (as necessary), and implementation of

institutional controls. Once waste placement operations are complete, a final cover system will be placed as part of repository closure and subsequent O&M will be implemented to maintain integrity of the closure. It is anticipated that the cells will be constructed in a phased approach as mining-related wastes are generated over time at the Site and future installation of repository covers may also be implemented using a phased approach.

The selected remedy includes interim elements such as collection and management as well as disposal of repository-generated MIW leachate. Permanent management and disposal requirements for the MIW leachate, based on quantity and quality of the MIW leachate, will be selected in a final record of decision.

## STATUTORY DETERMINATIONS

The selected interim remedy meets the mandates of CERCLA § 121 and the NCP. The selected interim remedy will provide adequate protection of human health and the environment until a final remedy for the Bonita Peak Repository is selected. It will comply with all federal and state requirements that are applicable or relevant and appropriate to the IRA. The selected interim remedy is also cost effective.

The Bonita Peak Repository selected interim remedy consists of both permanent and interim solutions. Interim solutions for the remedy include management and disposal of the repository-generated MIW leachate, including treatment if necessary. EPA has determined that contaminated media addressed by this IRA (i.e., treatment sludge, mine waste, and MIW leachate) are not principal threat waste. However, these solutions may reduce the toxicity, mobility, and volume of MIW leachate in the interim through treatment, depending on its characteristics.

Permanent solutions to address management and disposal of MIW leachate will be addressed as part of the final remedy for the Bonita Peak Repository. The statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element will be considered and addressed as part of the final remedy.

The selected interim remedy will not result in unlimited use and unrestricted exposure land use scenarios. A statutory review will be conducted no less than every 5 years after the initiation of remedial action to ensure that the remedy is protective of human health and the environment.

## RECORD OF DECISION DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section (Part 2) of this IROD:

- Contaminants of potential ecological concern (COPECs) and their respective concentrations (Section 5.0 – Summary of Site Characteristics)

- Current and reasonably anticipated future land use assumptions (Section 6.0 – Current or Reasonably Anticipated Future Land and Resource Uses)

- Risks represented by the mining-related wastes (Section 7.0 – Summary of Risks)
- Cleanup established for the COPECs and the basis for the levels (Section 8.0 – Remedial Action Objectives and Remedial Goals)
- How source materials constituting principal threats are addressed (Section 11.0 – Principal Threat Wastes; Section 12.0 – Selected Interim Remedy)
- Potential land use that will be available at the repository location as a result of the selected interim remedy (Section 12.0 – Selected Interim Remedy)
- Estimated capital, annual O&M, and total present value costs; discount rate; and the number of years over which the remedy cost estimates are projected (Section 12.0 – Selected Interim Remedy)
- Key factors that led to selecting the remedy (Section 12.0 – Selected Interim Remedy; Section 14.0 – Statutory Determinations; Section 15.0 – Documentation of Significant Changes)

Additional information can be found in the administrative record file for this Site (SEMS #CON000802497), available on EPA's BPMD website.

# AUTHORIZING SIGNATURES

BETSY SMIDINGER Digitally signed by BETSY SMIDINGER
Date: 2021.04.30 11:47:25 -06'00'

Betsy Smidinger, Director
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Jennifer T. Opila

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Hazardous Materials and Waste Management Division
CDPHE

April 29, 2021
Date

# DECISION SUMMARY

## TABLE OF CONTENTS

LIST OF EXHIBITS

LIST OF TABLES



LIST OF FIGURES



LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AM | adaptive management |
| ARAR | applicable or relevant and appropriate requirement |
| BERA | baseline ecological risk assessment |
| BMP | best management practice |
| BPMD | Bonita Peak Mining District |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CCR | Colorado Code of Regulations |
| CDM Smith | CDM Federal Programs Corporation |
| CDPHE | Colorado Department of Public Health and Environment |
| CDPS | Colorado Discharge Permit System |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CIP | community involvement plan |
| COPEC | contaminant of potential ecological concern |
| COVID-19 | coronavirus disease 2019 |
| CRS | Colorado Revised Statutes |
| CSM | conceptual site model |
| DRMS | Colorado Division of Reclamation, Mining and Safety |
| ECY | embankment cubic yard |
| EPA | U.S. Environmental Protection Agency |
| FFS | focused feasibility study |
| IC | institutional control |
| IRA | interim remedial action |

| | |
|---|---|
| IROD | interim record of decision |
| IWTP | interim water treatment plant |
| LUC | land use control |
| mg/L | milligrams per liter |
| MIW | mining-influenced water |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NOAA | National Oceanic and Atmospheric Administration |
| NPL | National Priorities List |
| O&M | operation and maintenance |
| OU | operable unit |
| RAO | remedial action objective |
| RCRA | Resource Conservation and Recovery Act |
| RG | remediation goal |
| RI | remedial investigation |
| SGC | Sunnyside Gold Corporation |
| SEMS | Superfund Enterprise Management System |
| SMP | site management plan |
| TechLaw | TechLaw, Inc. |
| TCLP | toxicity characteristic leaching procedure |
| U.S.C. | United States Code |
| USGS | U.S. Geological Survey |
| °F | degrees Fahrenheit |

# 1.0 INTRODUCTION

This interim record of decision (IROD) is for the Bonita Peak Repository within the Bonita Peak Mining District (BPMD) Superfund Site (the Site) (identified within the Superfund Enterprise Management System [SEMS] as #CON000802497). The U.S. Environmental Protection Agency (EPA) is the lead agency and the Colorado Department of Public Health and Environment (CDPHE) is the support agency. The interim remedial action (IRA) for the Bonita Peak Repository addressed in this IROD is anticipated to be EPA-financed. The Site is in southwestern Colorado in San Juan County, where multiple mining-related contaminants have been found in more than one media (surface water, sediment, soil, and waste rock) because of historical mining activities.

This IROD is the decision document for the sitewide Bonita Peak Repository, which follows a streamlined investigation and evaluation of conditions. EPA's streamlined investigation and evaluation of conditions included a risk assessment memorandum included as part of the focused feasibility study (FFS) (CDM Federal Programs Corporation [CDM Smith] 2020a). The FFS report presents the results of the development and detailed evaluation of remedial alternatives for the Bonita Peak Repository.

Public involvement is an input integrated into this IROD. Public involvement opportunities included participating in a public meeting and providing comments on the proposed plan (issued July 29, 2020) during a subsequent 30-day public comment period.

This IROD documents EPA's selected interim remedy for an on-site repository identified in the FFS. Following this IROD, the next step in the Superfund process will be completing remedial designs and implementing the IRA based on the selected interim remedy. Ultimately, sitewide RIs, feasibility studies, and record of decisions (RODs) will be completed in the future to provide a final remedy for the Site.

## 1.1 BASIS OF INTERIM ACTIONS

Interim actions are defined in *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (EPA 1999) as those that are limited in scope and address contaminated areas or media that will also be addressed by a final remedial action. Reasons for taking interim actions include the need to:

- Take quick action to protect human health and the environment from an imminent threat in the short term while a final remedial solution is being developed; or

- Institute temporary measures to stabilize a site and/or prevent further migration of contaminants or further environmental degradation.

This will be an interim action to mitigate potential threats and stability/migration concerns posed by mining-related wastes in their current interim management locations. The specific stability/migrations concerns for mining-related wastes are:

- The continued operation of the Gladstone interim water treatment plant (IWTP) reduces ecological risk by reducing loading of contaminants of potential ecological concern (COPECs) from the Gold King Mine adit discharge to Cement Creek. If the finite storage capacity for IWTP-generated sludge is exceeded, it could present a threat, potentially impacting unrestricted operation of the Gladstone IWTP and resulting in greater risk for a release of Gladstone IWTP-generated sludge to the environment.

- The removal of specific mine wastes and interim local management of those mine wastes as part of the 2019 IROD (EPA 2019a) may be vulnerable to storm events or may be accessed by the public, posing stability and risk issues, and would therefore benefit from having a final disposal location.

After the interim action is implemented, the presence of the Bonita Peak Repository will inform future response action decisions within the Site. Certain elements of the Bonita Peak Repository will be interim in nature and others would be final, as discussed in Section 12.0. The final remedial decisions for this repository will be made in a final ROD.

## 1.2 SITE DESCRIPTION

The Site is centered in southwestern Colorado in San Juan County (Figure 1-1). Within the Site, there are three main drainages (Mineral Creek, Cement Creek, and Upper Animas River), which flow into the Animas River at Silverton. After the three main drainages combine as the Animas River, the river flows south from Silverton to Durango, Colorado, crosses into New Mexico, and joins the San Juan River in Farmington, New Mexico. The three main drainages within the Site contain over 400 abandoned or inactive mines where large- to small-scale mining operations occurred. The Site listing on the National Priorities List (NPL) identifies 48 mining-related sources or potential sources for contaminated media affecting the three main drainages (EPA 2016a).

The Site is currently organized into five operable units (OUs):

- OU1 – Sitewide. OU1 encompasses the entire BPMD Superfund Site.

- OU2 – Mayflower. OU2 includes the Mayflower Tailing Ponds Nos. 1, 2, 3, and 4, and the Mayflower Mill and Tailings Study Area.

- OU3 – Bonita Peak Groundwater System. OU3 generally includes the saturated and unsaturated workings of the Sunnyside Mine, associated drainage and haulage tunnels, nearby mines not known to be connected to the Sunnyside Mine by workings (e.g., Red & Bonita Mine and Gold King Mine), and the surrounding geographic area that may be hydraulically connected or influenced by current and/or historical releases from or management of these mines.

- OU4 – Ben Franklin Mine.

- OU5 – London Mine.

The mining-related wastes identified for potential disposal at the proposed repository, as described in this IROD, include sludge generated at the Gladstone IWTP, mine wastes generated from IRAs described in the 2019 IROD, and mine wastes generated from future Site response actions. Construction of the Bonita Peak Repository is considered a sitewide action (OU1) because the mining-related wastes generated for potential disposal at an on-site repository are generated from various locations within the BPMD. The repository will be located on three of the Mayflower tailings impoundments that are part of OU2. The IRA described in this IROD includes components to minimize cross-media impacts to OU2 from construction and operation of the Bonita Peak Repository.

## 1.3 INTERIM RECORD OF DECISION FORMAT

This IROD is organized into the following sections:

Part I: Declaration

Part II: Decision Summary

- Section 1.0 – Introduction. Provides an introduction to the IROD.

- Section 2.0 – Site History and Response Activities. Provides a history of the Site and EPA's activities at the Site.

- Section 3.0 – Highlights of Community Participation. Describes the range of community outreach activities for the Site.

- Section 4.0 – Scope and Role of the Response Actions. Describes how the IRA selected for the Site fits into the overall scope of the Site.

- Section 5.0 – Summary of Site Characteristics. Summarizes the physical characteristics of the Site and the types of contamination at the Site.

- Section 6.0 – Current and Reasonably Anticipated Future Land and Resource Uses. Describes land and resource uses for the location of the Bonita Peak Repository.

- Section 7.0 – Summary of Risks. Discusses the ecological risk information supporting an IRA for the Bonita Peak Repository.

- Section 8.0 – Remedial Action Objectives and Cleanup Levels. Discusses the remedial action objectives (RAOs) and related cleanup criteria developed by EPA to protect human health and the environment at the Bonita Peak Repository.

- Section 9.0 – Description of Alternatives. Describes the remedial alternatives developed and evaluated in the FFS for the Bonita Peak Repository, including a description of remedy components, common elements, and expected outcomes.

- Section 10.0 – Comparative Analysis of Alternatives. Summarizes the remedial alternatives that were retained for detailed analysis in the FFS.

- Section 11.0 – Principal Threat Wastes. Discusses whether principal threat wastes were identified for the IRA and discusses how the selected interim remedy will prevent exposure to such wastes.

- Section 12.0 – Selected Interim Remedy. Describes the selected interim remedy for the Bonita Peak Repository, including its components, cost, expected outcomes, performance standards, and compliance with EPA's environmental justice mandate.

- Section 13.0 – Institutional and Land Use Controls. Describes the land use controls (LUCs) and institutional controls (ICs) that will be evaluated for the selected interim remedy.

- Section 14.0 – Statutory Determinations. Describes how the selected interim remedy is protective of human health and the environment, complies with or appropriately waives applicable or relevant and appropriate requirements (ARARs), is cost effective, and uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

- Section 15.0 – Documentation of Significant Changes. Describes the modifications that were made to the preferred alternatives outlined in the proposed plan prior to becoming the selected interim remedy described in this IROD.

- Section 16.0 – References. Provides a list of references cited in the IROD.

Part III: Responsiveness Summary

- Section 1.0 – Summarizes the opportunities for public involvement surrounding the proposed plan for the Bonita Peak Repository.

- Section 2.0 – Summarizes the quantitative information about the comments received—how many stakeholders provided written comments, names of commenters serving in an official capacity (e.g., state officials, Animas River Stakeholders Group), and what topics raised the most comments, concerns, and questions.

- Section 3.0 – Summarizes (by topic) the significant comments received and EPA's responses to the comments. There are 13 primary categories of comments.

- Section 4.0 – Summarizes the modifications to the proposed plan made as a result of the comments.

- Section 5.0 – References. Provides a list of references cited in the IROD.

# 2.0 SITE HISTORY AND RESPONSE ACTIVITIES

## 2.1 SITE BACKGROUND AND HISTORY

### 2.1.1 Site Mining History

The three main drainages within the Site contain over 400 abandoned or inactive mines where large- to small-scale mining operations occurred. Early mining activities began in the 1870s and continued into the early 1900s and were intermittent, based on mine accessibility and improvements to mining and milling technologies. By 1905, mines were consolidated into fewer and larger operations where there were facilities for milling large volumes of ore. The major mining operations in the Eureka district included the Sunnyside and Gold King Mines (Burbank and Luedke 1969). By the 1970s, only one year-round active mine (Sunnyside Mine) remained in the county, which closed permanently in 1991 (TechLaw, Inc. [TechLaw] 2017; EPA 2016a). A consent decree and order between Sunnyside Gold Corporation (SGC) and the Colorado Water Quality Control Division of CDPHE was entered into court on May 8, 1996, resulting in additional mitigation projects to be conducted by SGC at mining-related sources in the area. Some of the mitigation projects resulted in wastes from other mining-related sources being placed in the Mayflower tailings impoundments.

The Mayflower Mill was constructed in 1929 and 1930, with major expansions in 1937 and 1975 (U.S. Geological Survey [USGS] 2007a). The Mayflower tailings impoundments were constructed between 1936 and 1977 (EPA 2017a). Prior to this, tailings from the Mayflower Mill were discharged directly to surface water (National Park Service 1999, USGS 2007a). Mayflower tailings impoundment 1 was constructed in 1936 and was primarily used for disposal of milling ore extracted from the Mayflower Mine from 1936 to the 1950s. The use of tailings impoundment 1 was discontinued following a release of tailings in 1975, and the impoundment was reclaimed in 1983. Mayflower tailings impoundment 2 was constructed in 1936, shortly after tailings impoundment 1. Tailings impoundment 2 was used in parallel with tailings impoundment 1 until its use was discontinued in 1975. The impoundment was reclaimed in 1983. Mayflower tailings impoundment 3 was constructed in 1976 to serve as a temporary storage for the tailings released during the 1975 breach at impoundment 1. The impoundment was used for other disposal purposes as well, before being reclaimed in 1992. Tailings impoundment 4 was constructed in 1975 and 1976 and was used for the disposal of mine waste from nearby areas and treatment sludge from the former American Tunnel and Terry Tunnel water treatment systems. Reclamation of impoundment 4 occurred between 2004 and 2006 (Formation Environmental 2016).

## 2.2 RESPONSE ACTIVITIES

### 2.2.1 Listing on the National Priorities List

The Site was proposed for addition to the NPL in April 2016, and the listing became effective in September 2016 (EPA 2016b).

### 2.2.2 Summary of Previous Cleanup and Reclamation Actions

Past cleanup and reclamation efforts at the Site addressed in this IROD have been conducted by multiple parties (federal, state, and/or private) using various statutory and regulatory authorities. The following subsections describe previous cleanup and reclamation actions that occurred at the repository location or have generated mining-related waste requiring disposal in the repository.

#### 2.2.2.1 Mayflower Tailings Impoundments

Historical information pertaining to the Mayflower tailings impoundments is included to aid in understanding the chosen location of the Bonita Peak Repository. The action described in this IROD is not intended to address the existing contamination at impoundments, which will be addressed as part of future response actions for OU2.

As part of the requirements of the 1978 mine permit reclamation plan, impoundments 1 and 2 were reclaimed in 1983 by application of mulch, fertilizer, and seed. By 1985, the reclamation had failed, as indicated by acidic and toxic soil conditions. This reclamation generally included regrading the side slopes for a stable configuration and placement of a locally derived media top cover. Impoundments 1 and 2 were reclaimed again between 1991 and 1992. Drainage improvements upslope of impoundments 1 and 2 were installed in 1999. Tailings impoundment 3 was reclaimed in 1992 by regrading the side slopes to a stable configuration and placing a soil media top cover, using soil from the slope behind tailings impoundment 4 as cover materials. Tailings impoundment 4 was reclaimed between 2004 and 2006 by regrading the side slopes and placing a locally derived media top cover (Formation Environmental 2019).

#### 2.2.2.2 Related Comprehensive Environmental Response, Compensation, and Liability Act Response Actions

##### *2.2.2.2.1 Gladstone IWTP Response Action*

The Gladstone IWTP was designed and constructed to treat ongoing mining-influenced water (MIW) discharge from the Gold King Mine, and has operated continuously since October 2015. Gold King Mine adit MIW flows by gravity from the adit discharge collection sump to settling ponds at the upper Gladstone area before conveyance to the Gladstone IWTP. The Gladstone IWTP is an automated facility that includes the following key components: single-stage lime-neutralization reactor, flocculation basin, inclined plate clarifiers, geotextile filter bags, and instrumentation control system. The Gladstone IWTP produces sludge that is currently being stored in a finite interim management location. Additional detail on the treatment facility may be found in the Gladstone IWTP action memorandum (EPA 2017b).

##### *2.2.2.2.2 Interim Remedial Actions (2019 IROD)*

The 2019 IROD for OU1 included selected interim remedies to address five contaminant migration issues for mining-related sources throughout the Site. The selected interim remedies are intended to provide adequate protection of human health and the environment until subsequent remedies are selected for these sources. Three of the five IRAs described in the 2019 IROD include excavation and interim local management of contaminated mining-related solid

wastes until a final disposal location is identified (EPA 2019a). These IRAs began in 2019 and are expected to be completed within the next 3 to 5 years.

### 2.2.3 Summary of Pertinent Site Investigations

This section provides a summary of Site investigations pertinent to this IROD, the first of which is ongoing.

#### 2.2.3.1 OU2 Mayflower RI Investigation

SGC is conducting an RI for OU2 pursuant to the May 10, 2017 Administrative Settlement and Order on Consent for Remedial Investigation (the AOC) (EPA 2017a). The RI consists of a multimedia approach that includes investigation of surface water, groundwater, and solid-phase media impacted by the Mayflower tailings impoundments (Formation Environmental 2017).

Preliminary findings of the investigation, as reported by SGC, indicate the presence of two primary groundwater systems (a glacial/alluvial aquifer system and a fractured bedrock system) and a minor colluvial groundwater system. Several monitoring wells and seeps/springs have elevated metals compared to upslope or deeper groundwater and surface water. Metals concentrations increase in the Upper Animas River as it flows through the reach adjacent to the Mayflower Mill and impoundments. Determining the sources of the metals is a primary objective of the OU2 RI. The work associated with the OU2 RI is ongoing and consists of sampling events to further characterize the nature and extent of contamination and fate and transport of contaminants. The Bonita Peak Repository described in this IROD will be located at the Mayflower tailings impoundments. As further discussed in Section 4.1, the construction and operation of the Bonita Peak Repository will be implemented to minimize cross-media impacts to OU2.

#### 2.2.3.2 Bonita Peak Repository Geotechnical Investigation

CDM Smith conducted a geotechnical investigation of the Mayflower tailings impoundments on behalf of EPA to support the evaluation of the impoundment locations for the proposed Bonita Peak Repository. This geotechnical investigation included collection and analysis of geotechnical samples, along with visual inspections of the Mayflower tailings impoundments (CDM Smith 2020b). This investigation included the following:

- Review of historical surface and subsurface information for the Mayflower tailings impoundments
- Excavating five test pits and collecting geotechnical samples
- Advancing five test borings and collecting geotechnical samples
- Recording field measurements and observations
- Conducting geotechnical laboratory tests to assist with classifying soil/tailings

The purpose of this investigation was to provide geotechnical data to assess the stability of the Mayflower tailings impoundments in their current conditions and with an additional load representative of future mining-related wastes to inform the evaluation of remedial alternatives in the FFS for the construction, operation, and closure of the Bonita Peak Repository.

## 3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

EPA is implementing a robust program of community participation at the Site that exceeds the minimum requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). EPA began community involvement for the Site prior to the Site's listing on the NPL in September 2016, and active community involvement related to the Site continues today. A description of community involvement activities implemented at the Site since 2015 is provided below. Publicly available documents are on EPA's BPMD website, along with updates on the Superfund process and coming events, access to reports and plans, and Site contact information.

### 3.1 INTERVIEWS AND COMMUNITY INVOLVEMENT PLAN

In late 2016 and early 2017, EPA and CDPHE conducted community interviews with stakeholders affected by the Site to obtain general information, identify community concerns and issues, and determine how best to communicate with the public. Interviewees included local officials and stakeholders from Silverton and Durango, San Juan County, La Plata County, and the Southern Ute Indian Tribe. Findings were supplemented with information gathered during face-to-face interactions between EPA, CDPHE, and the communities.

Using the information from the interviews, a community involvement plan (CIP) was prepared and distributed in August 2017 (CDM Smith 2017). The CIP was updated and distributed in September 2019 (CDM Smith 2019) and is available on EPA's BPMD website.

### 3.2 INFORMATION REPOSITORIES

EPA Region 8 established two information repositories in Colorado and assisted EPA Regions 6 and 9 in establishing repositories in New Mexico and the Navajo Nation, respectively. The repositories contain basic information for public review, documents about Site activities, technical documents, the CIP, and general information about the Superfund program.

The information repositories are:

- Silverton Public Library, 1117 Reese Street, Silverton, Colorado
- Durango Public Library, 1900 East Third Avenue, Durango, Colorado
- Farmington Public Library, 2101 Farmington Avenue, Farmington, New Mexico
- Diné College Shiprock Campus Library, 1228 Yucca Street, Shiprock, New Mexico

The administrative record is housed at the EPA Superfund Records Center in Denver, Colorado. Information about the administrative record file and information repositories has been included in Site fact sheets and on EPA's BPMD website.

## 3.3 SUPPORT FOR COMMUNITY GROUPS

The Silverton/San Juan County Planning Group is the entity comprised of local officials and residents that provides Silverton and San Juan County a "seat at the table," as requested by the Governor of Colorado, Silverton officials, and San Juan County officials in their letters to EPA supporting the addition of the Site to the NPL. In addition to the Planning Group, the Community Advisory Group (CAG) is an independent advisory group that serves as an informational conduit between diverse community interests, EPA, and state and other federal partners. EPA coordinates with both and involves these community groups throughout the decision-making process.

## 3.4 FACT SHEETS

EPA prepares fact sheets for the Site that provide information to the community at key points. Fact sheets are distributed electronically, via EPA's electronic mailing list, and were made available to the public at EPA's BPMD website. Printed copies are distributed at public meetings. Examples of fact sheets issued are "Site Strategy" (February 2020) and "Proposed Plan for Bonita Peak Repository" (July 2020). A story map of the Site provides an overview of types of contamination, source areas, and analytical results.

## 3.5 PUBLISHED ADVERTISEMENTS

EPA posts public notices in local newspapers about public comment opportunities, upcoming events, and other Site-related information. These media outlets include the *Silverton Standard*, the *Durango Herald,* and the *Southern Ute Drum*.

## 3.6 PUBLIC MEETINGS AND AVAILABILITY SESSISONS

EPA prepares multiple presentations and handouts that provide specific information to the public. As an example, EPA routinely hosts or participates in public meetings with stakeholders to provide updates on Site activities, ongoing work, and in-depth discussions on special topics. Presentations are made publicly available on EPA's BPMD website and include most recently, "Update on Operable Unit 02 – Mayflower Area," "Bonita Peak Mining District Adaptive Management Site Management Plan: Adaptive Decision-Making," and "2020 Year in Review and Plan for 2021."

## 3.7 PROPOSED PLAN, PUBLIC MEETING, AND PUBLIC COMMENT PERIOD

EPA issued its "Proposed Plan for the Bonita Peak Repository" on July 29, 2020. The proposed plan was made available at the four Site information repositories. An electronic notice with links to relevant documents was posted on EPA's BPMD website throughout the public comment period. Because of coronavirus disease 2019 (COVID-19) restrictions on travel and public gatherings, a virtual public meeting for the proposed plan was held on August 11, 2020, via Adobe Connect software. EPA gave a presentation on the FFS and the proposed plan, and the public had an opportunity to provide oral and written comment.

The 30-day public comment period for the proposed plan was from July 29 to August 27, 2020. Announcement of the public comment period and public comment meeting were published in the July "Bonita Peak Mining District Update," which was sent to the Site's email list. Notices were published in the *Silverton Standard*, the *Durango Herald*, and the *Southern Ute Drum*.

## 3.8 IROD RESPONSIVENESS SUMMARY

This IROD includes the responsiveness summary for the proposed plan (Part 3 of this IROD).

## 3.9 ADDITIONAL COMMUNITY ENGAGEMENT

EPA has conducted other activities with the goal of engaging and informing the public. These activities include:

- **Electronic Updates**. EPA issues monthly updates of Site activities in the form of the "Bonita Peak Mining District Update." These two-page updates are sent to the Site's email list and provide recent activities, upcoming events, items new to the website, and more. Spanish-language versions are also available. Past copies of the update were made available to the public from the BPMD website.

- **Tours**. EPA has conducted several tours specific to issues at the Site. These tours focused on cultural resources, the Gladstone IWTP, and the mining-related sources at the Site.

- **BPMD Calendar**. Beginning in May 2018, EPA posts a calendar of field activities on the BPMD website so local emergency managers and the public have easy access to past, current, and planned activities. COVID-19 restrictions reduced in-person public activities for much of 2020.

- **Emergency Alerts**. EPA uses the "Bonita Peak Mining District Alert and Notification Plan Standard Operation Procedure", revised April 2020, ""to communicate to participants events that affect the appearance of or water quality in the Animas River. Plan participants include state and local emergency management agencies, public health departments, downstream states and tribes, and local officials.

- **Outreach Regarding Future Land Use**. As described further in Section 6.0, the Mayflower tailings impoundments are privately owned and Mayflower tailings impoundment 4 is operated and monitored under a Colorado Division of Reclamation, Mining and Safety (DRMS) permit. No formal process has been conducted to solicit views from the public specifically regarding future land use; however, as noted in Section 3.7, EPA has provided the public with opportunity to provide comments regarding future land use for the Bonita Peak Repository during the public meeting and public comment period.

# 4.0 SCOPE AND ROLE OF RESPONSE ACTIONS

The following subsections describe the scope and role of the response actions within the overall Site cleanup strategy and the relationship of the OUs.

## 4.1 OVERALL STRATEGY AND RELATIONSHIP OF OPERABLE UNITS

The Site is currently organized into five OUs, as described in Section 1.2. The adaptive management (AM) site management plan (SMP) identifies Site Principles, which are goals, objectives, and strategies that provide a basis to guide all EPA work at the Site. The current Site Principles include the water quality objectives, priority reach objectives, and selected Site strategy outlined in the AM SMP. A key component of the selected Site strategy is the siting and construction of a repository for managing waste derived from sitewide remedial activities (EPA 2020).

This IROD is intended to allow for consolidation of wastes within the Site, including treatment sludge generated at the Gladstone IWTP, mine wastes generated from IRAs described in the 2019 IROD, and mine wastes generated from future Site response actions. A future decision document would be prepared if wastes generated in a future response action were to be disposed of at the Bonita Peak Repository. Since the mining-related wastes generated for potential disposal at the on-site repository are generated from various locations in the BPMD, the Bonita Peak Repository would be considered a sitewide action (OU1). There are ongoing and future RIs that will be implemented to characterize and inform response action decision-making within the Site. As noted in Section 1.1, the IROD documents an interim action. The final remedial decision for the Bonita Peak Repository will be made in a final ROD.

The Bonita Peak Repository will be located at the Mayflower tailings impoundments that are part of OU2. Specific to the OU2 RI, the implementation of the selected remedy will include components and concepts to minimize cross-media impacts to OU2 from construction and operation of the sitewide repository (i.e., Bonita Peak Repository).

# 5.0 SUMMARY OF SITE CHARACTERISTICS

This section includes an overview of the physical characteristics and the nature and extent of contamination at the proposed location of the Bonita Peak Repository.

## 5.1 SITE OVERVIEW

### 5.1.1 Site Location and Topography

The Site is in southwestern Colorado in San Juan County. It spans across five USGS 7.5-minute topographic quadrangles including Handies Peak, Howardsville, Ironton, Ophir, and Silverton (USGS 2016a through 2016e). Formed from Pleistocene glaciation and Holocene erosion, the terrain of the western San Juan Mountains is steep and rugged (USGS 2007a).

The NPL listing for the Site identifies 48 mining-related sources. Within the Site, there are three main drainages: Mineral Creek, Cement Creek, and the Upper Animas River. The Upper Animas River begins approximately 14 miles northeast of Silverton, Colorado. The Upper Animas River combines with Mineral Creek and Cement Creek as the Animas River and flows south from Silverton to New Mexico, joining the San Juan River in Farmington, New Mexico.

The Bonita Peak Repository will be constructed on top of the Mayflower tailings impoundments area, northeast of Silverton. This area consists of four tailings impoundments, a mill, and appurtenances that extend for approximately 1 mile along the right bank of the Upper Animas River, 1 mile upstream of Silverton and directly north of County Road 2. The furthest upstream (i.e., eastern) impoundment is tailings impoundment 1; the impoundments are sequentially numbered downstream (i.e., to the west). The impoundments each have relatively flat surfaces with side slopes facing toward County Road 2. The impoundments range in elevation from 9,438 to 9,680 feet North American Vertical Datum of 1988.

### 5.1.2 Climate

The portions of the Site within San Juan County have a subalpine to alpine climate with snowy, cold winters and cool summers. In the subalpine climate region, the minimum and maximum mean temperatures for January and July are 2 degrees Fahrenheit (°F)/32°F and 40°F/74°F, respectively (Chapman et al. 2006). In the alpine climate region, the minimum and maximum mean temperatures for January and July are minus 8°F/24°F and 36°F/72°F, respectively (Chapman et al. 2006).

Long-term climate data, including precipitation, for Silverton has been collected by a participating National Weather Service Cooperative Observing Program weather station. The National Oceanic and Atmospheric Administration (NOAA) has a record of climate data for the Silverton, Colorado station dating back to 1905 (NOAA 2020). The weather station is currently at a latitude of 37.809 North and a longitude of 107.663 West. In 2018, the Silverton station recorded annual precipitation of approximately 19 inches (NOAA 2020). The greatest amount of

snowfall is between November and April, with an average snowfall of 12 feet per year (EPA 2016c).

### 5.1.3 Geology

The geology of the Site within San Juan County is relevant to the assessment of the hydrogeological framework and understanding of potential source materials present and establishment of the Bonita Peak Repository. Therefore, this section focuses on the description of the bedrock geology.

The Site is centered in the western San Juan Mountains in the area of the Silverton and San Juan calderas. The younger Silverton caldera is situated within the older San Juan caldera, forming between approximately 28 and 27 million years ago (USGS 2007a). During and after the caldera formation period, volcanotectonic events occurred that introduced extensive Tertiary-aged volcanic rock and extensive mineralization within fractured host rock (USGS 2007b). Volcanic formations of the San Juan volcanic field cover land north and east of the Silverton caldera. Comprised of pyroclastic rocks and lava flows, the San Juan volcanic field lies on the Paleozoic and Mesozoic rock formation (Free et al. 1989).

The general stratigraphy in the region consists of Precambrian crystalline basement, Paleozoic to Tertiary sedimentary rocks, Tertiary volcanic rocks, and Quaternary deposits (USGS 2007a). Quaternary surficial deposits are the result of glaciation and weathering of bedrock in the headwaters of subbasins. The surficial deposits are either acid-generating or acid-neutralizing depending on their bedrock source (USGS 2007a).

The native soils in the area of the Mayflower tailings impoundments primarily consist of glacial till. The glacial till material is comprised of a mixture of fine to coarse sands and fine to coarse gravels with cobbles, silt, and clay (CDM Smith 2020b). The depth of the glacial till varies from one impoundment to the next. The glacial deposits underlying the Mayflower tailings impoundments are generally less than 100 feet thick (Formation Environmental 2016). A portion of Mayflower tailings impoundment 4 is underlain by alluvium deposited within the former floodplain of the Upper Animas River. The cover materials placed during previous reclamation vary from one impoundment to the next but are generally composed of fine to coarse sands and fine to coarse gravels with cobbles, silt, and clay (CDM Smith 2020b).

### 5.1.4 Surface Water Hydrology

The Animas River watershed extends from the mountainous terrain in San Juan County, Colorado, south into the San Juan River in Northern New Mexico (URS Operating Services 2012). The three major tributaries of the Animas River in San Juan County include Mineral Creek, Cement Creek, and the Upper Animas River. For the development of the FFS, the characteristics of the Upper Animas River and Cement Creek were analyzed. Mineral Creek is west of Silverton and does not impact the Mayflower tailings impoundments. Cement Creek, along which the Gladstone IWTP is located, is a major tributary to the Upper Animas River. The

USGS gaging stations associated with these two major tributaries, shown on Figure 1-1, are listed with their respective characteristics as follows:

- Upper Animas River Drainage Basin, USGS gaging station 09358000 (USGS 2020a)
    - This USGS gaging station is at the Animas River as it flows along the southeastern edge of Silverton. Cement Creek's confluence with the Animas River is approximately one-tenth of a mile downstream of this gaging station.
    - The highest discharge occurs in June, with a monthly average flow of 497 cubic feet per second (cfs).
    - The lowest discharges occur throughout January and February, with monthly average flows of 25 and 23 cfs, respectively.
- Upper Animas River Drainage Basin, USGS gaging station 09359020 (USGS 2020b)
    - This USGS gaging station is at the Animas River south of Silverton. Mineral Creek's confluence with the Animas River is approximately 1 mile upstream of this gaging station.
    - The highest discharge occurs in June, with a monthly average flow of 1,040 cfs.
    - The lowest discharges occur throughout January and February, with monthly average flows of 63 and 59 cfs, respectively.
- Cement Creek Drainage Basin, USGS gaging station 09358550 (USGS 2020c)
    - This USGS gaging station is at Cement Creek, immediately north of Silverton. Mineral Creek confluences with the Animas River approximately one-quarter mile downstream of this gaging station.
    - The highest discharge occurs in June, with a monthly average flow of 133 cfs.
    - The lowest discharges occur throughout January and February, with monthly average flows of 13 cfs for both months.

#### 5.1.4.1 Local Surface Water Hydrology

The reach of the Upper Animas River near the existing Mayflower tailings impoundments is a net gaining reach during both high- and low-flow conditions (Formation Environmental 2017). Arrastra Creek and Boulder Creek are two minor tributaries that flow into the Upper Animas River near the Mayflower tailings impoundments. Arrastra Creek enters into the Upper Animas River just upstream of the Mayflower Mill, on the south riverbank. Boulder Creek flows between tailings impoundments 1 and 2 and enters into the Upper Animas River through a culvert.

Drainage controls have been installed at the Mayflower tailings impoundments. These controls consist of lined constructed ditches, unlined ditches, slope drains, and underground piping, which are located uphill from the Mayflower tailings impoundments (Formation Environmental 2016). These controls were installed to assist in diverting surface water and shallow groundwater away from the tailings. The water is diverted to outfalls that discharge to the Upper Animas River.

Three ditches were installed upgradient of impoundment 1 and the Mayflower Mill. An unlined stormwater detention basin was constructed to the south of the Mayflower Mill. A concrete barrier wall was constructed along the northern edge of impoundment 4 and includes multiple drains and outlets. An unlined ditch serves as the controls for impoundments 2 and 3. Galvin Spring has been identified to the northwest of impoundment 2. This spring is channeled to outfall 3 through an unlined ditch that funnels around the western side of impoundment 3 (SGC 1999, SGC 1998, DRMS 1998).

### 5.1.5 Subsurface Hydrogeology

Groundwater is under investigation at the repository location as part of the RI for OU2. Overall, it appears that groundwater flows southwesterly within the valley and toward the river. Given that the Upper Animas River is gaining flow in this area, groundwater discharge to the river is likely, but more precise subsurface flow paths have not been determined. Determination of groundwater flow paths is an objective of the OU2 RI and will eventually be presented in an RI report.

Two primary groundwater systems have been identified at this location: a glacial/alluvial aquifer system and a fractured bedrock system (Formation Environmental 2017). A third system of colluvial groundwater exists uphill of the impoundments but appears to be of much less significance. As is common with fractured bedrock aquifers, the extent and connectedness of the fractured bedrock system is not well understood but is known to be overlain by unconsolidated materials in the Mayflower tailings area. The glacial/alluvial groundwater system is comprised of unconsolidated glacial drift on the north side of the Upper Animas River valley, including under the impoundments and alluvium in the floodplain areas of the valley.

Snowmelt and rain infiltrate surficial deposits and cause recharge of the shallow and generally unconfined aquifers, whether glacial/alluvial or bedrock. Large seasonal variations in groundwater depth have been reported (Formation Environmental 2017). Investigations have identified areas apparently lacking perennial groundwater and the glacial/alluvial system appears to be disconnected between various locations, although the horizontal extent has not been fully characterized (Formation Environmental 2019). Several seeps and springs have been identified in the hillside to the north of the tailings impoundments and along the right bank of the Upper Animas River, directly south of the impoundments.

### 5.1.6 Conceptual Site Model

A conceptual site model (CSM) is a basic description of how contaminants enter the environment, how they are transported, and what routes of exposure to organisms and humans

occur. It provides a framework for assessing risks from contaminants, developing remedial strategies, and determining source control requirements and methods to address unacceptable risks. A comprehensive CSM has not been developed for the Site, however, the CSM will be developed and included as part of future sitewide RIs. A description of the identified migration routes and exposure pathways relevant to the contaminant migration issues addressed by the IRA covered in this IROD is provided in Section 5.3.

## 5.2 SAMPLING STRATEGY

CDM Smith conducted a geotechnical investigation of the Mayflower tailings impoundments as discussed in Section 2.2.3.2 (CDM Smith 2020b). This investigation included the collection of geotechnical samples to support the evaluation of the impoundment locations for construction of the Bonita Peak Repository.

SGC, under EPA oversight, is conducting an RI for OU2 to investigate the surface water, groundwater, and solid-phase media impacted by the Mayflower tailings impoundments. Sampling is ongoing as part of the OU2 RI conducted by SGC to further characterize the hydraulic connectivity of the groundwater and surface water systems near or at the tailings impoundments and to characterize the seasonal and spatial variations in water quality. Following completion of ongoing OU2 RI, a future decision documents would be prepared to document the OU2 response action.

## 5.3 TYPES OF CONTAMINATION AND KNOWN POTENTIAL ROUTES OF MIGRATION

The Bonita Peak Repository is intended to consolidate mining-related wastes from other locations throughout the Site. Mining-related wastes are present at the Gladstone IWTP and in sources addressed by IRAs that pose contaminant migration issues. The contaminated media evaluated in the FFS include Gladstone IWTP sludge, 2019 IRA mine waste, and waste from future response actions. The specific contaminant migration issues posed by interim management of mining-related wastes generated from response actions described in the following subsections contribute to unacceptable human health and ecological risks.

### 5.3.1 Gladstone IWTP Sludge

As described in Section 2.2.2.2, the Gold King Mine adit discharge treated within the Gladstone IWTP is a MIW that exhibits a low pH and contains elevated concentrations of heavy metals (e.g., iron, aluminum) and most of the surface water COPECs. Metals that are precipitated from the treatment process are concentrated in the sludge. The sludge produced by the Gladstone IWTP exhibits consistent waste characteristics.

Treatment residuals generated from operation of the Gladstone IWTP are estimated to be approximately 6,000 cubic yards of sludge per year. The sludge is currently being stored at the IWTP location, which has a finite storage capacity and the reason a disposal location elsewhere within the Site will likely be required by the end of 2021 to continue IWTP operation.

A sludge sample was collected on April 12, 2016, to be analyzed for metals concentrations. None of the concentrations in the sludge exceeded the toxicity characteristic leaching procedure (TCLP) standards, which are typically used to determine whether a solid waste is characteristically hazardous because of toxicity. Exhibit 5-1 compares the TCLP standards to the sludge sample analytical results. Validated sludge data are included in Appendix D of the engineering evaluation/cost analysis (CDM Smith 2016).

**Exhibit 5-1 TCLP Metals Comparison Criteria and Gladstone IWTP Sludge Metals Concentrations**

| Analyte | TCLP Standard (mg/L) | Gladstone IWTP Sludge (mg/L) |
|---|---|---|
| Arsenic | 5.0 | 0.03 U |
| Barium | 100 | 0.05 U |
| Cadmium | 1.0 | 0.31 |
| Chromium | 5.0 | 0.05 U |
| Lead | 5.0 | 0.025 U |
| Mercury | 0.2 | 0.02 U |
| Selenium | 1.0 | 0.025 U |
| Silver | 5.0 | 0.01 UJ |

**Notes:** Data from April 12, 2016 sample; U – analyte was analyzed for but not detected above the method detection limit; UJ – analyte was analyzed for but not detected above the method detection limit, which is approximate and may be inaccurate or imprecise; mg/L – milligrams per liter

The lime neutralization process removes COPECs from the water as solid metal hydroxides, then treated water flows to Cement Creek. The average load of COPECs mass removed documented in 2016 is 992 pounds per day (CDM Smith 2016). Each clarifier within the Gladstone IWTP is designed to remove 330 mg/L total suspended solids per 900 gallons per minute.

Current treatment results in a reduction of toxicity and mobility of the metal contaminants by transferring them from the aqueous and mobile phase to a more geochemically stable and less bioavailable solid phase. Metals in treatment sludge have limited contaminant bioavailability because of the lime-buffered conditions.

### 5.3.2 IRA Mine Waste

As described in Section 2.2.2.2, the 2019 OU1 IROD included excavation and interim local management of three types of mining-related wastes (obstructive mine waste, mine portal pond sediments, and instream mine waste). The purpose of these IRAs was to provide stabilization of the mining-related sources; prevent further environmental degradation; and reduce the potential for uncontrolled releases, transport, and deposition of particulates and MIW-containing COPECs.

In general, these wastes have elevated contaminant concentrations, water soluble contaminant loads, and/or acid-generating potential. Exhibit 5-2 provides volumes of each of these types of waste generated for interim management from the 2019 IRAs as estimated in the 2019 IROD (EPA 2019a).

**Exhibit 5-2 Summary of Mining-Related Wastes from IRAs in the 2019 IROD**

| Description | Estimated Volume (cubic yards) |
|---|---|
| Obstructive mine waste (from mine portal MIW discharges IRA) | 30 |
| Mine portal pond sediments | 10,200 |
| Instream mine waste | 470 |

**Mine Portal MIW Discharges**

The interim remedy for mine portal MIW discharges involves constructing diversion and isolation components to route mine portal MIW discharge around contaminated mine waste with the potential for interaction and comingling at mining-related sources. In addition, mine wastes at the entrance to a mine portal that are partially obstructing the free flow of mine portal MIW discharge will be excavated. When mine portal excavation is needed, the excavated wastes will be placed at the mining-related source for gravity dewatering, as needed. Excavated wastes will be managed locally at the mining-related source on an interim basis. It is anticipated some of these wastes will be transported to the Bonita Peak Repository for disposal.

**Pond Sediment**

The interim remedy for mine portal pond sediments involves excavation of existing sediment and repair of berms within mine portal ponds to allow continued pond function. During the excavation process, the excavated wastes will be placed at the mining-related source for gravity dewatering, as needed. Additional dewatering could be implemented for saturated sediment through ex situ amendment with a dewatering agent, as necessary, for handling and geotechnical stability. Excavated wastes will be managed locally at the mining-related source on an interim basis. It is anticipated some of these wastes will be transported to the Bonita Peak Repository for disposal.

**Instream Mine Wastes**

The interim remedy for instream mine wastes involves excavation of instream mine wastes at mining-related sources to remove wastes that impede flow or are susceptible to erosion or leaching of contaminants. During the excavation process, the excavated wastes will be placed outside of the stream channel adjacent to the mining-related source for gravity dewatering. Excavated wastes will be managed locally at the mining-related source on an interim basis. It is anticipated these wastes will be transported to the Bonita Peak Repository for disposal.

### 5.3.3 MIW Leachate

Interaction of water and oxygen with sulfide minerals can result in generation of MIW, which provides a mechanism for contaminant migration into surface water and potentially groundwater, where it exists. Activities at the proposed Bonita Peak Repository have the potential to generate MIW leachate because of the nature of the mining-related wastes proposed for disposal. In

particular, mine wastes are susceptible to generation of MIW leachate if exposed to precipitation, stormwater, or other means of water exposure. Therefore, it is appropriate to consider the management and minimization of MIW generation for the proposed repository activities.

### 5.3.4 Overview of Fate and Transport

Site investigations are ongoing; the fate and transport discussion presented in this section is not intended to be complete and final for the Site. The fate and transport discussion herein is focused on currently identified contaminant migration issues associated with the mining-related wastes identified for disposal at the Bonita Peak Repository.

Prior to implementing the Gladstone IWTP, the MIW from the Gold King Mine Adit was discharging to Cement Creek. The Gold King Mine adit MIW exhibits a low pH and contains elevated concentrations of heavy metals (e.g., iron, aluminum) and most of the surface waters COPECs. Cement Creek carries high loads of total and dissolved metals and high acidity into the Animas River.

The MIW from the Gold King Mine adit is now being diverted to the Gladstone IWTP where treatment of the MIW results in reduction of toxicity and mobility of the metal contaminants by transferring them from the aqueous and mobile phase to a more geochemically stable and less bioavailable solid phase. However, the contaminants cannot be destroyed and are only immobilized, and could be released if the sludge were to be reacidified to the point of exhausting the neutralizing potential of the lime. Until sludge is disposed of in a permanent location, the sludge drying area and interim sludge management area could be breached by high surface water flows, ice jams, or avalanches, which could result in erosion and/or direct transport of the sludge into Cement Creek.

Mine waste from source areas addressed under the 2019 IROD may be transported to the repository for disposal. Contaminants at these mining-related sources within the Site, specifically metals and metalloids, are present in solid-phase materials (mine waste rock, tailings, soil, and bedrock outcrops) at the Site and in MIW. Metalloids, such as arsenic, have properties of both metals and nonmetals. Adverse impacts are associated with transformation of solid-phase metals and metalloids into forms that are mobile and potentially harmful to humans and ecological receptors. Crushing and grinding during mining and mineral processing may cause metals to mobilize in the form of very fine-grained particulates that can be physically transported by wind or water. Interaction with water and oxygen with sulfide minerals (especially pyrite) can result in generation of MIW and partial or complete dissolution of metals and/or metalloids from the solid phase, which can provide a mechanism for contaminant migration into surface water and potentially groundwater, where it exists. These processes increase the mobility of contaminants in the environment and therefore increase the potential for impacts to receptors.

Several mining-related sources identified in the 2019 IROD have mine waste that has been transported in front of a flowing adit. This mine waste can result in increased potential for obstructed adit flow and subsequent uncontrolled releases and erosion of the wastes into surface water.

Several mining-related sources identified in the 2019 IROD use settling ponds to reduce metals concentrations from their adit MIW discharge. This allows metals to settle out of the adit discharge water through either formation of iron oxyhydroxides and subsequent coprecipitation (as with arsenic), or through the physical settling of undissolved metals. This process produces residual sludge in the settling ponds. If sufficient sludge and sediment accumulates in the ponds and reduces the residence time of adit discharge in the ponds, or if accumulated sludge diverts the adit discharge such that water does not flow through the settling ponds as intended, then the ability for metals to settle out of the adit discharge water is diminished.

One mining-related source identified in the 2019 IROD has mine waste that has been transported into a stream channel. This mine waste can result in increased potential for obstructed surface water flow and subsequent uncontrolled releases and erosion of the waste into surface water, as well as additional metals leaching from the obstructive mine waste into nearby surface water bodies.

# 6.0 CURRENT AND REASONABLY ANTICIPATED FUTURE LAND AND RESOURCE USES

The current land and resource use and reasonably anticipated future land and resource use pertinent to this IRA are the land and resources within and adjacent to the Mayflower tailings impoundments. The following information describes the land and resource uses at that location.

The Mayflower tailings impoundments are patented mining claims currently owned by SGC. Mayflower tailings impoundment 4, which is owned by SGC, is operated and monitored under DRMS permit number M1977378. The mining claim associated with the Mayflower Mill adjacent to the tailings impoundments was donated by SGC to the San Juan County Historical Society to serve as a National Historical Landmark. The mill is a popular tourist attraction and is open for self-guided tours during the summer months.

Land adjacent to the Mayflower tailings impoundments is owned by the Bureau of Land Management. These lands are not directly within the locations evaluated for the development of the Bonita Peak Repository. Additionally, there is a drinking water intake at Boulder Creek, approximately 600 feet upstream of impoundments 1 and 2, and there is a storage tank for the town of Silverton to the west of impoundment 4.

The assumption in this IROD is that the predominant future land use will not vary from the current ownership land use. The future land use will be subject to the determinations of the property owners but will be determined consistent with appropriate local land use zoning, the active mining permit, and mining-related uses.

## 6.1 SURROUNDING LAND USE AND POPULATION

The Census 2010 population for San Juan County, Colorado was approximately 700 people (U.S. Census Bureau 2010). Historically, mining was the main industry in the area; therefore, there are many inactive and abandoned mines within the three nearby watersheds. Retail business and construction are now the most common industries (DATA USA 2018). Tourism in the area includes outdoor recreation, skiing, hunting, and off-roading. Recreation is the predominant land use for other mining-related sources within the Site, many of which are located in remote areas of San Juan County.

# 7.0 SUMMARY OF RISKS

An ecological risk assessment memoranda was developed to support the development of the Bonita Peak Repository FFS. The Bonita Peak Repository is intended to primarily address ecological risks at the Site. The ecological risk memoranda, included as Appendix A of the FFS, was developed specifically to document and summarize unacceptable risks to aquatic ecological receptors to support the need to properly manage mining-related wastes derived from the implementation of CERCLA response actions within the Animas River watershed in a sitewide mine waste repository (CDM Smith 2020a). The following sections provide an overview of the risk methodology, summarize the risk results, and present the basis for remedial action resulting from the overall risk conclusions for ecological receptors.

## 7.1 SUMMARY OF ECOLOGICAL RISK

The Animas River and many of its tributaries, including Cement Creek, carry elevated concentrations of hazardous substances (metals and metalloids) because of MIW generated from mining activities and from naturally mineralized sources. The aquatic baseline ecological risk assessment (BERA) characterizes ecological risks to benthic macroinvertebrates, fish, and aquatic wildlife receptors exposed to sediments, water, and dietary items potentially contaminated by mine wastes and naturally mineralized materials within select BPMD watershed river reach exposure units (TechLaw 2019). The aquatic BERA built on the previous Upper Animas BERA that was originally made available as a draft in April 2015 (TechLaw 2015). The Upper Animas BERA assessed risks to aquatic ecological receptors in lower Mineral Creek, Cement Creek, and the Animas River just up- and downriver of Silverton, through the Animas Canyon to Bakers Bridge. The aquatic BERA assessed risks to aquatic-dependent ecological receptors throughout the Mineral Creek watershed, the Animas River watershed above the town of Silverton, and an approximate 20-mile reach of the Animas River downriver from Bakers Bridge that extends through the City of Durango (Durango Reach). The Upper Animas BERA was finalized and is Attachment 1 to the aquatic BERA. Together, these two assessments provide continuous characterization of aquatic receptor risks from exposure to mine-related and natural sources of contamination from the headwaters of the BPMD to about 70 river miles down the Animas River through Durango.

While aquatic life is unlikely to be directly exposed to mine-related surface water drainages (i.e., mine portal discharges) prior to entering the receiving stream, mine-related surface water drainages can significantly increase instream metals concentrations, subsequently contributing to risks to ecological receptors. The health of aquatic ecosystems within Site drainages are currently limited by high concentrations of toxic metals emanating from a wide range of mining-related and natural sources such that aquatic life is precluded in some locations.

The Gladstone IWTP reduces ecological risk by treating the Gold King Mine adit discharge that would otherwise discharge untreated to Cement Creek. The Gladstone IWTP can help reduce COPEC loads through a lime neutralization, flocculation, and precipitation process. COPECs are identified using hazard quotients that are calculated using maximum-detected concentrations for

each contaminant measured in pore water, sediment, and surface water, and the most conservative no-effect sediment ecological screening value. Based on the data presented in the *BPMD Gladstone IWTP Action Memorandum* (EPA 2017b), when influent and effluent associated with the IWTP were evaluated, COPECs removed by the IWTP include aluminum, beryllium, cadmium, copper, iron, lead, manganese, silver, and zinc. This list is consistent with the COPEC list identified in the aquatic BERA, where contaminants of interest include the following metals/metalloids: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc (TechLaw 2019). The *Gladstone Interim Water Treatment Plant Engineering Evaluation/Cost Analysis* (CDM Smith 2016) estimated that the 2016 COPEC load removed at the Gladstone IWTP from the Gold King Mine adit discharge to Cement Creek was 992 pounds per day, a reduction of 85 percent in loading compared to the untreated influent stream.

Each of the IRAs outlined in the 2019 IROD also has as a potential benefit in reducing metals concentrations in surface waters by addressing potential mining-related sources and/or reducing stormwater or mining-related discharges comingling with these sources. Residual risks could remain from untreated mining-related wastes remaining at 2019 IROD interim management locations that are not fully contained, and could also result in potential stability and migration concerns. Importantly, many of the metals originating from the IRA mining-related sources are known to be toxic to aquatic life at elevated levels. While it is recognized that ecological risks presented in the aquatic BERA are comprised of naturally occurring and mining-related metal/metalloid concentrations, it appears highly likely that BPMD mining activities have substantially increased aquatic receptors exposure to metals/metalloids at levels beyond those that would have occurred without mining (TechLaw 2019).

## 7.2 BASIS OF ACTION

Continued operation of the Gladstone IWTP and implementation of the IRAs pursuant to the 2019 IROD will help reduce ecological risk because of exposure to metals/metalloids, as described above. However, proper management of the wastes generated from the operation of the Gladstone IWTP and implementation of the IRAs pursuant to the 2019 IROD is necessary for continued IWTP function and to avoid inadvertent adverse impacts from the interim waste management areas as part of the IRAs. The interim waste management, for some mining-related sources and response actions, have potential stability and migration concerns, including vulnerability to storm events and the potential for erosion and transport, that can result in increased physical stressors to ecological receptors. At IRA source areas where on-site management of mining-related wastes may be vulnerable to external influences such as storm events, this material may be placed in the repository for long-term disposal. This would reduce the risk that these wastes may be transported by storm events contaminating nearby water bodies.

Relocating wastes to the Bonita Peak Repository generated by other CERCLA response actions, including 2019 IRAs and Gladstone IWTP operations, would increase the likelihood of sustained risk reductions achieved by those response actions A proposed repository would promote

ecological recovery by allowing for the continuous operation of the IWTP and proper management of treatment sludge and wastes generated from the 2019 IRAs.

The response action selected in this IROD is necessary to protect the environment from actual or threatened releases of hazardous substances into the environment.

# 8.0 REMEDIAL ACTION OBJECTIVES AND CLEANUP LEVELS

## 8.1 REMEDIAL ACTION OBJECTIVES

RAOs are typically developed by evaluating several sources of information, including results of the risk assessments, ARARs, and to-be-considered information. These inputs are the basis for determining whether protection of human health and the environment is achieved for a particular remedial alternative.

The scope of the RAOs in this IROD is intended to address exposure pathways for mining-related contamination that could potentially result in unacceptable human health and/or ecological risks from mining-related wastes placed within the Bonita Peak Repository based on preliminary supporting information (i.e., characterization and human health/ecological risk information). The RAOs are not intended to address all potential human health and/or ecological risks because the supporting information is preliminary and the actions to be taken are interim. The final remedial decisions for these mining-related sources will address the known unacceptable human health and ecological risks.

Any unacceptable risks from contaminant sources associated with OU2 are excluded from the evaluation of this IROD. A future record(s) of decision will document final remedial decisions for the mining-related sources at OU2 and will address any unacceptable human health and ecological risks.

The following RAOs were identified for the Bonita Peak Repository IRA:

1. Manage mining-related wastes placed in the repository and contain resulting MIW leachate to minimize migration of contamination from the repository to groundwater and surface water outside the repository, contributing to unacceptable ecological risks in the Upper Animas River adjacent to the repository location.
2. Control surface water runoff from the repository to minimize transport and control deposition of COPECs into a receiving stream that contribute to unacceptable ecological risk in the Upper Animas River adjacent to the repository location.
3. Limit uses of the property that are incompatible with a mining-related waste repository.

The RAOs focus on the exposure pathways that should be addressed to demonstrate that the repository containment remedy addresses all unacceptable risks identified for this interim action. Achievement of the RAOs would eliminate exposure pathways to the environment and associated potential human health and/or ecological risks pertinent to a mine waste repository. Confirming the integrity and conditions of the Bonita Peak Repository components would remain critical to the protectiveness of human and ecological receptors for the full life cycle of the repository.

## 8.2 CLEANUP CRITERIA

Remediation goals (RGs), or cleanup levels, are generally concentration-based goals for individual chemicals for specific medium and land use combinations at CERCLA sites (EPA 1991b). They are typically presented as chemical- and media-specific values that when met, achieve the RAOs. RGs are discussed in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] 300.430(e)(2)(i)). Identification and selection of the cleanup levels are typically based on RAOs, the current and reasonably anticipated future land uses, and the ARARs.

There are difficulties in establishing cleanup levels for the type of interim action that this IROD addresses (i.e., placement of mining-related wastes in a sitewide repository). Specifically, remediation goals typically address adequate protection of human health and the environment from residual contamination at the locations the wastes posing unacceptable risks were located, and do not focus on residual risks after they are relocated to a containment facility. The following subsections describe the rationale and basis for the cleanup criteria identified for this IRA and the approach for determining the identified cleanup criteria are met to achieve protectiveness at the repository.

### 8.2.1 Basis and Rationale for Identification of Cleanup Criteria

Cleanup levels are a subset of the RAOs that are the more specific statements of the desired endpoint concentrations or risk levels. EPA has determined that conventional chemical- and media-based cleanup levels are not appropriate for this interim action given its scope (i.e., containment of wastes generated from other locations within the Site from other response actions) and the uncertainty regarding those other response actions (i.e., uncertain composition of those wastes and the timing for management and placement of those wastes). A more detailed discussion of the relationships of this interim action with other responses actions is discussed in Section 4.0.

EPA, in establishing the rulemaking for the NCP and developing relevant guidance, has acknowledged the difficulties in establishing chemical- and media-based cleanup levels as part of early and interim actions. For instance, EPA has acknowledged that ARARs informing chemical- and media-based cleanup levels do not exist for all exposure media, such as certain types of contaminated soil, and in those cases, EPA must use other information to set remediation goals that will ensure protection of human health and the environment. Specifically, other information can be used, as necessary, to determine what levels are necessary to protect human health and the environment, such as state guidelines on what is protective for certain chemicals (EPA 1990).

Furthermore, the rulemaking for the NCP and relevant guidance has acknowledged that cleanup levels the selected remedy are expected to achieve will be indicated, as appropriate, in a ROD. The flexibility of appropriateness for identifying chemical- and media-based cleanup levels was included specifically for interim actions, which may not specify final remediation goals (EPA 1990) and may only include qualitative statements (EPA 1991a). EPA, in relevant guidance, also

indicates for CERCLA municipal landfills that quantitative risk assessments are not required to determine cleanup levels because the type of cap will be determined by closure ARARs, and groundwater within the landfill that is extracted would be required to meet discharge limits or other standards for disposal (EPA 1993). However, the IROD should demonstrate, qualitatively, how the interim action will address the potential risks (EPA 1991a).

### 8.2.2 Identification and Approach to Demonstrate Attainment of Cleanup Criteria

EPA has determined, because of the rationale discussed in Section 8.1.2, that quantitative chemical- and media-based RGs will not be established for this repository IRA. Rather, qualitative cleanup criteria consisting of action-specific ARARs related to the design, construction, and operation of solid waste disposal facilities will be the cleanup criteria. Attainment of the cleanup criteria for this interim action will be demonstrated through compliance with the action-specific ARARs in conjunction with achievement of RAOs, as discussed in Section 8.1, to demonstrate the protectiveness of the containment systems for human health and the environment.

# 9.0 DESCRIPTION OF ALTERNATIVES

This section describes the remedial alternatives developed and evaluated in the FFS to address potentially unacceptable risks to human health and the environment from interim waste management of mine wastes and sludge, as part of previous decision documents, and to provide disposal capacity for treatment sludges to allow for continued operation of the Gladstone IWTP, as needed. It includes common elements of alternatives, description of remedy components, and expected outcomes for each alternative. The detailed evaluation and comparative analysis of alternatives described in this section is summarized in Section 10.0.

## 9.1 DEVELOPMENT OF REMEDIAL ALTERNATIVES

Remedial alternatives were assembled to address potentially unacceptable risks to human health and the environment from interim management of wastes and sludge, and to provide disposal capacity for treatment sludges to allow as needed for continued operation of the Gladstone IWTP. The alternatives were assembled by combining the remedial technologies and process options presented in Section 4.0 of the FFS.

For alternative identification and evaluation, “representative” or “selected” process options were identified for evaluation within the remedial technology category to simplify the analysis and comparison of alternatives. Figure 9-1 illustrates the conceptual mining-related waste management and disposal process assumed for all remedial alternatives described in this section.

The remedial alternatives assembled include:

- Alternative NA: No Action
- Alternative R1: Repository at Mayflower Tailings Impoundment 1
- Alternative R2: Repository at Mayflower Tailings Impoundment 2
- Alternative R3: Repository at Mayflower Tailings Impoundment 3
- Alternative R4: Repository at Mayflower Tailings Impoundment 4

## 9.2 DESCRIPTION OF REMEDY COMPONENTS

This section identifies the key common elements for remedy components assumed in the FFS that would be required as part of all remedial alternatives (other than No Action alternative). Some common elements include those described in the subsections that follow.

### 9.2.1 Repository Initial Development

- Based on geotechnical analyses of existing conditions, a setback would be implemented along the edges of the top surface of the impoundment to increase its geotechnical stability.

- Drying cells would be constructed to dewater mining-related wastes, primarily treatment sludge transported from the Gladstone IWTP. As treatment sludges are allowed to dewater in the drying cells, decant water (i.e., MIW leachate) would be managed through evaporation with periodic transfer to the leachate holding cell for interim management and storage prior to disposal.

- A stockpile cell would be constructed at the repository to temporarily store mining-related wastes not requiring dewatering before placement within the disposal cell. The stockpile cell would be configured to allow for collection and management of any MIW leachate generated from precipitation events.

- The disposal cell would be constructed to serve as the final disposal location for mining-related wastes. Above the primary liner, a drainage layer would be placed to collect leachate. The collected leachate would be conveyed to a leachate holding cell for interim management and storage prior to disposal.

- A leachate holding cell would be constructed at the repository to temporarily store and manage MIW leachate prior to disposal. Treatment of leachate, if necessary, would take place on-site in a manner appropriate for the quality and quantity of the leachate prior to disposal, such as treatment at the Gladstone IWTP prior to discharge.

- Construction of the repository cells would include installation of a liner, to minimize infiltration into existing underlying tailings, and a leak detection system.

- Contaminated water would be transferred from the various process cells (i.e., drying cells, the stockpile cell, and the disposal cell) to the leachate holding cell through the use of hoses, piping, pumps, or other methods.

- Existing access roads would be utilized and road improvements would be implemented if necessary. An additional access road within the impoundment footprint would be constructed to access the different cells.

- Access controls, such as temporary fencing, would be installed around the perimeter of the impoundment.

- ICs would be implemented at the repository, which are assumed to consist of governmental and proprietary controls and associated informational devices, although enforcement tools with IC components could be used as necessary to accomplish the IC objectives. The IC objectives are primarily to protect engineered remedial features of the repository likely to be permanent and secondarily to exclude public access to the repository. These ICs would be in addition to any current or future ICs implemented for OU2.

### 9.2.2 Stormwater Controls

- Stormwater controls consisting of lined channels and culverts would divert stormwater away from the repository and toward the previously constructed stormwater controls at each respective tailings impoundment.
- A detention basin could be constructed, if necessary, to control stormwater runoff. Additional best management practices (BMPs) would be implemented as necessary to address potential erosion and sedimentation issues.

### 9.2.3 Waste Placement Operations

- After the initial components of the repository are constructed (i.e., repository cells and water management components) and BMPs are implemented, waste placement operations would begin.

- Treatment sludges from the Gladstone IWTP would be loaded from their current location and transported to the repository. Following adequate dewatering within the drying cells, the treatment sludges would be relocated to the disposal cell for final disposal.

- Mine wastes, including mine wastes from the IRAs in the 2019 IROD for OU1 and mine wastes from future response actions, would be transported to the repository. If the mine wastes require dewatering, they could initially be placed in the drying cells; however, it is assumed the majority of the mine wastes would be placed directly into the disposal cell for final disposal without requiring additional dewatering.

- It is assumed waste placement operations would primarily occur during the summer months.

- Monitoring and maintenance of the Bonita Peak Repository would be performed routinely during waste placement operations. These activities would include management of water from the drying cells and any MIW leachate that is generated from the disposal cell and collected in the leachate holding cell.

- Treatment of water collected from these cells, if necessary, would take place on-site in a manner appropriate for the quality and quantity of the leachate prior to disposal, such as treatment at the Gladstone IWTP prior to discharge. Periodic maintenance would also be conducted on the collection piping below the disposal cell to ensure there are no blockages or leaks.

- Additional maintenance activities would include maintaining access controls (fencing) and stormwater controls, and implementing BMPs.

- Prior to winter, the repository would be winterized, which would include placing a temporary cover over the disposal cell to protect the waste from windblown dispersion and/or saturation from precipitation.

- A groundwater monitoring and cell leak detection program would be implemented during waste placement operations and postclosure to monitor for migration of contaminants from the repository to groundwater.

### 9.2.4 Repository Closure

- Once waste placement operations are complete, closure of the repository would be conducted by installing a cover system over consolidated sludge and mine waste in the disposal cell. While temporary covers would be used for winterization between operational seasons, closure would include the placement of the final cover at the disposal cell.

- The construction of the cover would include placing a liner (to prevent infiltration) and covering it with a protective layer of soil or rock. It is assumed for both gently sloping areas at the top of the disposal cell and the side-sloped areas, the cover would include placing soil material above the liner and revegetating the cover to control erosion and enhance evapotranspiration of precipitation. Assumptions regarding the cover system would be further refined during remedial design.

- Following construction of the cover, permanent access controls consisting of fencing and/or gates would be constructed along the perimeter of the impoundment. Repository closure would also include decommissioning of the drying cells and the stockpile cell.

### 9.2.5 Postclosure Operation and Maintenance

- Operation and maintenance (O&M) of the Bonita Peak Repository would be performed routinely after final closure of the repository. The cover system would be maintained to minimize infiltration into the underlying wastes within the disposal cell.

- Periodic inspections of the cover system and access controls would be conducted, which includes inspection for erosion and exposed liner, inspection of vegetative cover and stormwater controls, and inspection of the gate and fencing for damage. Any necessary repairs or improvements would be made at that time.

- Postclosure maintenance would also include periodic management of MIW leachate, as necessary. Treatment of leachate, if necessary, would take place on-site in a manner appropriate for the quality and quantity of the leachate prior to disposal, such as treatment at the Gladstone IWTP prior to discharge.

- A groundwater monitoring and cell leak detection program would be implemented both during waste placement operations and postclosure to monitor for migration of contaminants from the repository to groundwater

## 9.3 DISTINGUISHING FEATURES OF EACH ALTERNATIVE

### 9.3.1 Alternative NA: No Further Action

- Estimated capital cost: $0
- Estimated total O&M costs (over 100 years): $0
- Estimated total periodic costs (over 100 years): $0
- Estimated total present value cost: $0
- Estimated construction timeframe: None
- Estimated time to achieve RAOs: will never comply with RAOs

Alternative NA is required by the NCP as a baseline for comparison against other remedial alternatives. This alternative would leave treatment sludge and mine wastes from the IRAs in the 2019 IROD for OU1 in their current states and locations and no additional response actions would be implemented to address them. The treatment sludge would continue to be stored in its temporary storage location adjacent to the Gladstone IWTP, and mine wastes would continue be stored at their interim management locations throughout the Mineral Creek, Cement Creek, and Animas River watersheds. Because of finite storage capacity near the Gladstone IWTP, this alternative could potentially impact unrestricted operation of the Gladstone IWTP once interim storage capacity is reached.

Summary of Major Remedial Components and Associated Quantities for Alternative NA: None (no action taken).

Key ARARs: Because no action is taken, no chemical-, location-, or action-specific ARARs would be triggered.

### 9.3.2 Alternative R1: Repository at Mayflower Tailings Impoundment 1

- Estimated capital cost: $4,420,000
- Estimated total O&M costs (over 100 years): $9,243,000
- Estimated total periodic costs (over 100 years): $976,000
- Estimated total present value cost: $6,440,000
- Estimated construction timeframe: one construction season (up to 5 months)
- Estimated time to achieve RAOs: upon completion of waste placement operations, the implementation of the repository cover will be completed in less than 1 year. The

estimated repository volume is between the reasonable minimum volume of 18,000 cubic yards and the reasonable maximum volume of 67,000 cubic yards.

Alternative R1 includes construction of a mining-related waste repository at Mayflower tailings impoundment 1, as described in Section 9.2. The repository would consist of multiple drying cells, a stockpile cell, a leachate holding cell, and a final disposal cell. Mining-related wastes, including treatment sludge and mine wastes, would be managed and then disposed of in the proposed repository.

The footprint of the top of Mayflower tailings impoundment 1 is approximately 8 acres. Based on geotechnical analyses of existing conditions, a setback would be implemented along the edges of the top surface of the impoundment to increase geotechnical stability. Therefore, the available footprint for repository component construction is approximately 7 acres.

It is estimated that approximately 18,000 embankment cubic yards (ECY) of stockpiled treatment sludges and mine wastes would be placed within the disposal cell under a reasonable minimum volume placement scenario. However, it is estimated that the disposal cell could be expanded to a capacity of 67,000 ECY under a reasonable maximum volume placement scenario. Exhibit 9-1 provides a summary of the major remedial components for Alternative R1 requiring construction and the estimated quantities for these components.

**Exhibit 9-1 Summary of Major Remedial Components and Associated Quantities for Alternative R1**

| Remedial Component | Estimated Quantity |
|---|---|
| Estimated Available Footprint for Repository | 7 AC |
| Estimated Waste Placement Volume (Reasonable Minimum Volume Scenario) for Disposal Cell | 18,000 ECY |
| Estimated Reasonable Maximum Capacity Volume for Disposal Cell | 67,000 ECY |
| Estimated Drying Cell Footprint | 42,000 SF |
| Estimated Disposal Cell Footprint | 140,000 SF |
| Estimated Leachate Holding Cell Footprint | 1,225 SF |
| Estimated In-Place Volume of Borrow Material for Remedial Component Construction | 6,180 BCY |
| Estimated Volume of Import Rock Material for Remedial Component Construction | 4,100 BCY |
| Estimated Length of Perimeter of Impoundment for Access Controls | 3,700 FT |

**Notes:** Although detailed quantities have been provided, they should be considered approximate and for evaluation purposes only.
AC – acre; BCY – bank cubic yards; FT – feet; SF – square feet

Key ARARs:

- National Historic Preservation Act (16 United States Code [U.S.C] § 470) and implementing regulations 36 CFR Part 800 (Protection of Historic Properties)

- Colorado Fugitive Dust Plan/Opacity, Regulation No. 1, 5 Colorado Code of Regulations [CCR] 1001-3(III)(D)(2)(b), pursuant to Colorado Revised Statues [CRS] § 25-7-101 et seq.

- CDPHE Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2, Part 1, Sections 2.1.2 through 2.1.8, 2.2, 2.5.4, 2.5.5, 2.5.6, 2.5.7, 3.1.5, 3.1.8, 3.2.5, 3.2.6, 3.5.2, 3.5.3, and 3.6

- Colorado Discharge Permit System (CDPS) Regulations (5 CCR 1002-61.3(2)(a) and (f)(ii), pursuant to CRS §25-8-501

- Resource Conservation and Recovery Act (RCRA) Subtitle D (42 U.S.C. § 6901) and implementation regulations at 40 CFR 258.28

- Colorado Environmental Covenants Statute, CRS § 25-15-317 et seq.

### 9.3.3 Alternative R2: Repository at Mayflower Tailings Impoundment 2

- Estimated capital cost: $3,383,000

- Estimated total O&M costs (over 100 years): $8,743,000

- Estimated total periodic costs (over 100 years): $954,000

- Estimated total present value cost: $5,349,000

- Estimated construction timeframe: one construction season (up to 5 months)

- Estimated time to achieve RAOs: upon completion of waste placement operations, the implementation of the repository cover will be completed in less than 1 year. The estimated repository volume is between the reasonable minimum volume of 18,000 cubic yards and the reasonable maximum volume of 33,800 cubic yards.

Alternative R2 includes construction of a mining-related waste repository at Mayflower tailings impoundment 2, as described in Section 9.2. The repository would consist of multiple drying cells, a stockpile cell, a leachate holding cell, and a final disposal cell. Mining-related wastes, including treatment sludge and mine wastes, would be managed and then disposed of in the proposed repository.

The footprint of the top of Mayflower tailings impoundment 2 is approximately 5 acres. Based on geotechnical analyses of existing conditions, a setback would be implemented along the edges of the top surface of the impoundment to increase geotechnical stability. Therefore, the available footprint for repository component construction is approximately 4.5 acres.

It is estimated that approximately 18,000 ECY of stockpiled treatment sludges and mine wastes would be placed within the disposal cell under a reasonable minimum volume placement scenario. However, it is estimated that the repository could be expanded to a capacity of 33,800 ECY under a reasonable maximum volume placement scenario. Exhibit 9-2 provides a summary of the major remedial components for Alternative R2 requiring construction and the estimated quantities for these components.

Exhibit 9-2 Summary of Major Remedial Components and Associated Quantities for Alternative R2

| Remedial Component | Estimated Quantity |
|---|---|
| Estimated Available Footprint for Repository | 4.5 AC |
| Estimated Waste Placement Volume (Reasonable Minimum Volume Scenario) for Disposal Cell | 18,000 ECY |
| Estimated Reasonable Maximum Capacity Volume for Disposal Cell | 33,800 ECY |
| Estimated Drying Cell Footprint | 31,500 SF |
| Estimated Disposal Cell Footprint | 91,650 SF |
| Estimated Leachate Holding Cell Footprint | 1,225 SF |
| Estimated In-Place Volume of Borrow Material for Remedial Component Construction | 4,260 BCY |
| Estimated Volume of Import Rock Material for Remedial Component Construction | 2,700 BCY |
| Estimated Length of Perimeter of Impoundment for Access Controls | 2,000 FT |

**Notes:** Although detailed quantities have been provided, they should be considered approximate for evaluation purposes only.

Key ARARs:

- Colorado Air Pollution Prevention and Control Act (CRS §25-7-101 et seq.)
- CDPHE Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2, Part 1, Sections 2.1.2 through 2.1.8, 2.2, 2.5.4, 2.5.5, 2.5.6, 2.5.7, 3.1.5, 3.1.8, 3.2.5, 3.2.6, 3.5.2, 3.5.3, and 3.6
- CDPS Regulations (5 CCR 1002-61.3(2)(a) and (f)(ii), pursuant to CRS §25-8-501.
- RCRA Subtitle D (42 U.S.C. § 6901) and implementation regulations at 40 CFR 258.28
- Colorado Environmental Covenants Statute (CRS § 25-15-317 et seq.)

### 9.3.4 Alternative R3: Repository at Mayflower Tailings Impoundment 3

- Estimated capital cost: $3,166,000
- Estimated total O&M costs (over 100 years): $8,743,000
- Estimated total periodic costs (over 100 years): $941,000

- Estimated total present value cost: $5,141,000
- Estimated construction timeframe: one construction season (up to 5 months)
- Estimated time to achieve RAOs: upon completion of waste placement operations, the implementation of the repository cover will be completed in less than 1 year. The estimated repository volume is between the reasonable minimum volume of 18,000 cubic yards and the reasonable maximum volume of 22,800 cubic yards.

Alternative R3 includes construction of a mining-related waste repository at Mayflower tailings impoundment 3. The repository would consist of multiple drying cells, a stockpile cell, a leachate holding tank, and a final disposal cell. Mining-related wastes, including treatment sludge and mine wastes, would be managed and then disposed of in the proposed repository. The repository components, with the exception of the leachate holding cell, would be constructed for Alternative R3 in the same manner as described in Section 9.2.

The footprint of the top of Mayflower tailings impoundment 3 is approximately 4 acres. Based on geotechnical analyses of existing conditions, a setback would be implemented along the edges of the top surface of the impoundment to increase geotechnical stability. Therefore, the available footprint is approximately 3 acres. Because of space limitations at this impoundment location, it is assumed that a storage tank would be utilized in lieu of a leachate holding cell to temporarily store MIW leachate.

It is estimated that approximately 18,000 ECY of stockpiled treatment sludges and mine wastes would be placed within the disposal cell under a reasonable minimum volume placement scenario. However, it is estimated that the repository could be expanded to a capacity of 22,800 ECY under a reasonable maximum volume placement scenario.

Exhibit 9-3 provides a summary of the major remedial components for Alternative R3 requiring construction and the estimated quantities for these components.

**Exhibit 9-3 Summary of Major Remedial Components and Associated Quantities for Alternative R3**

| Remedial Component | Estimated Quantity |
|---|---|
| Estimated Available Footprint for Repository | 3 AC |
| Estimated Waste Placement Volume (Reasonable Minimum Volume Scenario) for Disposal Cell | 18,000 ECY |
| Estimated Reasonable Maximum Capacity Volume for Disposal Cell | 22,800 ECY |
| Estimated Drying Cell Footprint | 16,500 SF |
| Estimated Disposal Cell Footprint | 63,000 SF |
| Estimated Leachate Holding Cell Footprint | 50,000 SF |
| Estimated In-Place Volume of Borrow Material for Remedial Component Construction | 2,770 BCY |
| Estimated Volume of Import Rock Material for Remedial Component Construction | 1,850 BCY |
| Estimated Length of Perimeter of Impoundment for Access Controls | 1,900 FT |

**Notes:** Although detailed quantities have been provided, they should be considered approximate and for evaluation purposes only.

Key ARARs:

- Colorado Air Pollution Prevention and Control Act (CRS §25-7-101 et seq.)
- CDPHE Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2, Part 1, Sections 2.1.2 through 2.1.8, 2.2, 2.5.4, 2.5.5, 2.5.6, 2.5.7, 3.1.5, 3.1.8, 3.2.5, 3.2.6, 3.5.2, 3.5.3, and 3.6
- CDPS Regulations (5 CCR 1002-61.3(2)(a) and (f)(ii), pursuant to CRS §25-8-501.
- RCRA Subtitle D (42 U.S.C. § 6901) and implementation regulations at 40 CFR 258.28
- Colorado Environmental Covenants Statute (CRS § 25-15-317 et seq.)

### 9.3.5 Alternative R4: Repository at Mayflower Tailings Impoundment 4

- Estimated capital cost: $11,365,000
- Estimated total O&M costs (over 100 years): $9,543,000
- Estimated total periodic costs (over 100 years): $1,156,000
- Estimated total present value cost: $13,393,000
- Estimated construction timeframe: one construction season (up to 5 months)
- Estimated time to achieve RAOs: upon completion of waste placement operations, the implementation of the repository cover will be completed in less than 1 year. The estimated repository volume is between the reasonable minimum volume of 18,000 cubic yards and the reasonable maximum volume of 508,300 cubic yards.

Alternative R4 includes construction of a mining-related waste repository at Mayflower tailings impoundment 4, as described in Section 9.2. The repository would consist of multiple drying cells, a stockpile cell, a leachate holding cell, and a final disposal cell. Mining-related wastes, including treatment sludge and mine wastes, would be managed and then disposed of in the proposed repository.

The footprint of the top of Mayflower tailings impoundment 4 is approximately 22.5 acres. Based on geotechnical analyses of existing conditions, a setback would be implemented along the edges of the top surface of the impoundment to increase geotechnical stability. Therefore, the available footprint for repository component construction is approximately 21 acres.

It is estimated that approximately 18,000 ECY of stockpiled treatment sludges and mine wastes would be placed within the disposal cell under a reasonable minimum volume placement scenario. However, it is estimated that the repository could be expanded to a capacity of 508,300

ECY under a reasonable maximum volume placement scenario. Because of the potential size of the repository and longer side slopes under that scenario, benching of the side slopes may be required to mitigate slope stability concerns. Exhibit 9-4 provides a summary of the major remedial components for Alternative R4 requiring construction and the estimated quantities for these components.

**Exhibit 9-4 Summary of Major Remedial Components and Associated Quantities for Alternative R4**

| Remedial Component | Estimated Quantity |
|---|---|
| Estimated Available Footprint for Repository | 21 AC |
| Estimated Waste Placement Volume (Reasonable Minimum Volume Scenario) for Disposal Cell | 18,000 ECY |
| Estimated Reasonable Maximum Capacity Volume for Disposal Cell | 508,300 ECY |
| Estimated Drying Cell Footprint | 69,350 SF |
| Estimated Disposal Cell Footprint | 531,000 SF |
| Estimated Leachate Holding Cell Footprint | 4,900 SF |
| Estimated In-Place Volume of Borrow Material for Remedial Component Construction | 63,500 BCY |
| Estimated Volume of Import Rock Material for Remedial Component Construction | 15,500 BCY |
| Estimated Length of Perimeter of Impoundment for Access Controls | 1,550 FT |

**Notes:** Although detailed quantities have been provided, they should be considered approximate and for evaluation purposes only.

Key ARARs:

- Colorado Air Pollution Prevention and Control Act (CRS §25-7-101 et seq.)
- CDPHE Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2, Part 1, Sections 2.1.2 through 2.1.8, 2.2, 2.5.4, 2.5.5, 2.5.6, 2.5.7, 3.1.5, 3.1.8, 3.2.5, 3.2.6, 3.5.2, 3.5.3, and 3.6
- CDPS Regulations (5 CCR 1002-61.3(2)(a) and (f)(ii), pursuant to CRS §25-8-501.
- RCRA Subtitle D (42 U.S.C. § 6901) and implementation regulations at 40 CFR 258.28
- Colorado Environmental Covenants Statute (CRS § 25-15-317 et seq.)

## 9.4 EXPECTED OUTCOMES OF EACH ALTERNATIVE

### 9.4.1 Alternative NA: No Further Action

The expected outcomes of Alternative NA include the following:

- Residual risks would remain from untreated mining-related wastes remaining at interim management locations that are not fully contained, and would include potential stability and migration concerns.

- The interim management locations, for some mining-related sources and response actions, may be vulnerable to storm events with the potential for erosion and transport to streams with the associated contributions to unacceptable risks to the environment.

- Because of finite storage capacity near the Gladstone IWTP, this alternative could potentially impact unrestricted operation of the Gladstone IWTP once interim storage capacity is reached. This could result in releases of MIW from the Gold King Mine to Cement Creek. The releases would additionally contribute to unacceptable risks to the environment, especially if the treatment sludge were to be reacidified.

### 9.4.2 Alternative R1: Repository at Mayflower Tailings Impoundment 1

The expected outcomes of Alternative R1 include the following:

- Alternative R1 would provide protection of human health and the environment in the short term through interim elements and is intended to provide adequate protection until a final remedy is selected. The elements that are interim in nature include MIW leachate collection and management until a final remedy is selected for MIW leachate disposal (i.e., treatment and/or discharge).

- Alternative R1 would provide protection of human health and the environment in the long term through final containment elements, such as bottom liners, and MIW leachate collection. These elements would isolate mining-related wastes from the surrounding environment. Additionally, the cover system and stormwater drainage controls would minimize migration of contamination to surface waters.

- Alternative R1 would address potential threats and stability/migration concerns for the Gladstone IWTP treatment sludge, mine wastes generated from the IRAs of the 2019 IROD, and the potential MIW leachate.

- The estimated repository volume is between the reasonable minimum volume of 18,000 cubic yards and the reasonable maximum volume of 67,000 cubic yards, which would result in up to 13 years of operation. These assumptions are based on annual placement of treatment sludges at a constant annual sludge generation rate, determined from the current rates.

- ICs would be implemented at the repository, which are assumed to consist of governmental and proprietary controls and associated informational devices to protect engineered remedial features likely to be permanent and to limit public access to the repository.

- The alternative would not result in unlimited use and unrestricted exposure land use scenarios.

- After closure, O&M would be performed routinely to maintain the integrity of the repository. Routine monitoring and subsequent maintenance, as necessary, would be conducted.

### 9.4.3 Alternative R2: Repository at Mayflower Tailings Impoundment 2

The expected outcomes of Alternative R2 include the following:

- Alternative R2 would provide protection of human health and the environment in the short term through interim elements and is intended to provide adequate protection until a final remedy is selected. The elements that are interim in nature include MIW leachate collection and management until a final remedy is selected for MIW leachate disposal (i.e., treatment and/or discharge).

- Alternative R2 would provide protection of human health and the environment in the long term through final containment elements, such as bottom liners, and MIW leachate collection. These elements would isolate mining-related wastes from the surrounding environment. Additionally, the cover system and stormwater drainage controls would minimize migration of contamination to surface waters.

- Alternative R2 would address potential threats and stability/migration concerns for the Gladstone IWTP treatment sludge, mine wastes generated from the IRAs of the 2019 IROD, and the potential MIW leachate.

- Alternative R2 would have more limited area available for repository components such as drying cells and leachate holding cells/tanks.

- Alternatives R2 would result in greater short-term impacts to workers because of the large number of equipment working in more constrained areas.

- The estimated repository volume is between the reasonable minimum volume of 18,000 cubic yards and the reasonable maximum volume of 33,800 cubic yards, which would result in up to 4 years of operation. These assumptions are based on annual placement of treatment sludges at a constant annual sludge generation rate, determined from the current rates.

- ICs would be implemented at the repository, which are assumed to consist of governmental and proprietary controls and associated informational devices to protect engineered remedial features likely to be permanent and to limit public access to the repository.

- The alternative would not result in unlimited use and unrestricted exposure land use scenarios.

- After closure, O&M would be performed routinely to maintain the integrity of the repository. Routine monitoring and subsequent maintenance, as necessary, would be conducted.

### 9.4.4 Alternative R3: Repository at Mayflower Tailings Impoundment 3

The expected outcomes of Alternative R1 include the following:

- Alternative R3 would provide protection of human health and the environment in the short term through interim elements and is intended to provide adequate protection until a final remedy is selected. The elements that are interim in nature include MIW leachate collection and management until a final remedy is selected for MIW leachate disposal (i.e., treatment and/or discharge).

- Alternative R3 would provide protection of human health and the environment in the long term through final containment elements, such as bottom liners, and MIW leachate collection. These elements would isolate mining-related wastes from the surrounding environment. Additionally, the cover system and stormwater drainage controls would minimize migration of contamination to surface waters.

- Alternative R3 would address potential threats and stability/migration concerns for the Gladstone IWTP treatment sludge, mine wastes generated from the IRAs of the 2019 IROD, and the potential MIW leachate.

- Alternative R3 would have more limited area available for repository components such as drying cells and leachate holding cells/tanks.

- Alternatives R3 would result in greater short-term impacts to workers because of the large number of equipment working in more constrained areas.

- The estimated repository volume is between the reasonable minimum volume of 18,000 cubic yards and the reasonable maximum volume of 22,800 cubic yards, which would result in up to 1 year of operation. These assumptions are based on annual placement of treatment sludges at a constant annual sludge generation rate, determined from the current rates.

- ICs would be implemented at the repository, which are assumed to consist of governmental and proprietary controls and associated informational devices to protect engineered remedial features likely to be permanent and to limit public access to the repository.

- The alternative would not result in unlimited use and unrestricted exposure land use scenarios.

- After closure, O&M would be performed routinely to maintain the integrity of the repository. Routine monitoring and subsequent maintenance, as necessary, would be conducted.

### 9.4.5 Alternative R4: Repository at Mayflower Tailings Impoundment 4

The expected outcomes of Alternative R1 include the following:

- Alternative R4 would provide protection of human health and the environment in the short term through interim elements and is intended to provide adequate protection until a final remedy is selected. The elements that are interim in nature include MIW leachate collection and management until a final remedy is selected for MIW leachate disposal (i.e., treatment and/or discharge).

- Alternative R4 would provide protection of human health and the environment in the long term through final containment elements, such as bottom liners, and MIW leachate collection. These elements would isolate mining-related wastes from the surrounding environment. Additionally, the cover system and stormwater drainage controls would minimize migration of contamination to surface waters.

- Alternative R4 would address potential threats and stability/migration concerns for the Gladstone IWTP treatment sludge, mine wastes generated from the IRAs of the 2019 IROD, and the potential MIW leachate.

- The estimated repository volume is between the reasonable minimum volume of 18,000 cubic yards and the reasonable maximum volume of 508,300 cubic yards, which would result in up to 128 years of operation. These assumptions are based on annual placement of treatment sludges at a constant annual sludge generation rate, determined from the current rates.

- ICs would be implemented at the repository, which are assumed to consist of governmental and proprietary controls and associated informational devices to protect engineered remedial features likely to be permanent and to limit public access to the repository.

- The alternative would not result in unlimited use and unrestricted exposure land use scenarios.

After closure, O&M would be performed routinely to maintain the integrity of the repository. Routine monitoring and subsequent maintenance, as necessary, would be conducted.

# 10.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

The FFS evaluated five remedial alternatives (including No Action alternative required by the NCP). These remedial alternatives were individually evaluated against the two threshold criteria and five balancing criteria. A comparative analysis of the remedial alternatives using the threshold and balancing criteria has been put into narrative form in the following subsections. The results of the individual detailed analysis for each remedial alternative are presented on Exhibit 10-1; presentation of this information aids in understanding a comparative analysis of the alternatives and identifying the key tradeoffs between them. Only significant comparative differences between alternatives are presented; the full rationale for the qualitative ratings determined as part of detailed analysis for the individual alternatives is provided in Appendix E of the FFS (CDM Smith 2020a). The information presented below is consistent with the FFS. Additional considerations that arose during the public comment period are described and addressed in Section 15.0 of this IROD.

## 10.1 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

### 10.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or ICs.

Of the five alternatives, the no further action alternative (Alternative NA) would fail to provide protection of human health and the environment. Alternative NA would not provide a permanent disposal location for wastes generated from the Gladstone IWTP and other response actions. Residual risks would remain from untreated mining-related wastes remaining at interim management locations that are not fully contained, and would include potential stability and migration concerns that may result in unacceptable ecological risks. Exceedance of interim storage capacity of sludge generated at the Gladstone IWTP may result in a threat of release and migration to Cement Creek and, if an off-site disposal alternative was not found, the IWTP may need to be shut down, thus resulting in the release of MIW from the Gold King Mine to Cement Creek. These releases would additionally contribute to unacceptable risks to the environment, especially if treatment sludge released to Cement Creek were to be reacidified. Thus, this alternative was given a rating of "not adequate."

Alternatives R1, R2, R3, and R4 were each given a rating of "adequate" because each alternative would provide protection of human health and environment through the construction of an on-site repository. Containment elements of the repository proposed for each alternative, such as the use of liner systems, would be final elements of the remedial action and would be protective to human health and environment in the long term by isolating mining-related wastes from the surrounding environment. Other elements of the repository proposed for each alternative, including MIW leachate collection and management, would be interim in nature and would be

protective to human health and environment in the short term and would provide adequate protection until a final remedy is selected for contaminated water management and disposal. RAO 1 would be achieved through the use of liner and cover systems at the cells within the repository, and through the use of dust suppression and other BMPs to minimize fugitive dust during waste placement operations. During winters and other periods of extended inactivity, temporary covers would be utilized to minimize dust generation. RAO 2 would be achieved through BMPs, such as berming and sloping, to reduce erosion and generation of MIW leachate from precipitation, snowmelt, and runoff. RAO 3 would be achieved using ICs to prevent land uses incompatible with a mine waste repository. In addition, access controls, such as fencing and signage, would limit public access to the repository. Implementation of these alternatives would address potential threats and stability/migration concerns for contaminated media. Long-term effectiveness and permanence of the repository depends on continued integrity of the covers and adherence to ICs. The results of the geotechnical analysis indicate that the recommended setback would reduce the likelihood of shallow slope instabilities from impacting the placement of a repository on Mayflower tailings impoundments 1, 2, 3, or 4 (under both reasonable minimum volume and reasonable maximum volume scenarios).

### 10.1.2 Compliance with ARARs

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations, which are collectively referred to as "ARARs" unless such ARARs are waived under CERCLA section 121(d)(4).

Under Alternative NA, treatment sludges and mine wastes would be left in their interim management locations initiated under other response actions. No action would be taken to permanently dispose of these mining-related wastes. Because no further action is taken, chemical-, location, or action-specific ARARs would not be pertinent to this alternative. Thus, this alternative was given a rating of "none."

Alternatives R1, R2, R3, and R4 would similarly comply with ARARs because of the commonalities of the alternatives. Since Alternatives R1, R2, R3, and R4 could comply with substantive requirements of ARARs without a CERCLA ARAR waiver, these alternatives were given rating of "will comply."

Action-specific ARARs for Alternatives R1, R2, R3, and R4 would be addressed similarly because of the commonalities of the alternative components. Location-specific ARARs for Alternatives R1, R2, R3, and R4 would be addressed similarly but with slight variations based on their respective locations. Specifically, the Mayflower Mill adjacent to the repository proposed for Alternative R1, was listed as a National Historic Landmark in 2000. Construction activities, as part of R1, would be conducted to eliminate or minimize adverse effects to the historical features in accordance with the National Historic Preservation Act, 16 U.S.C. §470, and implementing regulations codified at 36 CFR Parts 800.4, 800.5, 800.5, and 100.10.

Additionally, wetland surveys have not been completed for the Mayflower tailings impoundments; however, the current footprint of Mayflower tailings impoundments 3 and 4 and an area around the base of Mayflower tailings impoundment 1 each contain a wetland, according to the National Wetlands inventory. If wetlands are confirmed on the impoundments after the survey, then repository cell siting will be carried out in a manner to avoid them or meet other referenced regulations in accordance with CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.1 (Location Restrictions).

A detailed analysis of how the location- and action-specific ARARs would be addressed for Alternatives R1, R2, R3, and R4 during implementation of the Bonita Peak Repository IRA can be found in Section 8.0 of the FFS (CDM Smith 2020a).

### 10.1.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain on-site following remediation and the adequacy and reliability of controls.

Alternative NA would fail to provide protection of human health and the environment as it would not permanently dispose of the treatment sludge generated from the operation of the Gladstone IWTP and mine wastes not permanently contained in interim management locations from the implementation of the IRAs under other response actions. These mining-related wastes would remain at their current interim management locations. Residual risks would remain from untreated mining-related wastes remaining at interim management locations, and would include potential stability and migration concerns. Some of the interim management locations would remain vulnerable to storm events with the potential for erosion and transport to streams with the associated contributions to unacceptable risks to the environment. If capacity from interim storage of treatment sludge adjacent to the Gladstone IWTP is exceeded, it could present a threat of release and migration to Cement Creek. Immediate mitigative steps could include requiring the Gladstone IWTP to be shut down, which could then result in releases of MIW from the Gold King Mine to Cement Creek. These releases would additionally contribute to unacceptable risks to the environment, especially if the treatment sludge were to be reacidified. Thus, this alternative was given a rating of “low.”

Alternatives R1, R2, R3, and R4 have many similarities in long-term effectiveness and permanence because of commonalities in the approaches. Disposal of mining-related wastes would aid in reducing ecological risk through proper management of the wastes generated from the operation of the Gladstone IWTP and the implementation of the IRAs under other response actions. Treatment sludge currently stored near the Gladstone IWTP, treatment sludge generated during future Gladstone IWTP operations, mine wastes from the IRAs in the 2019 IROD for OU1 not permanently contained in interim management locations, and miscellaneous mine wastes generated from future Site response actions would be permanently disposed of at the

proposed repository under each alternative. Residual risks would remain from untreated wastes managed at the repository. The repository included in each alternative would have the reasonable minimum capacity for placement of approximately 18,000 ECY of mining-related wastes. Long-term effectiveness and permanence of the repository proposed under each alternative would depend on the repository cover, BMPs, inspection and repair as necessary to maintain their integrity, and adherence to ICs. O&M activities would be periodically required to repair damage or erosion to the covers. Monitoring and maintenance of covers would need to be performed in perpetuity. While subsurface tailings at OU2 is not the focus of this IROD, implementation of repository proposed under each alternative would lessen infiltration of precipitation into subsurface tailings.

Key long-term effectiveness and permanence factors that differ between Alternatives R1, R2, R3, and R4 are summarized below:

- Alternative R4 has the largest reasonable maximum capacity (508,300 ECY), followed by Alternative R1 (67,000 ECY), Alternative R2 (33,800 ECY), and Alternative R3 (22,800 ECY). The larger potential capacities of Alternatives R4 and R1 would allow for greater flexibility for placing future waste volumes above the reasonable minimum volume scenario, and would reduce the concerns of limited storage at interim storage areas (such as the Gladstone IWTP) that could contribute to unacceptable risks to the environment if the mining-related wastes were to be released and migrate to streams.

- The adequacy and reliability of controls under Alternatives R2 and R3 would be reduced compared to Alternatives R4 and R1 because of the more limited area available for repository components such as drying cells and leachate holding cells/tanks. The more limited area and the correspondingly smaller repository components could reduce the adequacy and reliability of properly managing the stormwater and contaminated water without adverse impacts to the environment because of inflexibility in meeting design requirements for repository cell components such as minimum stormwater channel widths and grades, and maximum cover slopes. For the same reasons, more frequent O&M may be required, which also raises uncertainty about adequacy and reliability of the controls. More limited disposal areas would also result in uncertainties in disposing of mining-related wastes generated from other response actions because of the smaller reasonable maximum capacities.

Thus, Alternative R4 was given a rating of "high." Alternative R1 was given a rating of "moderate to high." Alternative R2 was given a rating of "moderate." Alternative R3 was given a rating of "low to moderate."

### 10.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

This section provides an evaluation of the degree to which each remedial alternative employs a treatment technology to permanently and significantly reduce toxicity, mobility, or volume,

including how treatment is used to address the principal threats posed by contaminated media at the Site, as described in Section 6.4.

Alternative NA fails to provide a reduction of toxicity, mobility, or volume through treatment since no action is taken and thus treatment is not a component of this alternative. Thus, this alternative was given a rating of "none."

Alternatives R1, R2, R3, and R4 have many similarities in reduction of toxicity, mobility, or volume through treatment because of commonalities in the approaches. While the sludge was derived from treatment activities conducted at the Gladstone IWTP under separate response actions, no additional treatment of sludge or mine wastes would be undertaken for these alternatives. However, contaminated aqueous media in the form of MIW leachate would be generated for treatment as needed prior to disposal/discharge. Treatment of MIW leachate, if necessary, would take place on-site in a manner appropriate for the quality and quantity of the leachate prior to disposal, such as treatment at the Gladstone IWTP prior to discharge. Some reduction of toxicity and mobility of contaminants within the MIW leachate would be achieved from on-site treatment. However, the degree of reduction of toxicity and mobility of contaminants from treatment is uncertain given the unknown or variable quantities and composition of the MIW leachate. The volume of MIW leachate is expected to be small relative to the overall volume of mining-related wastes placed in the repository. In addition, sludge from the Gladstone IWTP underwent prior treatment to sequester metals contaminants if kept outside of acidic environments. While the mine wastes have potential to result in acidic leachate, it is assumed that the volume of treatment sludge in the repository would be larger than the volume of mine wastes. Thus, this should result in higher pH and lower metals concentrations in leachate. Because of these uncertainties, Alternatives R1, R2, R3, and R4 were each given an overall rating of "low to moderate."

### 10.1.5 Short-Term Effectiveness

This section provides an evaluation of the adverse effects of each remedial alternative during the construction and implementation phase of the remedial action until remedial response objectives are met.

No action would be undertaken under Alternative NA to address wastes generated from the operation of the Gladstone IWTP and the implementation of the IRAs placed at their current interim management locations under other response actions. Thus, there are no short-term risks posed to the community, workers, or the environment during implementation of this alternative. This alternative was given a rating of "none."

Alternatives R1, R2, R3, and R4 have many similarities in short-term effectiveness because of commonalities in the approaches. Each alternative would pose short-term risks to the community in the form of increased safety hazards, as truck traffic would be required to transport MIW leachate generated at the repository to the Gladstone IWTP and to transport mining-related wastes and borrow materials to the repository. Safety measures, such as signage and flaggers,

could be used in areas where truck traffic could pose increased safety hazards. Implementation of these alternative could cause a short-term risk to the community due to dust creation from repository construction activities and waste placement operations. Safety measures, such as dust suppression, would protect community during implementation.

There would also be short-term impacts to worker for Alternatives R1, R2, R3, and R4. Construction of the repository and waste placement operations could pose some short-term risks to workers. Safety measures, such as dust suppression, use of PPE, and establishment of work zones, would protect workers during implementation. There would be increased safety hazards to workers from truck traffic that would be required to transport MIW leachate generated at the repository to the Gladstone IWTP and to transport mining-related wastes and borrow materials to the repository. Additional worker risks could be posed by working near the sloped areas along the perimeter of the impoundment, abandonment of monitoring wells within repository cell footprints, working at high altitude, and frequent changes in weather conditions.

There would also be short-term impacts to the environment for Alternatives R1, R2, R3, and R4 because of the use of construction and hauling equipment and development of borrow areas for repository construction. Lined cells, used for storage and management of water during waste placement operations, have the potential to leak and infiltrate into the subsurface, particularly if wastes and borrow materials are improperly placed during operations and closure. During initial repository implementation and operation, the repositories proposed under each alternative would be vulnerable to storm events, with the potential for erosion and transport to streams. Groundwater and leachate detection monitoring would be performed during these activities to help determine whether these impacts are occurring and allow for mitigative approaches for these impacts to be implemented.

Key short-term effectiveness factors that differ between Alternatives R1, R2, R3, and R4 are summarized below:

- Implementation of Alternative R1 would result in greater short-term impacts to the community and workers because of the proximity of Mayflower tailings impoundment 1 to the Mayflower Mill (the mill is directly adjacent to the impoundment). Potential community risks include impacts to visitors and museum workers when present (e.g., janitors) at the Mayflower Mill, including dust generation, noise pollution, and increased truck traffic along the access road that connects to the Mayflower Mill parking lot. Potential worker risks include increased safety issues related to community traffic along the access road that connects to the Mayflower Mill parking lot.

- Alternative R3 has the smallest available footprint for repository construction (3 acres), followed by Alternative R2 (4.5 acres), Alternative R1 (7 acres), and Alternative R4 (21 acres). Implementation of alternatives with smaller available footprints, such as Alternatives R3 and R2, would result in greater short-term impacts to workers because of the large number of equipment working in more constrained areas.

- Alternative R3 has an additional impact to workers from the removal or relocation of agricultural structures (e.g., corrals) within the impoundment's footprint.

- Alternatives with larger volume capacities, such as the repositories proposed in Alternatives R4 and R1, have the potential for more short-term impacts to the community, workers, and the environment. Larger capacity repositories would require greater volumes of borrow materials to be developed and more truck traffic for transportation of mining-related wastes and borrow materials.

- Based on the closer proximity of the repository under Alternative R4 to Silverton, dust generation and noise pollution from implementation of Alternative R4 would result in slightly more short-term impacts to the community.

Based on these differing levels of short-term impacts to the community, workers, and the environment for each alternative, Alternatives R1, R2, R3, and R4 were each given an overall rating of "moderate."

### 10.1.6 Implementability

This section provides an evaluation of the technical and administrative feasibility of implementing an alternative, and the availability of various services and materials required during its implementation.

Alternative NA has no further action taken. Since no action would be undertaken to address wastes generated from the operation of the Gladstone IWTP and the implementation of the IRAs placed at their current interim management locations under other response actions, this alternative was given a rating of "none."

Alternatives R1, R2, R3, and R4 have many similarities in implementability because of commonalities in the approaches. Construction of repository components, transportation of mining-related wastes, and waste placement operations are relatively straightforward. Labor, equipment, and materials for initial repository development, waste placement operations, final cover construction during closure, and postclosure maintenance should be available.

There could be difficulties in constructing and operating the repository because of uncertainties about timing and volumes of mining-related wastes to be placed, the ultimate capacity of the repository, and the volume of contaminated water generated from the repository. Remedial design would need to consider these uncertainties and provide flexibility for waste placement. Implementation of these alternatives would require protection or abandonment of existing groundwater wells at the impoundment to avoid any construction difficulties. Implementation of these alternatives may require additional investigations to address any remaining uncertainties regarding geotechnical stability. It is assumed that designated uncontaminated borrow materials outside of the repository for the construction of repository components would be generated and transported from within the Site; however, borrow locations of suitable quantity and quality have

not been identified yet and thus import of off-site borrow materials for a portion of the soil and rock materials may be required. It is assumed that the impoundments would be accessed through the existing access roads. However, alternative access or road improvements may be necessary to improve access.

Implementation of these alternatives could impact the ability to avoid impacts on the ability to conduct the ongoing OU2 RI and would require agency coordination. While OU2 activities are still ongoing and the final OU2 remedy is unknown, it is expected that implementation of these remedial alternatives would not interfere with the final OU2 remedy, assuming the presumptive approach involves containment rather than removal of tailings. If conducted, tailings removal would have to be limited or targeted to avoid impacts to the repository. Maintenance of ICs may be more difficult because of the current ownership status.

Key implementability factors that differ between Alternatives R1, R2, R3, and R4 are summarized below:

- Because of the proximity of the Mayflower Mill and museum operations, Alternative R1 would require additional agency coordination with San Juan County.

- Conventional on-road trucks may have difficulties accessing Mayflower tailings impoundment 1 through the existing access road because of the alignment (i.e., sharp curve). Alternative access could be considered, such as accessing Mayflower tailings impoundment 1 from the northwestern side. Road improvements would likely be necessary to improve access.

- Logistics for working with a large amount of construction equipment and multiple repository cells may be difficult to manage for alternatives with the smallest available footprint, such as Alternatives R2 and R3.

- Implementation of Alternative R3 would require removal of existing agricultural structures on the footprint of Mayflower tailings impoundment 3.

- The considerably larger footprint for Alternative R4 would allow for greater flexibility in the design of the repository. Design of the repository could consider phased construction to alleviate other implementation issues, such as ongoing OU2 RI efforts.

- The remaining data needs for the ongoing OU2 RI are greater at Mayflower tailings impoundment 4 than other impoundments. Therefore, implementability issues related to the ongoing OU2 RI, such as impacting the ability to conduct RI investigations and requiring additional agency coordination, would be greatest for Alternative R4.

- Mayflower tailings impoundment 4 is operated and monitored under an active DRMS permit. Implementation of Alternative R4 would require additional agency coordination with DRMS.

- Alternatives with larger volume capacities, such as the repositories proposed in Alternatives R4 and R1, have the potential for more implementability issues related to materials required for construction. Larger capacity repositories would require greater volumes of borrow material to be developed and larger quantities of off-site materials, such as geosynthetic liners, to be obtained. However, construction of the repository in phases could reduce implementability impacts.

Thus, Alternatives R2 and R3 were each given a rating of "moderate to high." Alternatives R1 and R4 were each given a rating of "moderate."

### 10.1.7 Cost

The Bonita Peak Repository IROD focuses on the disposal of mining-related wastes that are currently being generated for interim management from other response actions, specifically treatment sludge from the Gladstone IWTP and the 2019 IRA. However, the evaluation also addresses flexibility for disposal of wastes from potential future response actions, which have uncertainty with respect to quantities and timing. Because of the reasonable certainty regarding quantities in the reasonable minimum volume placement scenario, use of that scenario best represents the costs for the alternatives.

The reasonable minimum volume placement scenario for each alternative is based on an assumption that the sizing of repository cells (i.e., the foundations for future waste placement) would be maximized at the onset of remedial action construction to the extent practicable. The repository cell sizing would be based on the available footprint of each tailings impoundment even if the waste volumes identified for initial placement under the alternative could be placed within a smaller cell footprint. Thus, while the costs for each alternative would place the same volume of waste under the reasonable minimum volume placement cost scenario (18,000 ECY), the footprint of the repository cells would vary by alternative and result in costs that appear disproportionate between alternatives. While all alternatives would be based on the placement of 18,000 ECY (a common cost element), the disposal cell footprints for Alternatives R1 through R4 would be based on horizontal footprints of 140,000 square feet, 91,650 square feet, 63,000 square feet, and 531,000 square feet, respectively. The other cells for the repository (e.g., drying cells and stockpile cells) would have corresponding differences in footprint size based on the available repository footprint and thus affect costs proportionally.

Cost estimates were also developed using the reasonable maximum scenario for the sensitivity analysis. Under the maximum volume scenario, it was assumed that the waste placement would utilize the full capacity of each repository to show the cost sensitivity of various repository components during that life cycle. The cost for Alternative R4 would include development of a repository with an estimated capacity of 508,300 ECY. That capacity would allow for placement of treatment sludge (assuming a constant annual generation rate) for up to 128 years in addition to the placement of treatment sludges stockpiled at the Gladstone IWTP. The cost for Alternative R1 would include development of a repository with an estimated capacity of 67,000 ECY. That

capacity would allow for placement of treatment sludge (assuming a constant annual generation rate) for up to 13 years in addition to the placement of treatment sludges stockpiled at the Gladstone IWTP. The cost for Alternative R2 would include development of a repository with an estimated reasonable maximum capacity of 33,800 ECY. That capacity would allow for placement of treatment sludge (assuming a constant annual generation rate) for up to 4 years in addition to the placement of treatment sludges stockpiled at the Gladstone IWTP. The cost for Alternative R3 would include development of a repository with an estimated capacity of 22,800 ECY. That capacity would allow for placement of treatment sludge (assuming a constant annual generation rate) for up to 1 year in addition to the placement of treatment sludges stockpiled at the Gladstone IWTP.

For evaluation purposes, the reasonable minimum volume scenario are the costs representing each alternative and compared between alternatives in this section. The present value cost for Alternative NA is $0. The present value cost for Alternative R1 is $6,440,000. The present value cost for Alternative R2 is $5,349,000. The present value cost for Alternative R3 is $5,141,000. The present value cost for Alternative R4 is $13,393,000. The present value costs presented for these alternatives use the simplistic assumption that the majority of capital costs would be incurred in Year 0.

**Exhibit 10-1 Summary of Comparative Analysis for Remedial Alternatives**

| Remedial Alternative | Threshold Criteria | | Balancing Criteria | | | | |
|---|---|---|---|---|---|---|---|
| | **Overall Protection of Human Health and the Environment** | **Compliance with ARARs** | **Long-Term Effectiveness and Permanence** | **Reduction of Toxicity, Mobility, or Volume through Treatment** | **Short-Term Effectiveness** | **Implementability** | **Present Value Cost (Dollars)[1]** |
| **Alternative NA** – No Further Action Action[2] | **Not Adequate**<br>- No action/no further action | **None**<br>- No action/no further action<br>- ARARs are not pertinent | **Low**<br>- Leaves mining-related wastes in their current interim local management locations | **None**<br>- No treatment beyond that performed initially during generation of sludge from water treatment | **None**<br>- No action/no further action<br>- No short-term risk posed since no additional action taken | **None**<br>- No action/no further action<br>- Criterion is not pertinent since no additional action taken | **$0** |
| **Alternative R1** – Repository at Mayflower Tailings Impoundment 1 | **Adequate**<br>- Adequate protection of human health and environment through achievement of RAOs 1, 2, and 3<br>- Interim features provide adequate protection in the short term until a final remedy is selected for contaminated water treatment/discharge and surrounding OU2 contamination | **Will Comply**<br>- See ARARs analysis (Appendix E of FFS) | **Moderate to High**<br>- Addresses unacceptable risks associated with mining-related wastes currently at interim management locations<br>- Capacity to address ecological risks for up to approximately 67,000 ECY of mining-related wastes; the reasonable maximum capacity of the repository in this alternative is the second largest of the alternatives<br>-Permanence of the repository enhanced through repository cells that isolate placed wastes from underlying groundwater and adjacent surface water<br>- Permanence of repository on Mayflower tailings impoundment 1 would be enhanced geotechnically using a setback from the slope face<br>- Adequacy and reliability through post-construction inspection and maintenance of repository components | **Low to Moderate**<br>- No treatment of sludges beyond that performed initially during generation of sludge from water treatment<br>- No treatment of mine wastes beyond any treatment that may occur during implementation of those response actions<br>- Small reduction in toxicity and mobility from treatment of MIW leachate generated during repository operations; the quantity of MIW leachate is uncertain but is expected to be of relative low volume because of isolation of wastes, and the quality of MIW leachate may be improved from the lime buffering of treatment sludge | **Moderate**<br>- Community, worker, and environmental impacts from transporting mining-related wastes, contaminated water, equipment, and borrow material<br>- Potential community and worker safety impacts regarding Mayflower Mill location in proximity to impoundment<br>- Potential worker safety issues from working in high altitudes and near sloped areas<br>- Potential environmental impacts from repository construction (e.g., dust generation) | **Moderate**<br>- Additional agency coordination with San Juan County required because of proximity to Mayflower Mill<br>- Uncertain borrow location(s) with suitable quality and quantity<br>- Difficulties in constructing and operating the repository because of uncertainties in waste volumes<br>- Coordination with agencies to avoid impacts to ongoing OU2 RI<br>- Difficulties accessing Mayflower tailings impoundment 1 through the existing access road because of the alignment (i.e., sharp curve) | **$6,440,000** |
| **Alternative R2** – Repository at Mayflower Tailings Impoundment 2 | **Adequate**<br>- Adequate protection of human health and environment through achievement of RAOs 1, 2, and 3<br>- Interim features provide adequate protection in the short term until a final remedy is selected for contaminated water treatment/discharge and surrounding OU2 contamination | **Will Comply**<br>- See ARARs analysis (**Appendix E of FFS**) | **Moderate to High**<br>- Addresses unacceptable risks associated with mining-related wastes currently at interim management locations<br>- Capacity to address ecological risks for up to approximately 33,800 ECY of mining-related wastes; the reasonable maximum capacity of the repository in this alternative is the 2nd smallest of the alternatives<br>- Permanence of the repository enhanced through repository cells that isolate placed wastes from underlying groundwater and adjacent surface water. | **Low to Moderate**<br>- No treatment of sludges beyond that performed initially during generation of sludge from water treatment<br>- No treatment of mine wastes beyond any treatment that may occur during implementation of those response actions<br>- Small reduction in toxicity and mobility from treatment of MIW leachate generated during repository operations; the quantity of MIW leachate is uncertain but is expected to be of relative low volume because of isolation of wastes, and the quality of MIW leachate may be improved from the lime buffering of treatment sludge | **Moderate**<br>- Community, worker, and environmental impacts from transporting mining-related wastes, contaminated water, equipment, and borrow material<br>- Worker safety because of large equipment working in more constrained areas<br>- Potential worker safety issues from working in high altitudes and near sloped areas<br>- Potential environmental impacts from repository construction (e.g., dust generation) | **Moderate to High**<br>- Difficulties from working with large equipment and multiple repository cells within a smaller repository footprint<br>- Uncertain borrow location(s) with suitable quality and quantity<br>- Difficulties in constructing and operating the repository because of uncertainties in waste volumes<br>- Coordination with agencies to avoid impacts to ongoing OU2 RI | **$5,335,000** |

| Remedial Alternative | Threshold Criteria | | Balancing Criteria | | | | |
|---|---|---|---|---|---|---|---|
| | **Overall Protection of Human Health and the Environment** | **Compliance with ARARs** | **Long-Term Effectiveness and Permanence** | **Reduction of Toxicity, Mobility, or Volume through Treatment** | **Short-Term Effectiveness** | **Implementability** | **Present Value Cost (Dollars)[1]** |
| | | | - Permanence of repository on Mayflower tailings impoundment 2 would be enhanced geotechnically using a setback from the slope face<br>- Adequacy and reliability through postconstruction inspection and maintenance of repository components<br>- Adequacy and reliability reduced because of more limited area available for repository components | | | | |
| **Alternative R3** – Repository at Mayflower Tailings Impoundment 3 | **Adequate**<br>- Adequate protection of human health and environment through achievement of RAOs 1, 2, and 3<br>- Interim features provide adequate protection in the short term until a final remedy is selected for contaminated water treatment/discharge and surrounding OU2 contamination | **Will Comply**<br>- See ARARs analysis (Appendix E of FFS) | **Low to Moderate**<br>- Addresses risks associated with mining-related wastes currently at interim management locations<br>- Capacity to address ecological risks for up to approximately 22,800 ECY of mining-related wastes; the reasonable maximum capacity of the repository in this alternative is the smallest of the alternatives<br>- Permanence of the repository enhanced through repository cells that isolate placed wastes from underlying groundwater and adjacent surface water<br>- Permanence of repository on Mayflower tailings impoundment 3 would be enhanced geotechnically using a setback from the slope face<br>- Adequacy and reliability through post-construction inspection and maintenance of repository components<br>- Adequacy and reliability reduced because of more limited area available for repository components | **Low to Moderate**<br>- No treatment of sludges beyond that performed initially during generation of sludge from water treatment<br>- No treatment of mine wastes beyond any treatment that may occur during implementation of those response actions<br>- Small reduction in toxicity and mobility from treatment of MIW leachate generated during repository operations; the quantity of MIW leachate is uncertain but is expected to be of relative low volume because of isolation of wastes, and the quality of MIW leachate may be improved from the lime buffering of treatment sludge | **Moderate**<br>- Community, worker, and environmental impacts from transporting mining-related wastes, contaminated water, equipment, and borrow material<br>- Worker safety because of large equipment working in more constrained areas and removal or relocation of corral<br>- Potential worker safety issues from working in high altitudes and near sloped areas<br>- Potential environmental impacts from repository construction (e.g., dust generation) | **Moderate to High**<br>- Difficulties from working with large equipment and multiple repository cells within a smaller repository footprint<br>- Uncertain borrow location(s) with suitable quality and quantity<br>- Difficulties in constructing and operating the repository because of uncertainties in waste volumes<br>- Coordination with agencies to avoid impacts to ongoing OU2 RI<br>- Would require removal of existing agricultural structures on the impoundment's footprint | **$5,141,000** |

| Remedial Alternative | Threshold Criteria | | Balancing Criteria | | | | |
|---|---|---|---|---|---|---|---|
| | **Overall Protection of Human Health and the Environment** | **Compliance with ARARs** | **Long-Term Effectiveness and Permanence** | **Reduction of Toxicity, Mobility, or Volume through Treatment** | **Short-Term Effectiveness** | **Implementability** | **Present Value Cost (Dollars)[1]** |
| **Alternative R4** – Repository at Mayflower Tailings Impoundment 4 | **Adequate**<br>- Adequate protection of human health and environment through achievement of RAOs 1, 2, and 3<br>- Interim features provide adequate protection in the short term until a final remedy is selected for contaminated water treatment/discharge and surrounding OU2 contamination | **Will Comply**<br>- See ARARs analysis (Appendix E of FFS) | **High**<br>- Addresses risks associated with mining-related wastes currently at interim management locations<br>- Capacity to address ecological risks for up to approximately 508,300 ECY of mining-related wastes; the reasonable maximum capacity of the repository in this alternative is substantially larger than all the other alternatives<br>-Permanence of the repository enhanced through repository cells that isolate placed wastes from underlying groundwater and adjacent surface water<br>- Permanence of repository on Mayflower tailings impoundment 4 would be enhanced geotechnically using a setback from the slope face<br>- Adequacy and reliability through post-construction inspection and maintenance of repository components | **Low to Moderate**<br>- No treatment of sludges beyond that performed initially during generation of sludge from water treatment<br>- No treatment of mine wastes beyond any treatment that may occur during implementation of those response actions<br>- Small reduction in toxicity and mobility from treatment of MIW leachate generated during repository operations; the quantity of MIW leachate is uncertain but is expected to be of relative low volume because of isolation of wastes, and the quality of MIW leachate may be improved from the lime buffering of treatment sludge | **Moderate**<br>- Community, worker, and environmental impacts from transporting mining-related wastes, contaminated water, equipment, and borrow material<br>- Greater potential community impacts because of proximity of Silverton to impoundment<br>- Potential worker safety issues from working in high altitudes and near sloped areas<br>- Potential environmental impacts from repository construction (e.g., dust generation) | **Moderate**<br>- Uncertain borrow location(s) with suitable quality and quantity<br>- Difficulties in constructing and operating the repository because of uncertainties in waste volumes<br>- Coordination with agencies to avoid impacts to ongoing OU2 RI<br>- Greater OU2 RI data needs at Mayflower tailings impoundment 4 may result in additional difficulties<br>- Would require additional agency coordination because of active DRMS permit | **$13,393,000** |

**Notes:**

1. Present value costs and quantitative ratings are subject to change. Detailed cost spreadsheets (cost summaries, present value analyses, and cost worksheets) for each alternative are presented in Appendix F of the FFS (CDM Smith 2020a).
2. Alternatives NA represents the no further action alternative required by the NCP.

**Legend for Qualitative Ratings System:**

| **Threshold Criteria (Overall Protection of Human Health and the Environment)** | **Threshold Criteria (Compliance with ARARs)** | **Balancing Criteria (Excluding Cost)** |
|---|---|---|
| Not Adequate | None | None |
| Adequate | Will comply | Low |
| | Will comply, but may require CERCLA ARAR waiver(s) | Low to Moderate |
| | | Moderate |
| | | Moderate to High |
| | | High |

## 10.2 MODIFYING CRITERIA

### 10.2.1 State Acceptance

State (support agency) acceptance is a modifying criterion under the NCP. Assessment of the state acceptance was completed after comments on the proposed plan were submitted to EPA during the formal comment period. Thus, state acceptance was not considered in the detailed analysis of alternatives presented in the FFS.

The State of Colorado, through CDPHE, was involved in the development of administrative record documents such as the proposed plan and the FFS, and concurs with the selected interim remedy in this IROD.

### 10.2.2 Community Acceptance

Community acceptance is also a modifying criterion under the NCP. Community assessment was completed after EPA received public comments on the proposed plan during the public commenting period. Thus, community acceptance was not considered in the detailed analysis of alternatives presented in the FFS.

Part 3 of this IROD provides discussion of the community acceptance, including responses to comments provided by members of the community during the formal comment period.

### 10.2.3 Modifications Made as a Result of Comments

Comments from the general public were addressed through clarification and explanation. These can be found in Part 3 of this document, the responsiveness summary. After careful consideration of the comments and recent developments related to the OU2 RI, changes were made to the preferred alternative presented in the proposed plan. The selected interim remedy will still involve a combination of Alternatives R1, R2, and R4, but will now be initially constructed at Mayflower tailings impoundment 4, rather than initially being constructed at Mayflower tailings impoundments 1 and 2. Further details regarding the selected interim remedy are described in Section 12.0 of this IROD.

## 11.0 PRINCIPAL THREAT WASTES

Principal threat wastes are source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present significant risk to human health or the environment should exposure occur. Low-level threat wastes are those source materials that generally can be reliably contained and would present only a low risk in the event of release.

As noted in Section 5.3, the types of mining-related wastes that will be disposed of at the Bonita Peak Repository include treatment generated sludge and mine wastes, including wastes generated from various watershed IRAs and mine wastes generated from future Site response actions. These mining-related wastes can also generate MIW leachate after placement in a repository cell when in contact with water and oxygen. These mining-related wastes and associated MIW leachate are considered source materials since they contain hazardous substances, pollutants, or contaminants that function as a reservoir for migration of contamination to groundwater, surface water, or air, or act as a source for direct exposure. However, these source materials are not considered principal threat wastes for the following reasons:

- Contaminants in the solid mining-related wastes are not highly toxic.
    - The contaminants present are not in forms or at concentrations that would result in designation of characteristic hazardous waste because of toxicity (i.e., through TCLP) if it were otherwise not exempt from regulation under RCRA by the Bevill amendment.
- Contaminants in the solid mining-related wastes are not highly mobile.
    - The contaminants present are inorganics that are generally bound as part of mineral assemblages within the solid media and are only mobile when in contact with water and oxygen over time.
- Contaminants in the solid mining-related wastes and MIW leachate can be reliably contained.
    - The contaminants present in solid mining-related wastes are inorganics generally bound as part of mineral assemblages within the solid media. Solid mine materials are particularly amenable to containment strategies that also isolate the solid mining-related wastes from water, resulting in reduced migration to MIW leachate. Although the specific characteristics of the MIW leachate (i.e., quantity and quality) are uncertain given waste variability, the mining and solid waste industries have developed materials, means, and methods to reliably contain leachate.

The mining-related wastes and MIW leachate addressed by this IROD, as defined above, are thus considered a low-level threat wastes and not principal threat wastes. As noted above, mining-related wastes from future Site response actions that meet this definition of low-level threat

waste will be disposed of at the Bonita Peak Repository, and the resulting MIW leachate would also meet the definition of low-level threat waste. This determination would be reevaluated if a future decision document included potential disposal of principal threat waste at the Bonita Peak Repository. Additional discussion in Section 14.0 describes the NCP statutory preference for treatment of principal threat waste and subsequent exclusion of treatment as a principal element of the remedy.

# 12.0 SELECTED INTERIM REMEDY

Based on consideration of the CERCLA requirements, the detailed analysis of remedial alternatives, state comments, and all public comments (see Part 3, Responsiveness Summary), EPA has determined that the preferred remedial alternatives for the IRA presented in the proposed plan for the sitewide cleanup constitute the appropriate remedy for the Site. The selected interim remedy consists of a combination of Alternatives R1, R2, and R4.

Modifications to the information presented in the proposed plan, as described in this section, were implemented based on comments provided during the formal comment period and additional information gathered following the release of the proposed plan. These modifications include:

- The sequence of impoundment use for phased repository construction, operation, and closure was revised. The EPA's preferred alternative combined Alternatives R1, R2, and R4, as discussed in the proposed plan. However, tailings impoundment 4 will be used as the primary location for disposal, holding, and drying cells. As impoundment 4 disposal cells reach capacity impoundments 1 and 2 will be used for disposal as necessary.

- ARARs pertaining to the selected interim remedy, including the use of the CERCLA interim measures waiver for specific ARARs, were clarified. A summary of federal and state ARARs for the selected interim remedy is attached as Appendix A.

As a result of these modifications, the quantities and costs associated with the preferred alternatives presented in the proposed plan (and Section 9.0) have been updated in the following subsections.

The selected interim remedy will provide permanent disposal of Gladstone IWTP sludge and of certain mining-related wastes from across the Site and will address repository-generated leachate. The selected remedy includes interim elements, such as collection and management as well as disposal (assumption of transport, treatment, and discharge after treatment) for repository-generated MIW leachate. Once the quantity and quality of the MIW-leachate is determined, permanent management and disposal approaches for the MIW leachate will be evaluated and selected in a final ROD.

The following subsections provide the rationale, detailed description, estimated costs, and expected outcome for the selected interim remedy.

## 12.1 SHORT DESCRIPTION OF THE SELECTED INTERIM REMEDY

A preliminary conceptual configuration of the Bonita Peak Repository is presented in Figure 12-1. The impoundments would be used as follows:

- **Mayflower tailings impoundment 4:** Used as the primary location for mining-related waste disposal. Additionally, used to manage mining-related wastes in holding cells and

drying cells prior to placement in waste disposal cells. As impoundment 4 space is used up, EPA would determine the future layout of disposal and waste management cells within the footprints of the selected impoundments.

- **Mayflower tailings impoundment 1 and/or 2:** Used as a secondary location for mine waste management (e.g., holding and drying cells) and/or disposal cells if impoundment 4 waste management and disposal cell capacity is exhausted and remedial decisions require repository disposal of mining-related wastes as part of future response actions.

The selected remedy includes the construction of various cells and infrastructure necessary to process wastes, a leachate holding cell/tank, stormwater controls, erosion and sediment control measures, access road improvements (as necessary), and implementation of ICs. Treatment sludges from the Gladstone IWTP would be loaded from their current location and transported to the repository. Additionally, mine wastes, including mine wastes from the IRAs in the 2019 IROD for OU1 and mine wastes from future response actions may be transported to the repository. Wastes would be stored and managed prior to placement in the disposal cell(s) to reduce water content. Once waste placement operations for disposal cell(s) are complete, final cover system(s) will be placed for closure of disposal cells and ultimately the repository and subsequent operations and maintenance will be conducted to maintain integrity of the repository closure.

Collection, management, and disposal (i.e., treatment of MIW leachate and discharge after treatment), if necessary, would take place on-site in a manner appropriate for the quality and quantity of the leachate as an interim measure. Once the quantity and quality of the MIW-leachate is determined, permanent management and disposal approaches for the MIW leachate will be selected and implemented.

## 12.2 RATIONALE FOR THE SELECTED INTERIM REMEDY

The selected interim remedy meets the threshold criteria and provides the best balance of tradeoffs with respect to the balancing criteria. The combination of Alternative R1, R2, and R4 allows for primary and secondary waste disposal locations, which will provide greater capacity, flexibility, and long-term effectiveness while reducing short-term impacts through phased implementation. The Bonita Peak Repository will provide safe, permanent disposal of Gladstone IWTP sludge and of certain mining-related wastes from across the Site and would address repository-generated leachate. The selected interim remedy will protect human health and the environment by isolating mining-related wastes and controlling the migration of contamination. The current interim management of mining-related wastes and the Gladstone IWTP-generated sludge pose potential threats for release of the wastes to the environment based on stability and migration concerns, and limited capacity for storage. The RAOs will be met through implementation of the selected interim remedy.

## 12.3 DETAILED DESCRIPTION OF THE SELECTED INTERIM REMEDY

The construction of the Bonita Peak Repository at Mayflower tailings impoundment 4 would consist of multiple processing cells, including drying cells, a stockpile cell, a leachate holding cell/tank, and cells for final disposal. The anticipated footprint of the top of Mayflower tailings impoundment 4 is approximately 22.5 acres. Based on geotechnical analysis of existing conditions, the remedy includes taking necessary steps to increase geotechnical stability, such as a setback along the edges of the top surface of the impoundment. While this IROD describes separate cells for drying, stockpiling, and ultimate disposal, the remedial design may consider combining cells, while retaining the objectives of the cells as described in this section. In addition, the particular handling of the mining-related wastes prior to ultimate disposal will be determined during the remedial design and subsequent operations planning. It is anticipated that the cells will be constructed in a phased approach as mining-related wastes are generated over time at the Site and future installation of repository covers may also be implemented using a phased approach.

### Drying Cells

Drying cells would be constructed to dewater mining-related wastes, particularly treatment sludge, to allow for a more geotechnically stable waste prior to placement into the disposal cell. To ensure that the waste is geotechnically stable and address any uncertainties regarding water content, a variety of techniques could be implemented, including mechanical dewatering or the addition of a dewatering agent. The drying cells would be designed and constructed in a manner to minimize infiltration into existing underlying tailings to achieve RAOs. As wastes are allowed to dewater in the drying cells, decant water would be managed through evaporation with periodic transfer to the leachate holding cell/tank for interim storage prior to disposal.

### Stockpile Cell

A stockpile cell would be constructed at the repository to temporarily store mining-related wastes before placement within the disposal cell. The stockpile cell would be configured to allow for collection of any MIW leachate generated from precipitation events. The collected MIW leachate would be transferred to the leachate holding cell/tank for interim storage prior to prior to disposal.

### Disposal Cell

The disposal cell would be constructed to serve as the final disposal location for mining-related wastes. Construction of the disposal cell would be designed and constructed to isolate newly placed mining-related wastes in the repository from existing Mayflower impoundment tailings and to limit infiltration of MIW leachate into the existing impoundment tailings. Leachate will be collected and conveyed to a leachate holding cell/tank for interim storage prior to disposal. Depending on the characteristics of the wastes disposed of at the repository, different disposal cell configurations could be considered during remedial design. The configurations that could be

considered include cell concepts that are more amenable to unsolidified mining-related wastes, such as bermed areas, or cell concepts more that are typical of a landfill-type configuration. While the details of the disposal cell will be determined through the remedial design process, the ultimate capacity of the repository will depend on the configuration selected and the amount of dewatering agents required, if necessary.

**Leachate Holding Cell/Tank**

A leachate holding cell/tank would be constructed at the repository to temporarily store MIW leachate prior to disposal. Treatment of leachate, if necessary, would take place on-site in a manner appropriate for the quality and quantity of the leachate prior to disposal, such as treatment at the Gladstone IWTP prior to discharge.

**Additional Repository Components**

Stormwater controls consisting of lined channels would divert stormwater away from the repository and toward the previously constructed stormwater controls at Mayflower tailings impoundment 4. Additional BMPs would be implemented as necessary to address potential erosion and sedimentation issues, such as constructing a detention basin to control stormwater runoff.

The existing access road at the impoundment 4 could be utilized; however, road improvements or additional access road construction could be implemented if necessary. Access road considerations for impoundments 1 and 2, such as concerns regarding traffic near the Mayflower Mill area at impoundment 1, would be evaluated once waste placement operations transitioned to those impoundments. Access controls, such as temporary fencing, would be installed around the operational area of the impoundment.

**Institutional Controls**

ICs would be implemented at the repository, which are assumed to consist of governmental and proprietary controls and associated informational devices, although enforcement tools with IC components could be used as necessary to accomplish the same IC objectives. The IC objectives are to protect engineered remedial features likely to be permanent and to limit public access to the repository. These ICs would be in addition to any current or future ICs implemented for OU2. Preparation of an IC implementation and assurance plan would be performed to assist in monitoring and maintaining the ICs. Public engagement during the construction and operation of the repository would be performed through channels such as fact sheets, public meetings, or newsletters.

**Waste Placement Operations**

After the initial components of the repository are constructed (i.e., repository cells and water management components) and BMPs are implemented, waste placement operations would begin. Wastes that were generated pursuant to other decision documents, could be placed within the

repository. It is currently estimated that approximately 18,000 ECY of stockpiled treatment sludges and mine wastes would be placed initially within the disposal cell, as described in Exhibit 12-1. While the remedial design will provide more refined estimates, with optimal waste characteristics, it is currently estimated that the disposal cell at impoundment 4 could be expanded over time to a capacity of 508,300 ECY under a maximum volume placement scenario. As noted previously, depending on waste characteristics different disposal cell configurations could be considered during remedial design which may reduce the overall capacity below the maximum volume indicated.

Treatment sludges from the Gladstone IWTP would be loaded from their current location and transported to the repository. Additionally, mine wastes, including mine wastes from the IRAs in the 2019 IROD for OU1 and mine wastes from future response actions may be transported to the repository. It is assumed that both treatment sludges and mine wastes would be placed within the same disposal cell. However, there is flexibility to consider alternative configurations during remedial design. Separation of treatment sludges and mine wastes through separating layers or lifts could be considered to limit waste management and repository operational issues such as differential settlement or MIW leachate system plugging. Phasing of waste placement cells may be considered as well prior to reaching full capacity of tailings impoundment 4.

As tailings impoundment 4 waste disposal cells reach capacity, temporary cover would be placed over them until final disposal cell closure. If final disposal capacity were exhausted for disposal cells on impoundment 4, waste placement operations could then begin on impoundments 1 and 2 as future waste generation and disposal decisions are made.

The remedial design will incorporate BMPs to reduce leachate generation and waste dispersion, potentially including placing a temporary cover over the disposal cell between operational seasons.

Monitoring and maintenance of the Bonita Peak Repository would be performed periodically during waste placement operations. These activities would include controlling water from the drying cells and any MIW leachate that is generated from the disposal cell and collected in the leachate holding cell/tank. Treatment of water collected from these cells, if necessary, would take place on-site in a manner appropriate for the quality and quantity of the leachate prior to disposal, such as treatment at the Gladstone IWTP prior to discharge. Periodic maintenance would also be conducted on the leachate collection system below the disposal cell as necessary to ensure that blockages do not inhibit functionality and leaks do not result in discharges from the repository. Additional maintenance activities would include maintaining access controls (fencing) and stormwater controls and implementing BMPs.

A groundwater monitoring and cell leak detection program would be implemented during waste placement operations and postclosure to monitor for migration of contaminants from the repository to groundwater.

## Repository Closure

Once phased waste placement operations are complete, closure of the disposal cells and ultimately the repository would be conducted by installing a cover system over consolidated sludge and mine waste in a given disposal cell, which would be refined during remedial design. Following construction of the cover, permanent access controls, such as fencing and gates, where appropriate, would be constructed around the repository. Repository closure would also include decommissioning of the drying cells and the stockpile cell.

## Postclosure O&M

O&M of the Bonita Peak Repository would be performed routinely after final closure of the repository. The cover system would be maintained to minimize infiltration into the underlying wastes within the disposal cell. Periodic inspections of the cover system and access controls would be conducted, which includes inspection for erosion and exposed liner, inspection of vegetative cover and stormwater controls, and inspection of any gates and fencing for damage. Any necessary repairs or improvements would be made at that time. Postclosure maintenance would also include periodic management of MIW leachate, as necessary. Treatment of water collected from these cells, if necessary, would take place on-site in a manner appropriate for the quality and quantity of the leachate prior to disposal, such as treatment at the Gladstone IWTP prior to discharge.

A groundwater monitoring and cell leak detection program would be implemented both during waste placement operations and postclosure to monitor for migration of contaminants from the repository to groundwater.

Exhibit 12-1 provides a summary of the major remedial components for the Bonita Peak Repository selected interim remedy and the estimated quantities for these components.

**Exhibit 12-1 Summary of Major Remedial Components**

| Remedial Component | Unit | Estimated Quantity |
|---|---|---|
| Approximate available repository footprint<br>• Impoundment 4 = 21<br>• Impoundment 1 = 7<br>• Impoundment 2 = 4.5 | Acres | 32.5 |
| Approximate known waste placement volume for disposal cell | ECY | 18,000 |
| Approximate maximum waste placement volume for disposal cell<br>• Impoundment 4 = 508,300<br>• Impoundment 1 = 67,000<br>• Impoundment 2 = 33,800 | ECY | 609,100 |

**Notes:** Although detailed quantities have been provided, they should be considered approximate for evaluation purposes only and will be reevaluated during remedial design. Approximate known waste placement volumes are based on best available information for sludge generated from the Gladstone IWTP and mine wastes expected to be generated from the IRAs in the 2019 IROD. Approximate maximum waste placement volumes are based on optimal waste characteristics. Depending on waste characteristics different disposal cell configurations could be considered during remedial design which may reduce the overall capacity below the maximum volume indicated.

## 12.4 ESTIMATED COST OF THE SELECTED INTERIM REMEDY

The present value cost for fully implementing the selected interim remedy (utilizing tailings impoundment 4 for disposal until it reaches capacity followed by utilizing tailings impoundments 1 and 2), which utilized a 7 percent real discount rate during the 160 year period of analysis, is approximately $10,443,000. The estimated total capital costs in present value dollars are $3,288,000. The average annual O&M and periodic costs in constant dollars (incurred during the 160 year period of analysis) are approximately $65,000 and $420,000, respectively. The costs documented for the selected interim remedy assume the use of a phased approach to construction of the Bonita Peak Repository. Present value costs for future phases are discounted through the utilization of a discount rate. As noted in Section 10.1.7, present value costs for Alternatives R1 through R4 in the FFS did not assume the use of phased construction; therefore, the majority of capital costs for those alternatives were assumed to be incurred in Year 0. Table 12-1 presents the cost estimate summary for the full implementation of the selected interim remedy, including the present value analysis on a year-by-year basis.

Appendix B provides supplemental cost tables to estimate the costs associated with two additional phased costing scenarios. The cost for initial development of the repository (initial phase of construction consisting of a repository with an initial capacity of approximately 100,000 cubic yards), as presented in Table B-1 of Appendix B, is approximately $2,504,000 in present value dollars (during the 1 year period of analysis). The cost for implementing the initial phase of the selected interim remedy (placement of approximately 100,000 cubic yards of waste), as presented in Table B-2 of Appendix B, is approximately $8,377,000 in present value dollars (incurred during the 22 year period of analysis).

The information in Table 12-1 and Appendix B is based on the best available information regarding the anticipated scope of the Bonita Peak Repository selected interim remedy. For purposes of this IROD, the cost estimates presented in this IROD assume that the repository construction at Mayflower tailings impoundment 4 would be split out into five separate and equal phases. Changes in this phasing approach or in assumptions for the cost elements may occur as a result of new information and data collected during the engineering design of the selected interim remedy. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

## 12.5 EXPECTED OUTCOMES OF THE SELECTED INTERIM REMEDY

The Bonita Peak Repository selected interim remedy will provide protection of human health and the environment in both the short term and long term by isolating mining-related wastes, providing safe, permanent disposal of Gladstone IWTP sludge and of certain mining-related wastes from across the Site. While the selected remedy will provide protection of human and health and the environment, hazardous substances, pollutants, or contaminants will remain at the Site such that a five-year review will be required.

The use of liner and leachate collection and management systems will minimize the infiltration of the MIW leachate to groundwater. Interim covers will be placed on the waste disposal cells as they reach capacity to minimize the infiltration of water into the underlying mining-related wastes in the disposal cell. The cover system, in addition to the drainage controls will direct stormwater away from the mining-related wastes to minimize migration of contamination to the surface waters. Temporary cover systems, dust suppression, and other BMPs will be used during waste placement operations to minimize dust generation. Berming and sloping will be used to reduce erosion and generation of MIW leachate from precipitation, snowmelt, and runoff. ICs will be implemented at the repository, consisting of proprietary controls and associated informational devices to protect engineered remedial features and to prevent land uses incompatible with a mine waste repository. Access controls, such as fencing and signage, will limit public access to the repository.

Monitoring and maintenance of the repository will be routinely conducted post-closure to maintain the integrity of the repository for long-term effectiveness and permanence. Routine monitoring will consist of nonintrusive (surface) visual inspection to assess maintenance requirements; maintenance will then be performed as necessary to maintain the integrity of the repository components.

With optimal waste characteristics, the estimated maximum capacity for tailings impoundment 4 is 508,300 cubic yards. With that capacity, it is estimated that this impoundment can operate for up to 130 years based on the current sludge generation rates and estimated volumes of wastes identified in the 2019 IROD. Once tailings impoundment 4 has reached capacity, waste placement operations will begin at tailings impoundments 1 and 2, with expected capacities of approximately 67,000 cubic yards and 33,800 cubic yards, respectively. The anticipated timeline to reach capacity at the additional impoundments is 25 years, resulting in an anticipated 155 year life expectancy and total waste capacity of 609,100 cubic yards for the Bonita Peak Repository. Because of uncertainties in waste volumes and waste characteristics to be disposed of at the Bonita Peak Repository, those estimates may vary from the maximum capacities and timeframes presented.

Implementation of the selected interim remedy could result in positive economic benefits to the local service industry (i.e., hotels and restaurants) and/or local construction firms or other support industries based on the anticipated scope and scale of activities anticipated. Environmental and ecological benefits include the ability to continue operation of the Gladstone IWTP to reduce COPEC loading to Cement Creek. As noted in Section 7.1, it was estimated that the COPEC load removed at the Gladstone IWTP from the Gold King Mine adit discharge to Cement Creek is 992 pounds per day in 2016. In addition, the planned repository could promote ecological recovery by allowing for proper management of wastes generated from the 2019 IRAs.

# 13.0 INSTITUTIONAL AND LAND USE CONTROLS

ICs are defined as "non-engineered instruments that help minimize the potential for exposure to contamination and/or protect the integrity of a response action" in the *Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites* (EPA 2012). ICs are a subset of LUCs. LUCs include engineering and physical barriers, such as fences and signs, and ICs.

Final ICs will be selected in the final ROD; however, the NCP recommends that ICs should be used to supplement engineering controls during all phases of cleanup (see NCP § 300.430(a)(1)(iii)(D)). The need for and type of LUCs, including ICs, will be evaluated during the design phase of this IRA. Prior to the final ROD, EPA and the State of Colorado will work together to implement LUCs, including ICs, necessary to protect the integrity of the IRA taken in this IROD. ICs will include governmental or proprietary controls on land use as provided by the Colorado Environmental Covenants Statute, CRS §§ 25-15-317 et seq., and CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.5.4, enforcement tools that limit certain activities, and associated informational devices to provide information or notification to local communities and other interested persons, as appropriate.

## 13.1 INSTITUTIONAL AND LAND USE CONTROLS AT BONITA PEAK REPOSITORY

ICs will be implemented at the repository, which are assumed to consist of governmental controls in the form of a San Juan County ordinance, proprietary controls, and associated informational devices, although enforcement tools with IC components could be used as necessary to accomplish the same IC objectives. These IC objectives are primarily to protect engineered remedial features likely to be permanent and secondarily to exclude public access to the repository. The engineered remedial features that are likely to be permanent include the repository disposal cell and leachate holding cell/tank where mining-related wastes will be left in place, and other cells in which engineered components would remain. These ICs will be in addition to any current or future ICs implemented for OU2. Preparation of an IC implementation and assurance plan will be performed to assist in monitoring and maintaining the ICs. Public engagement during the construction and operation of the repository would be performed through channels such as fact sheets, public meetings, and newsletters. EPA will work with the State of Colorado to implement ICs pursuant to the Colorado Environmental Covenants Statute and other appropriate ICs.

## 13.2 LAND USE RESTRICTIONS

The repository is an engineered feature that will require monitoring, maintenance or operations to ensure it functions as intended. The repository is also an area where mining-related wastes will be left in place and restrictions on excavation, grading, drilling, tilling or other soil disturbing activities will be imposed. These restrictions only pertain to the Mayflower impoundments to the

degree that changed use of the impoundments could disturb the Bonita Peak Repository and/or supporting repository components and compromise their ability to function as intended.

The following land use restrictions were included in the San Juan County Ordinance No. 2020-01 and will be included in any environmental covenant or notice of environmental use restriction recorded as an IC pursuant to this IROD for the Bonita Peak Repository:

> "No excavation, drilling, grading, digging, tilling, or any other soil-disturbing activity is allowed within any Remediated Mine Waste Source Areas containing residual contamination at levels that have been determined to be safe for one or more specific uses, but not all uses, including mine tailings, waste-rock impoundments, or engineered structures or features that require monitoring, maintenance, or operation or that will not function as intended if it is disturbed, except as authorized in a remedial decision document or with the prior written authorization of CDPHE."

# 14.0 STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, EPA must select a remedy that is protective of human health and the environment, complies with or appropriately waives ARARs, is cost effective, and uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that include treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element. The following sections discuss how the Bonita Peak Repository meets these statutory requirements.

## 14.1 BONITA PEAK REPOSITORY

The following subsections discuss the statutory determinations for the Bonita Peak Repository of the selected interim remedy. The ARARs identified for the Bonita Peak Repository are included in Appendix A.

### 14.1.1 Protection of Human Health and the Environment

The Bonita Peak Repository will provide adequate protection of human health and the environment. Containment elements of the repository, such as the use of bottom liner systems, will be final elements of the remedial action and will be protective to human health and the environment in the long term by isolating mining-related wastes from the surrounding environment. Other elements of the repository include MIW leachate collection, management, and disposal, which will be interim in nature. These interim solutions will be protective to human health and the environment in the short term and would provide adequate protection until a final remedy is selected for contaminated water management and disposal. Mining-related wastes and resulting MIW leachate will be controlled through the use of a liner and cover systems at the cells within the repository and through the use of dust suppression and other BMPs to minimize fugitive dust during waste placement operations. During winters and other periods of extended inactivity, temporary covers will be utilized as necessary to minimize dust generation. Surface water runoff from the repository will be controlled to minimize transport and deposition of COPECs into a receiving stream that would contribute to unacceptable ecological risk through BMPs, such as berming and sloping, to reduce erosion and generation of MIW leachate from precipitation, snowmelt, and runoff. Further, ICs to prevent land uses incompatible with a mine waste repository and access controls, such as fencing and signage, will limit public access to the repository.

### 14.1.2 Compliance with ARARs

Location- and action-specific ARARs for the Bonita Peak Repository selected interim remedy will be addressed during implementation of the IRA, as indicated in the following paragraphs.

**Erosion, dust, and noise control:** Measures to control erosion, dust, and noise during construction and operation of the repository would be implemented to meet the requirements of federal and state ARARs.

Fugitive dust would be suppressed using BMPs during construction, operations, and maintenance to comply with the substantive requirements of the Colorado Fugitive Dust Control Plan/ Opacity Regulation No. 1. Sections III.D.2.b, III.D.2.f, 5 CCR 1001-3, pursuant to Colorado Air Pollution Prevention and Control Act, CRS §25-7-101 et seq., and the CDPHE Regulations Pertaining to Solid Wastes Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.3 (Site and Facility Standards – nuisance conditions prohibited). Additionally, repository cell components will be designed and constructed to mitigate the potential for fugitive dust after cell closure to avoid nuisance conditions and meet the substantive requirements of CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.5.6 (Closure of Solid Waste Disposal Sites and Facilities – prevent nuisance conditions).

Noise abatement measures will be implemented during construction, operations, and maintenance to comply with the Colorado Noise Abatement Statute, CRS §25-12-103 (Maximum Permissible Noise Levels), CRS §25-12-110 (Off-highway vehicles) and CDPHE Regulations pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Sections 2.1.3 (Site and Facility Standards – nuisance conditions prohibited).

**Mining-Related Waste Management:** Treatment sludge from the Gladstone IWTP and mine wastes from IRAs and other CERCLA response actions meet the exclusion requirements for identification as a hazardous waste indicated in 40 CFR 261.4(b)(7), commonly known as the Bevill exclusion, and will be regulated as solid waste. No other solid waste that could be identified as a hazardous waste is anticipated to be generated during implementation of the alternative, thus meeting the substantive requirements of CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.2 (Site and Facility Standards – hazardous waste prohibited).

No mining-related wastes will be placed in groundwater or surface water, thus meeting substantive requirements of CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.17 (Site and Facility Standards – disposal below or into surface or groundwater prohibited) and 6 CCR 1007-2, Part 1, Section 3.1 (Location restrictions). Bulk or containerized liquid wastes will not be placed in the disposal cell, thus meeting the substantive requirements of RCRA Subtitle D, 42 U.S.C. §6901 and implementing regulations codified at 40 CFR 258.28(a)(2) and 258.28(b)(2).

**Disposal Cell Components:** Bottom liners, leachate collection system, top liner, and cover material for the repository will be designed, constructed, operated, and maintained to meet substantive requirements of CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.2.5(B) through (D), and 3.2.6 (Design Requirements), Section 3.5.2 (Closure – grading requirements), Section 3.5.3 (Closure – final cover permeability), and Section 3.6 (Post Closure Care and Maintenance – post closure requirements).

**Surface Reclamation and Rehabilitation:** All surface reclamation activities under these alternatives, including grading, and periodic inspections of the cover, will be maintained to meet substantive requirements of CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.6 (Post Closure Care and Maintenance – post closure

requirements). Additionally, noxious weeds will be managed during construction, operations, and maintenance of disturbed areas and vegetated areas to meet the substantive requirements of the Colorado Noxious Weed Act CRS § 35-5.5-104 (Duty to Manage Noxious Weeds) and the implementing regulations codified at 8 CCR 1206-2, sections 3.1, 3.3, 3.4, 4.1, 4.4, and the San Juan County Plan B Species Elimination plan.

**Stormwater Management:** All stormwater runoff that is generated during construction, operation, and maintenance of the repository will be routed to stormwater management facilities through run-on/runoff controls to meet the substantive requirements of CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Sections 2.1.6 and 2.5.7 (Closure of Solid Waste Disposal Sites and Facilities – run-on/runoff controls required) and CDPS Regulations, 5 CCR 1002-61.3(2)(a) and (f)(ii), and CDPS general permit No. COR400000 (stormwater discharges associated with construction activity), pursuant to CRS § 25-8-501.

**MIW Leachate Management:** All MIW leachate produced from repository operations and maintenance will be managed and collected at the repository. Treatment of leachate, if necessary, will take place on-site in a manner appropriate for the quality and quantity of the leachate prior to discharge, thus meeting the substantive requirements of CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.6 (Post Closure Care and Maintenance – post closure requirements).

**Groundwater and Surface Water Protection:** A groundwater monitoring program and associated point of compliance would be established to meet the substantive requirements of CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Sections 2.2 (Ground Water Monitoring – groundwater monitoring required), 2.1.4 (Site and Facility Standards – water pollution prohibited), 2.1.15 (Site and Facility Standards – groundwater protection standards compliance), 2.5.5 (Closure of Solid Waste Disposal Sites and Facilities – prevent water pollution), and Section 3.6 (Post Closure Care and Maintenance – post closure requirements).

**Institutional Controls and Access Controls:** ICs in the form of governmental or proprietary controls and associated informational devices (i.e., an environmental covenant, notice of environmental use restrictions or County Ordinance) would be implemented for the repository disposal cell and leachate holding cell/tank where waste would be left in place and other cells in which engineered components would remain to comply with the substantive requirements of the Colorado Environmental Covenants Statute, CRS § 25-15-317 et seq., and CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.5.4 (Closure of Solid Waste Disposal Sites and Facilities – prevent unauthorized disposal).

Access controls will be implemented through appropriate signage and access restrictions, such as fencing to protect human health, the environment, and repository components through limiting public access, and will meet the substantive requirements of CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.8 (Site and Facility Standards –public access ).

**Additional Construction and Operation Locational Considerations:** There are additional construction and operation locational consideration ARARs that have substantive requirements that will be considered and met during implementation of the Bonita Peak Repository as indicated in the following paragraphs.

Cultural resource surveys have not been completed for the tailings impoundments. If cultural resources eligible for the national register are present, it will be necessary during remedial design and remedial action to determine if there will be an adverse effect, and if so, how the effect may be minimized or mitigated. The Mayflower Mill adjacent to Mayflower tailings impoundment 1 was listed as a National Historic Landmark in 2000. Construction activities at Mayflower tailings impoundment 1 will be conducted to eliminate or minimize adverse effects to the historical features in accordance with the National Historic Preservation Act, 16 U.S.C. §470 and implementing regulations codified at 36 CFR Parts 800.4, 800.5, 800.6, and 800.10(a).

Wetland surveys have not been completed for the tailings impoundments; however, the current footprint of Mayflower tailings impoundment 4 and an area around the base of Mayflower tailings impoundment 1 each contain a wetland, according to the National Wetlands Inventory. If wetlands are confirmed on the impoundments after survey, then repository cell siting will be carried out in a manner to avoid them or meet other referenced regulations in accordance with CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.1 (Location Restrictions).

A review to determine whether significant aquifer recharge areas exist within the area of the Mayflower tailings impoundments has not been conducted. If significant recharge areas are identified, the construction, operation, and maintenance of repository cells will be conducted in a manner to avoid adversely impacting them in accordance with CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.5 (Minimum Standards – aquifer recharge areas).

A cursory review of faults indicated no Holocene faults are present at any of the impoundments, meeting the substantive requirements in 6 CCR 1007-2, Part 1, Section 3.1 (Location Restrictions). However, a more extensive review would be required as part of remedy implementation. Additionally, a preliminary review of unstable areas has been completed but a seismic review has not been completed. The use of a setback from the edge of impoundments was used to avoid unstable areas. However, if the repository is determined to still be located in unstable areas or a seismic impact zone, engineering measures and/or seismic-resistant components would be incorporated as part of remedial design as indicated in 6 CCR 1007-2, Part 1, Section 3.1.5 (Site standards – unstable areas).

If bald or golden eagles are identified during remedial design and remedial action, activities will be modified and conducted to conserve the species and their habitat to comply with the substantive requirements of the Bald and Golden Eagle Protection Act, 16 U.S.C. §668(a).

If federal threatened or endangered species for San Juan County are identified at these tailings impoundment during remedial design and remedial action, activities will be modified and

conducted to conserve the species and their habitat in accordance with Endangered Species Act, 16 U.S.C. §1536, and implementing regulations codified at 50 CFR 17.21, 17.31, 17.61, 17.71 and 17.82. Additionally, if state-identified endangered and threatened species are present, they would be protected from detrimental actions during construction, operations and maintenance to meet the substantive requirements of the Colorado Wildlife Commission Regulations, 2 CCR 406-10:1002-1004, pursuant to the Colorado Nongame, Endangered, or Threatened Species Conservation Act, CRS §§ 33-2-104(3).

If migratory birds are identified during remedial design and remedial action, activities would be modified and conducted to conserve the species and their habitat in accordance with Migratory Bird Treaty Act, 16 U.S.C. §703(a). Additionally, actions detrimental to migratory birds would be prohibited as indicated within the Colorado Wildlife Enforcement and Penalties Act, CRS § 33-6-128.

Other wildlife, including nongame wildlife, that may be present at the Mayflower tailings impoundments would be protected from detrimental actions during construction, operations and maintenance to meet the substantive requirements of the Colorado Wildlife Enforcement and Penalties Act, CRS §§ 33-6-128 and the Colorado Wildlife Commission Regulations, 2 CCR 406-10:1002-1004, pursuant to the Colorado Nongame, Endangered, or Threatened Species Conservation Act, CRS §§ 33-2-104(3).

#### 14.1.2.1 ARAR Waivers

CERCLA ARAR waivers are not anticipated to be required to achieve compliance given the potential availability of variances within state law and regulations, particularly for solid waste disposal. If any ARAR cannot be complied with directly or through variances identified in state law and regulations, a CERCLA waiver may be pertinent. The CERCLA interim measures waiver is most relevant to address compliance with ARARs for conditions that are uncertain, such as groundwater and stormwater that will continue to be investigated as part of the OU2 RI. Other CERCLA waivers may be pertinent for ARARs requiring prescriptive repository components that could achieve equivalent performance through alternate materials and methods.

### 14.1.3 Cost Effectiveness

The Bonita Peak Repository selected interim remedy is cost effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost effective if its costs are proportional to its overall effectiveness" [NCP §300.430(f)(1)(ii)(D)]. This is determined by evaluating the overall effectiveness of the selected interim remedy and comparing that effectiveness to the overall costs. Effectiveness is evaluated by examining how the remedy meets three criteria: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. Overall effectiveness of the remedial alternatives was compared to costs to determine cost effectiveness. The relationship of the overall effectiveness of the Bonita Peak Repository selected interim remedy was determined to be proportional to its cost, and hence this remedy represents a reasonable value for the cost to be incurred.

The cost for the full implementation of the Bonita Peak Repository selected interim remedy is expected to have a cost of approximately $10,350,000 in present value dollars (during the 160 year period of analysis). EPA believes the selected interim remedy achieves an appropriate balance between cost effectiveness and protection of human health and the environment.

### 14.1.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

This determination looks at whether the selected interim remedy provides the best balance of tradeoffs among the alternatives with respect to the balancing criteria set forth in NCP §300.430(f)(1)(i)(B) such that it represents the maximum extent to which permanence and treatment can be practicably used at the Bonita Peak Repository. NCP §300.430(f)(1)(ii)(E) provides that the balancing shall emphasize the factors of "long-term effectiveness" and "reduction of toxicity, mobility, or volume through treatment," and shall consider the preference for treatment and bias against off-site disposal. The modifying criteria were also considered in making this determination.

The Bonita Peak Repository selected interim remedy consists of both permanent and interim solutions. The permanent solutions and treatment technologies include providing a permanent disposal location for wastes generated on-site. Interim components of the remedy include collection, management, and disposal (including treatment before discharge, if necessary), of the repository-generated MIW leachate. This measure may reduce the toxicity, mobility, and volume through treatment of MIW leachate in the interim, depending on characteristics of the leachate. Permanent solutions to address these interim elements of the remedy will be addressed as part of the final response action.

### 14.1.5 Preference for Treatment as a Principal Element

This determination looks at whether the selected interim remedy provides treatment as a principal element. The NCP establishes the expectation that treatment will be used to address principal threat wastes whenever practicable (40 CFR 300.430[a][1][iii][A]). Principal threat wastes are those source materials that are considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or will present a significant risk to human health and the environment should exposure occur. As discussed in Section 11.0 of this IROD, EPA has determined that media addressed by this IRA do not involve principal threat wastes. In addition, because this action does not constitute the final remedy, the CERCLA statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element will be considered and addressed by the final response action, particularly the final solutions for repository generated MIW leachate.

### 14.1.6 Five-Year Site Reviews

As part of the selected interim remedy, hazardous substances, pollutants or contaminants will remain at the Site. Therefore, five-year reviews pursuant to CERCLA §121(c) and NCP §300.430(f)(5)(iii)(C) are assumed to be conducted for the selected interim remedy. EPA shall

conduct a review of remedial actions no less often than each 5 years after the initiation of such remedial action to ensure the remedy is or will be protective of human health and the environment.

## 15.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The proposed plan for the Bonita Peak Repository was released for public comment in July 2020. The plan identified the combination of Alternatives R1, R2, and R4 as the preferred alternative for a sitewide mine waste repository, with initial construction at Mayflower tailings impoundments 1 and 2. After careful consideration of the comments, new information offered, and recent developments related to the OU2 RI, the EPA and the state decided that the selected remedy will initially be constructed in a phased approach at Mayflower tailings impoundment 4, rather than at Mayflower tailings impoundments 1 and 2. The selected interim remedy will still involve a combination of Alternatives R1, R2, and R4 but, as described in Section 12.0, implemented in a different order.

New information provided through public comments include concerns around impacts to the nonmotorized trail (located adjacent to Mayflower tailings impoundment 2) and the potential presence of an avalanche chute between Mayflower tailings impoundments 1 and 2. Initial literature searches of potential for avalanches indicates a potential avalanche chute between Mayflower tailings impoundments 1 and 2, and no mapped avalanche chutes in the immediate vicinity of Mayflower tailings impoundment 4. Modifications to the selected remedy to initially use Impoundment 4 for the repository instead of Impoundments 1 and 2 as discussed in Section 12.0 lessen concerns about the impacts to the non-motorized trail and near-term impacts from the mapped avalanche chute on repository components. Further evaluation of the potential avalanches will be conducted as part of the remedial design phase.

Additionally, it was noted in the FFS that there were greater data needs for the ongoing OU2 RI at Mayflower tailings impoundment 4. However, since the public release of the FFS and the proposed plan, investigation efforts at Mayflower tailings impoundment 4 have progressed, including completion of infrastructure to better understand nature and extent within several previously identified areas of data needs. Based on these developments, OU2 RI-related impacts to the implementation of a repository at Mayflower tailings impoundment 4 are expected to be more limited. In addition, utilizing a phased approach to constructing a repository at Mayflower tailings impoundment 4 (i.e., only using a portion of the impoundment 4 footprint initially) would further limit impacts and allow future OU2 RI characterization to continue as needed in areas outside the phased repository footprint.

The selected interim remedy is described in Section 12.0 of this IROD. In addition, final identification of ARARs pertaining to the selected interim remedy have been made, as presented in Appendix A.

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# TABLES

**Table 12-1: Cost Estimate Summary of Selected Interim Remedy for Interim Record of Decision - Full Implementation of Selected Interim Remedy**

**Impoundment 4: Phase 1**

**CAPITAL COSTS: (Assumed to be Incurred During Year 0) (Initial Construction at Impoundment 4 [Phase 1])**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Legal Controls | 1 | LS | $13,443 | $13,443 |
| Mobilization/Demobilization | 1 | LS | $8,318 | $8,318 |
| Access Road Improvements (Impoundment 4) | 1 | LS | $37,365 | $37,365 |
| General Conditions - Project-Dedicated Supervisory Staff (Repository Initial Development) | 1 | LS | $292,766 | $292,766 |
| General Conditions - Construction Facilities (Repository Initial Development) | 1 | LS | $27,896 | $27,896 |
| Surveying (Repository Initial Development) | 1 | LS | $50,181 | $50,181 |
| Erosion and Sediment Controls and Temporary Access Controls | 1 | LS | $24,057 | $24,057 |
| Dust Supression and Decontamination | 400 | HR | $185 | $74,027 |
| Borrow Material Development and Import of Materials (Impoundment 4 Phase 1) | 1 | LS | $331,582 | $331,582 |
| Preparation of Repository (Impoundment 4 Phase 1) | 1 | LS | $77,006 | $77,006 |
| Construction of Liner System for Drying Cell (Impoundment 4) | 1 | LS | $70,561 | $70,561 |
| Construction of Liner System for Disposal Cell (Impoundment 4 Phase 1) | 1 | LS | $540,266 | $540,266 |
| Construction of Leachate Holding Cell (Impoundment 4) | 1 | LS | $17,891 | $17,891 |
| Construction of Stockpile Cell | 1 | LS | $1,870 | $1,870 |
| Construction of Lined Drainage Channels (Impoundment 4 Phase 1) | 1 | LS | $16,754 | $16,754 |
| Community Awareness Activities | 1 | LS | $5,824 | $5,824 |
| SUBTOTAL | | | | $1,589,807 |
| Contingency (Scope and Bid) | 25% | | | $397,452 |
| SUBTOTAL | | | | $1,987,259 |
| Project Management | 6% | | | $119,236 |
| Remedial Design | 12% | | | $238,471 |
| Construction Management | 8% | | | $158,981 |
| TOTAL | | | | $2,503,947 |
| **TOTAL CAPITAL COST** | | | | **$2,504,000** |

**CAPITAL COSTS: (Assumed to be Incurred During Year 22) (Closure of Disposal Cell at Impoundment 4 [Phase 1])**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Repository Closure) | 1 | LS | $292,766 | $292,766 |
| General Conditions - Construction Facilities (Repository Closure) | 1 | LS | $20,344 | $20,344 |
| Cover System for Disposal Cell (Impoundment 4 - Phase 1) | 1 | LS | $296,857 | $296,857 |
| SUBTOTAL | | | | $609,967 |
| Contingency (Scope and Bid) | 25% | | | $152,492 |
| SUBTOTAL | | | | $762,459 |
| Project Management | 6% | | | $45,748 |
| Remedial Design | 12% | | | $91,495 |
| Construction Management | 8% | | | $60,997 |
| TOTAL | | | | $960,699 |
| **TOTAL CAPITAL COST** | | | | **$961,000** |

**PERIODIC COSTS: (Assumed to be Incurred During Year 1) (Initial Waste Placement at Impoundment 4 [Phase 1])**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Waste Placement Operations) | 1 | LS | $74,030 | $74,030 |
| General Conditions - Construction Facilities (Waste Placement Operations) | 1 | LS | $12,217 | $12,217 |
| Waste Placement Operations (Sludge from Gladstone IWTP) | 7,300 | ECY | $30 | $218,030 |
| Waste Placement Operations (Mining-Related Waste from 2019 IROD Actions) | 10,700 | ECY | $28 | $304,812 |
| Contaminated Water Management | 20 | DY | $1,358 | $27,160 |
| Winterization | 1 | LS | $33,741 | $33,741 |
| Community Awareness Activities | 1 | LS | $5,824 | $5,824 |
| SUBTOTAL | | | | $675,814 |
| Contingency (Scope and Bid) | 25% | | | $168,954 |
| SUBTOTAL | | | | $844,768 |
| Project Management | 6% | | | $50,686 |
| Technical Support | 10% | | | $84,477 |
| TOTAL | | | | $979,931 |
| **TOTAL PERIODIC COST** | | | | **$980,000** |

**PERIODIC COSTS - (Assumed to be Incurred in Year 2 through 22) (Annual Waste Placement at Impoundment 4 [Phase 1])**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Waste Placement Operations) | 1 | LS | $74,030 | $74,030 |
| General Conditions - Construction Facilities (Waste Placement Operations) | 1 | LS | $12,217 | $12,217 |
| Contaminated Water Management | 20 | DY | $1,358 | $27,160 |
| Winterization | 1 | LS | $33,741 | $33,741 |
| Annual Waste Placement Operations | 3,830 | ECY | $37 | $141,188 |
| SUBTOTAL | | | | $288,336 |
| Contingency (Scope and Bid) | 25% | | | $72,084 |
| SUBTOTAL | | | | $360,420 |
| Project Management | 8% | | | $28,834 |
| Technical Support | 10% | | | $36,042 |
| TOTAL | | | | $425,296 |
| **TOTAL PERIODIC COST** | | | | **$425,000** |

**Table 12-1: Cost Estimate Summary of Selected Interim Remedy for Interim Record of Decision - Full Implementation of Selected Interim Remedy**

**PERIODIC COSTS - REPLACEMENT OF STOCKPILE LINER (Assumed to be Incurred Once Every 5 Years During Year 1 through 155)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Replacement of Stockpile Liner | 1 | LS | $1,683 | $1,683 |
| SUBTOTAL | | | | $1,683 |
| Contingency (Scope and Bid) | 25% | | | $421 |
| SUBTOTAL | | | | $2,104 |
| Project Management | 10% | | | $210 |
| Technical Support | 10% | | | $210 |
| TOTAL | | | | $2,524 |
| **TOTAL PERIODIC COST** | | | | **$3,000** |

**ANNUAL COSTS (Assumed to be Incurred Annually During Year 1 through 22)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Groundwater Monitoring Activities (Impoundment 4) | 1 | LS | $27,316 | $27,316 |
| SUBTOTAL | | | | $27,316 |
| Contingency (Scope and Bid) | 20% | | | $5,463 |
| SUBTOTAL | | | | $32,779 |
| Project Management | 10% | | | $3,278 |
| Technical Support | 10% | | | $3,278 |
| TOTAL | | | | $39,335 |
| **TOTAL ANNUAL COST** | | | | **$39,000** |

**Impoundment 4: Phases 2 - 5**

**CAPITAL COSTS: (Assumed to be Incurred in Years 23, 50, 77, and 104) (Initial Construction at Impoundment 4 [Phases 2 through 5])**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Mobilization/Demobilization | 1 | LS | $8,318 | $8,318 |
| General Conditions - Project-Dedicated Supervisory Staff (Repository Initial Development) | 1 | LS | $292,766 | $292,766 |
| General Conditions - Construction Facilities (Repository Initial Development) | 1 | LS | $27,896 | $27,896 |
| Surveying (Repository Initial Development) | 1 | LS | $50,181 | $50,181 |
| Erosion and Sediment Controls and Temporary Access Controls | 1 | LS | $24,057 | $24,057 |
| Dust Supression and Decontamination | 400 | HR | $185 | $74,027 |
| Borrow Material Development and Import of Materials (Impoundment 4 Phases 2-5) | 1 | LS | $262,694 | $262,694 |
| Preparation of Repository Surfaces (Impoundment 4 Phases 2-5) | 1 | LS | $26,391 | $26,391 |
| Construction of Liner System for Disposal Cell (Impoundment 4 Phases 2-5) | 1 | LS | $540,266 | $540,266 |
| Construction of Lined Drainage Channels (Impoundment 4 Phases 2-5) | 1 | LS | $15,220 | $15,220 |
| Community Awareness Activities | 1 | LS | $5,824 | $5,824 |
| SUBTOTAL | | | | $1,327,640 |
| Contingency (Scope and Bid) | 25% | | | $331,910 |
| SUBTOTAL | | | | $1,659,550 |
| Project Management | 6% | | | $99,573 |
| Remedial Design | 12% | | | $199,146 |
| Construction Management | 8% | | | $132,764 |
| TOTAL | | | | $2,091,033 |
| **TOTAL CAPITAL COST** | | | | **$2,091,000** |

**CAPITAL COSTS: (Assumed to be Incurred in Years 49, 76, 103, 130) (Closure of Disposal Cell at Impoundment 4 [Phases 2 through 5])**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Repository Closure) | 1 | LS | $292,766 | $292,766 |
| General Conditions - Construction Facilities (Repository Closure) | 1 | LS | $20,344 | $20,344 |
| Cover System for Disposal Cell (Impoundment 4 Phases 2-5) | 1 | LS | $296,857 | $296,857 |
| SUBTOTAL | | | | $609,967 |
| Contingency (Scope and Bid) | 25% | | | $152,492 |
| SUBTOTAL | | | | $762,459 |
| Project Management | 6% | | | $45,748 |
| Remedial Design | 12% | | | $91,495 |
| Construction Management | 8% | | | $60,997 |
| TOTAL | | | | $960,699 |
| **TOTAL CAPITAL COST** | | | | **$961,000** |

**CAPITAL COSTS (Assumed to be Incurred During Year 130)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Disposal Cell Cover Allowance (Impoundment 4) | 1 | LS | $300,000 | $300,000 |
| SUBTOTAL | | | | $300,000 |
| Contingency (Scope and Bid) | 20% | | | $60,000 |
| SUBTOTAL | | | | $360,000 |
| Project Management | 8% | | | $28,800 |
| Technical Support | 10% | | | $36,000 |
| TOTAL | | | | $424,800 |
| **TOTAL CAPITAL COST** | | | | **$425,000** |

**Table 12-1: Cost Estimate Summary of Selected Interim Remedy for Interim Record of Decision - Full Implementation of Selected Interim Remedy**

**PERIODIC COSTS - (Assumed to be Incurred in Year 23 through 130) (Annual Waste Placement at Impoundment 4 [Phases 2 through 5])**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Waste Placement Operations) | 1 | LS | $74,030 | $74,030 |
| General Conditions - Construction Facilities (Waste Placement Operations) | 1 | LS | $12,217 | $12,217 |
| Contaminated Water Management | 20 | DY | $1,358 | $27,160 |
| Winterization | 1 | LS | $33,741 | $33,741 |
| Annual Waste Placement Operations | 3,830 | ECY | $37 | $141,188 |
| SUBTOTAL | | | | $288,336 |
| Contingency (Scope and Bid) | 25% | | | $72,084 |
| SUBTOTAL | | | | $360,420 |
| Project Management | 8% | | | $28,834 |
| Technical Support | 10% | | | $36,042 |
| TOTAL | | | | $425,296 |
| **TOTAL PERIODIC COST** | | | | **$425,000** |

**PERIODIC COSTS - REPLACEMENT OF STOCKPILE LINER (Assumed to be Incurred Once Every 5 Years During Year 23 through 130)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Replacement of Stockpile Liner | 1 | LS | $1,683 | $1,683 |
| SUBTOTAL | | | | $1,683 |
| Contingency (Scope and Bid) | 25% | | | $421 |
| SUBTOTAL | | | | $2,104 |
| Project Management | 10% | | | $210 |
| Technical Support | 10% | | | $210 |
| TOTAL | | | | $2,524 |
| **TOTAL PERIODIC COST** | | | | **$3,000** |

**ANNUAL COSTS (Assumed to be Incurred Annually During Year 23 through 130)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Groundwater Monitoring Activities (Impoundment 4) | 1 | LS | $27,316 | $27,316 |
| SUBTOTAL | | | | $27,316 |
| Contingency (Scope and Bid) | 20% | | | $5,463 |
| SUBTOTAL | | | | $32,779 |
| Project Management | 10% | | | $3,278 |
| Technical Support | 10% | | | $3,278 |
| TOTAL | | | | $39,335 |
| **TOTAL ANNUAL COST** | | | | **$39,000** |

**Impoundment 1**

**CAPITAL COSTS: (Assumed to be Incurred During Year 131) (Initial Construction at Impoundment 1)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Legal Controls | 1 | LS | $13,443 | $13,443 |
| Mobilization/Demobilization | 1 | LS | $8,318 | $8,318 |
| Access Road Improvements (Impoundment 1) | 1 | LS | $154,443 | $154,443 |
| General Conditions - Project-Dedicated Supervisory Staff (Repository Initial Development) | 1 | LS | $292,766 | $292,766 |
| General Conditions - Construction Facilities (Repository Initial Development) | 1 | LS | $27,896 | $27,896 |
| Surveying (Repository Initial Development) | 1 | LS | $32,676 | $32,676 |
| Erosion and Sediment Controls and Temporary Access Controls | 1 | LS | $22,481 | $22,481 |
| Dust Supression and Decontamination | 400 | HR | $185 | $74,027 |
| Borrow Material Development and Import of Rock Materials (Impoundment 1) | 1 | LS | $527,411 | $527,411 |
| Preparation of Repository Surfaces (Impoundment 1) | 1 | LS | $34,812 | $34,812 |
| Construction of Liner System for Disposal Cell (Impoundment 1) | 1 | LS | $765,806 | $765,806 |
| Construction of Leachate Holding Cell (Impoundment 1) | 1 | LS | $4,715 | $4,715 |
| Construction of Lined Drainage Channels (Impoundment 1) | 1 | LS | $48,511 | $48,511 |
| Community Awareness Activities | 1 | LS | $5,824 | $5,824 |
| SUBTOTAL | | | | $2,013,129 |
| Contingency (Scope and Bid) | 25% | | | $503,282 |
| SUBTOTAL | | | | $2,516,411 |
| Project Management | 5% | | | $125,821 |
| Remedial Design | 8% | | | $201,313 |
| Construction Management | 6% | | | $150,985 |
| TOTAL | | | | $2,994,530 |
| **TOTAL CAPITAL COST** | | | | **$2,995,000** |

**Table 12-1: Cost Estimate Summary of Selected Interim Remedy for Interim Record of Decision - Full Implementation of Selected Interim Remedy**

**CAPITAL COSTS: (Assumed to be Incurred During Year 148) (Closure of Disposal Cell at Impoundment 1)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Repository Closure) | 1 | LS | $292,766 | $292,766 |
| General Conditions - Construction Facilities (Repository Closure) | 1 | LS | $20,344 | $20,344 |
| Cover System for Disposal Cell (Impoundment 1) | 1 | LS | $395,588 | $395,588 |
| Surveying (Repository Closure) | 1 | LS | $32,676 | $32,676 |
| Permanent Access Controls | 1 | LS | $61,658 | $61,658 |
| SUBTOTAL | | | | $803,032 |
| Contingency (Scope and Bid) | 25% | | | $200,758 |
| SUBTOTAL | | | | $1,003,790 |
| Project Management | 6% | | | $60,227 |
| Remedial Design | 12% | | | $120,455 |
| Construction Management | 8% | | | $80,303 |
| TOTAL | | | | $1,264,775 |
| **TOTAL CAPITAL COST** | | | | **$1,265,000** |

**PERIODIC COSTS - (Assumed to be Incurred in Year 131 through 148) (Annual Waste Placement at Impoundment 1)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Waste Placement Operations) | 1 | LS | $74,030 | $74,030 |
| General Conditions - Construction Facilities (Waste Placement Operations) | 1 | LS | $12,217 | $12,217 |
| Contaminated Water Management | 20 | DY | $1,358 | $27,160 |
| Winterization | 1 | LS | $44,626 | $44,626 |
| Annual Waste Placement Operations | 3,830 | ECY | $37 | $141,188 |
| SUBTOTAL | | | | $299,221 |
| Contingency (Scope and Bid) | 25% | | | $74,805 |
| SUBTOTAL | | | | $374,026 |
| Project Management | 8% | | | $29,922 |
| Technical Support | 10% | | | $37,403 |
| TOTAL | | | | $441,351 |
| **TOTAL PERIODIC COST** | | | | **$441,000** |

**PERIODIC COSTS - REPLACEMENT OF STOCKPILE LINER (Assumed to be Incurred Once Every 5 Years During Year 131 through 148)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Replacement of Stockpile Liner | 1 | LS | $1,683 | $1,683 |
| SUBTOTAL | | | | $1,683 |
| Contingency (Scope and Bid) | 25% | | | $421 |
| SUBTOTAL | | | | $2,104 |
| Project Management | 10% | | | $210 |
| Technical Support | 10% | | | $210 |
| TOTAL | | | | $2,524 |
| **TOTAL PERIODIC COST** | | | | **$3,000** |

**ANNUAL COSTS (Assumed to be Incurred Annually During Year 131 through 148)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Groundwater Monitoring Activities (Impoundment 1) | 1 | LS | $25,053 | $25,053 |
| SUBTOTAL | | | | $25,053 |
| Contingency (Scope and Bid) | 20% | | | $5,011 |
| SUBTOTAL | | | | $30,064 |
| Project Management | 10% | | | $3,006 |
| Technical Support | 10% | | | $3,006 |
| TOTAL | | | | $36,076 |
| **TOTAL ANNUAL COST** | | | | **$36,000** |

**Table 12-1: Cost Estimate Summary of Selected Interim Remedy for Interim Record of Decision - Full Implementation of Selected Interim Remedy**

**Impoundment 2**

**CAPITAL COSTS: (Assumed to be Incurred During Year 148) (Initial Construction at Impoundment 2)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Legal Controls | 1 | LS | $13,443 | $13,443 |
| Mobilization/Demobilization | 1 | LS | $8,318 | $8,318 |
| Access Road Improvements (Impoundment 1) | 1 | LS | $154,443 | $154,443 |
| General Conditions - Project-Dedicated Supervisory Staff (Repository Initial Development) | 1 | LS | $292,766 | $292,766 |
| General Conditions - Construction Facilities (Repository Initial Development) | 1 | LS | $27,896 | $27,896 |
| Surveying (Repository Initial Development) | 1 | LS | $30,342 | $30,342 |
| Erosion and Sediment Controls and Temporary Access Controls | 1 | LS | $16,542 | $16,542 |
| Dust Supression and Decontamination | 400 | HR | $185 | $74,027 |
| Borrow Material Development (Impoundment 2) | 1 | LS | $357,487 | $357,487 |
| Preparation of Repository Surfaces (Impoundment 2) | 1 | LS | $22,775 | $22,775 |
| Construction of Liner System for Disposal Cell (Impoundment 2) | 1 | LS | $488,820 | $488,820 |
| Construction of Leachate Holding Cell (Impoundment 2) | 1 | LS | $4,715 | $4,715 |
| Construction of Lined Drainage Channels (Impoundment 2) | 1 | LS | $36,513 | $36,513 |
| Community Awareness Activities | 1 | LS | $5,824 | $5,824 |
| SUBTOTAL | | | | $1,533,911 |
| Contingency (Scope and Bid) | 25% | | | $383,478 |
| SUBTOTAL | | | | $1,917,389 |
| Project Management | 6% | | | $115,043 |
| Remedial Design | 12% | | | $230,087 |
| Construction Management | 8% | | | $153,391 |
| TOTAL | | | | $2,415,910 |
| **TOTAL CAPITAL COST** | | | | **$2,416,000** |

**CAPITAL COSTS: (Assumed to be Incurred During Year 155) (Closure of Drying Cell at Impoundment 4 and Disposal Cell at Impoundment 2)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Repository Closure) | 1 | LS | $292,766 | $292,766 |
| General Conditions - Construction Facilities (Repository Closure) | 1 | LS | $20,344 | $20,344 |
| Closure of Drying Cell (Impoundment 4) | 1 | LS | $43,812 | $43,812 |
| Cover System for Disposal Cell (Impoundment 2) | 1 | LS | $260,619 | $260,619 |
| Surveying (Repository Closure) | 1 | LS | $30,342 | $30,342 |
| Permanent Access Controls | 1 | LS | $32,987 | $32,987 |
| SUBTOTAL | | | | $680,870 |
| Contingency (Scope and Bid) | 25% | | | $170,218 |
| SUBTOTAL | | | | $851,088 |
| Project Management | 6% | | | $51,065 |
| Remedial Design | 12% | | | $102,131 |
| Construction Management | 8% | | | $68,087 |
| TOTAL | | | | $1,072,371 |
| **TOTAL CAPITAL COST** | | | | **$1,072,000** |

**PERIODIC COSTS - (Assumed to be Incurred in Year 149 through 155) (Annual Waste Placement at Impoundment 2)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Waste Placement Operations) | 1 | LS | $74,030 | $74,030 |
| General Conditions - Construction Facilities (Waste Placement Operations) | 1 | LS | $12,217 | $12,217 |
| Contaminated Water Management | 20 | DY | $1,358 | $27,160 |
| Winterization | 1 | LS | $29,297 | $29,297 |
| Annual Waste Placement Operations | 3,830 | ECY | $37 | $141,188 |
| SUBTOTAL | | | | $283,892 |
| Contingency (Scope and Bid) | 25% | | | $70,973 |
| SUBTOTAL | | | | $354,865 |
| Project Management | 8% | | | $28,389 |
| Technical Support | 10% | | | $35,487 |
| TOTAL | | | | $418,741 |
| **TOTAL PERIODIC COST** | | | | **$419,000** |

**PERIODIC COSTS - REPLACEMENT OF STOCKPILE LINER (Assumed to be Incurred Once Every 5 Years During Year 149 through 155)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Replacement of Stockpile Liner | 1 | LS | $1,683 | $1,683 |
| SUBTOTAL | | | | $1,683 |
| Contingency (Scope and Bid) | 25% | | | $421 |
| SUBTOTAL | | | | $2,104 |
| Project Management | 10% | | | $210 |
| Technical Support | 10% | | | $210 |
| TOTAL | | | | $2,524 |
| **TOTAL PERIODIC COST** | | | | **$3,000** |

**Table 12-1: Cost Estimate Summary of Selected Interim Remedy for Interim Record of Decision - Full Implementation of Selected Interim Remedy**

**ANNUAL COSTS (Assumed to be Incurred Annually During Year 149 through 155)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Groundwater Monitoring Activities (Impoundment 2) | 1 | LS | $21,845 | $21,845 |
| SUBTOTAL | | | | $21,845 |
| Contingency (Scope and Bid) | 20% | | | $4,369 |
| SUBTOTAL | | | | $26,214 |
| Project Management | 10% | | | $2,621 |
| Technical Support | 10% | | | $2,621 |
| TOTAL | | | | $31,456 |
| **TOTAL ANNUAL COST** | | | | **$31,000** |

## Post-Closure Costs

**ANNUAL COSTS (Assumed to be Incurred in Year 131 through 160) (Post Closure Maintenance at Impoundment 4)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Post-Closure Cover Maintenance | 1 | YR | $28,045 | $28,045 |
| Visual Inspection | 1 | YR | $11,409 | $11,409 |
| Groundwater Monitoring Activities (Impoundment 4) | 1 | LS | $27,316 | $27,316 |
| SUBTOTAL | | | | $66,770 |
| Contingency (Scope and Bid) | 20% | | | $13,354 |
| SUBTOTAL | | | | $80,124 |
| Project Management | 10% | | | $8,012 |
| Technical Support | 10% | | | $8,012 |
| TOTAL | | | | $96,148 |
| **TOTAL ANNUAL COST** | | | | **$96,000** |

**ANNUAL COSTS (Assumed to be Incurred in Year 149 through 160) (Post Closure Maintenance at Impoundment 1)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Post-Closure Cover Maintenance | 1 | YR | $28,045 | $28,045 |
| Visual Inspection | 1 | YR | $11,409 | $11,409 |
| Groundwater Monitoring Activities (Impoundment 1) | 1 | LS | $25,053 | $25,053 |
| SUBTOTAL | | | | $64,507 |
| Contingency (Scope and Bid) | 20% | | | $12,901 |
| SUBTOTAL | | | | $77,408 |
| Project Management | 10% | | | $7,741 |
| Technical Support | 10% | | | $7,741 |
| TOTAL | | | | $92,890 |
| **TOTAL ANNUAL COST** | | | | **$93,000** |

**ANNUAL COSTS (Assumed to be Incurred in Year 156 through 160) (Post Closure Maintenance at Impoundment 2)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Post-Closure Cover Maintenance | 1 | YR | $28,045 | $28,045 |
| Visual Inspection | 1 | YR | $11,409 | $11,409 |
| Groundwater Monitoring Activities (Impoundment 2) | 1 | LS | $21,845 | $21,845 |
| SUBTOTAL | | | | $61,299 |
| Contingency (Scope and Bid) | 20% | | | $12,260 |
| SUBTOTAL | | | | $73,559 |
| Project Management | 10% | | | $7,356 |
| Technical Support | 10% | | | $7,356 |
| TOTAL | | | | $88,271 |
| **TOTAL ANNUAL COST** | | | | **$88,000** |

**Summary of Present Value Analysis**

| Year[1] | Capital Costs[2] | Annual Costs | Post-Closure Costs | Periodic Costs | Total Annual Expenditure[3] | Discount Factor (7.0%) | Present Value[4] |
|---|---|---|---|---|---|---|---|
| 0 | $2,504,000 | $0 | $0 | $0 | $2,504,000 | 1.0000 | $2,504,000 |
| 1 | $0 | $39,000 | $0 | $980,000 | $1,019,000 | 0.9346 | $952,357 |
| 2 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.8734 | $405,258 |
| 3 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.8163 | $378,763 |
| 4 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.7629 | $353,986 |
| 5 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.7130 | $332,971 |
| 6 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.6663 | $309,163 |
| 7 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.6227 | $288,933 |
| 8 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.5820 | $270,048 |
| 9 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.5439 | $252,370 |
| 10 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.5083 | $237,376 |
| 11 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.4751 | $220,446 |
| 12 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.4440 | $206,016 |
| 13 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.4150 | $192,560 |
| 14 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.3878 | $179,939 |
| 15 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.3624 | $169,241 |
| 16 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.3387 | $157,157 |
| 17 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.3166 | $146,902 |
| 18 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.2959 | $137,298 |
| 19 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.2765 | $128,296 |
| 20 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.2584 | $120,673 |
| 21 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.2415 | $112,056 |
| 22 | $961,000 | $39,000 | $0 | $425,000 | $1,425,000 | 0.2257 | $321,623 |
| 23 | $2,091,000 | $39,000 | $0 | $425,000 | $2,555,000 | 0.2109 | $538,850 |
| 24 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.1971 | $91,454 |
| 25 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.1842 | $86,021 |

| Table 12-1: Cost Estimate Summary of Selected Interim Remedy for Interim Record of Decision - Full Implementation of Selected Interim Remedy | | | | | | | |
|---|---|---|---|---|---|---|---|
| Year[1] | Capital Costs[2] | Annual Costs | Post-Closure Costs | Periodic Costs | Total Annual Expenditure[3] | Discount Factor (7.0%) | Present Value[4] |
| 26 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.1722 | $79,901 |
| 27 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.1609 | $74,658 |
| 28 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.1504 | $69,786 |
| 29 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.1406 | $65,238 |
| 30 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.1314 | $61,364 |
| 31 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.1228 | $56,979 |
| 32 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.1147 | $53,221 |
| 33 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.1072 | $49,741 |
| 34 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.1002 | $46,493 |
| 35 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0937 | $43,758 |
| 36 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0875 | $40,600 |
| 37 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0818 | $37,955 |
| 38 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0765 | $35,496 |
| 39 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0715 | $33,176 |
| 40 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0668 | $31,196 |
| 41 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0624 | $28,954 |
| 42 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0583 | $27,051 |
| 43 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0545 | $25,288 |
| 44 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0509 | $23,618 |
| 45 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0476 | $22,229 |
| 46 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0445 | $20,648 |
| 47 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0416 | $19,302 |
| 48 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0389 | $18,050 |
| 49 | $961,000 | $39,000 | $0 | $425,000 | $1,425,000 | 0.0363 | $51,728 |
| 50 | $2,091,000 | $39,000 | $0 | $428,000 | $2,558,000 | 0.0339 | $86,716 |
| 51 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0317 | $14,709 |
| 52 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0297 | $13,781 |
| 53 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0277 | $12,853 |
| 54 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0259 | $12,018 |
| 55 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0242 | $11,301 |
| 56 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0226 | $10,486 |
| 57 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0211 | $9,790 |
| 58 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0198 | $9,187 |
| 59 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0185 | $8,584 |
| 60 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0173 | $8,079 |
| 61 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0161 | $7,470 |
| 62 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0151 | $7,006 |
| 63 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0141 | $6,542 |
| 64 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0132 | $6,125 |
| 65 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0123 | $5,744 |
| 66 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0115 | $5,336 |
| 67 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0107 | $4,965 |
| 68 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0100 | $4,640 |
| 69 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0094 | $4,362 |
| 70 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0088 | $4,110 |
| 71 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0082 | $3,805 |
| 72 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0077 | $3,573 |
| 73 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0072 | $3,341 |
| 74 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0067 | $3,109 |
| 75 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0063 | $2,942 |
| 76 | $961,000 | $39,000 | $0 | $425,000 | $1,425,000 | 0.0058 | $8,265 |
| 77 | $2,091,000 | $39,000 | $0 | $425,000 | $2,555,000 | 0.0055 | $14,053 |
| 78 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0051 | $2,366 |
| 79 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0048 | $2,227 |
| 80 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0045 | $2,102 |
| 81 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0042 | $1,949 |
| 82 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0039 | $1,810 |
| 83 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0036 | $1,670 |
| 84 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0034 | $1,578 |
| 85 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0032 | $1,494 |
| 86 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0030 | $1,392 |
| 87 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0028 | $1,299 |
| 88 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0026 | $1,206 |
| 89 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0024 | $1,114 |
| 90 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0023 | $1,074 |
| 91 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0021 | $974 |
| 92 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0020 | $928 |
| 93 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0019 | $882 |
| 94 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0017 | $789 |
| 95 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0016 | $747 |
| 96 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0015 | $696 |
| 97 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0014 | $650 |
| 98 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0013 | $603 |
| 99 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0012 | $557 |
| 100 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0012 | $560 |
| 101 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0011 | $510 |
| 102 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0010 | $464 |
| 103 | $961,000 | $39,000 | $0 | $425,000 | $1,425,000 | 0.0009 | $1,283 |
| 104 | $2,091,000 | $39,000 | $0 | $425,000 | $2,555,000 | 0.0009 | $2,300 |
| 105 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0008 | $374 |
| 106 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0008 | $371 |
| 107 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0007 | $325 |
| 108 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0007 | $325 |
| 109 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0006 | $278 |
| 110 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0006 | $280 |
| 111 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0005 | $232 |
| 112 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0005 | $232 |
| 113 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0005 | $232 |
| 114 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0004 | $186 |
| 115 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0004 | $187 |
| 116 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0004 | $186 |
| 117 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0004 | $186 |
| 118 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0003 | $139 |
| 119 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0003 | $139 |
| 120 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0003 | $140 |
| 121 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0003 | $139 |
| 122 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0003 | $139 |
| 123 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0002 | $93 |
| 124 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0002 | $93 |
| 125 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.0002 | $93 |
| 126 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0002 | $93 |

**Table 12-1: Cost Estimate Summary of Selected Interim Remedy for Interim Record of Decision - Full Implementation of Selected Interim Remedy**

| Year[1] | Capital Costs[2] | Annual Costs | Post-Closure Costs | Periodic Costs | Total Annual Expenditure[3] | Discount Factor (7.0%) | Present Value[4] |
|---|---|---|---|---|---|---|---|
| 127 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0002 | $93 |
| 128 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0002 | $93 |
| 129 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.0002 | $93 |
| 130 | $1,386,000 | $39,000 | $0 | $428,000 | $1,853,000 | 0.0002 | $371 |
| 131 | $2,995,000 | $36,000 | $96,000 | $441,000 | $3,568,000 | 0.0001 | $357 |
| 132 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 133 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 134 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 135 | $0 | $36,000 | $96,000 | $444,000 | $576,000 | 0.0001 | $58 |
| 136 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 137 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 138 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 139 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 140 | $0 | $36,000 | $96,000 | $444,000 | $576,000 | 0.0001 | $58 |
| 141 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 142 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 143 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 144 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 145 | $0 | $36,000 | $96,000 | $444,000 | $576,000 | 0.0001 | $58 |
| 146 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $57 |
| 147 | $0 | $36,000 | $96,000 | $441,000 | $573,000 | 0.0001 | $29 |
| 148 | $3,482,000 | $36,000 | $96,000 | $441,000 | $4,055,000 | 0.00004 | $162 |
| 149 | $0 | $31,000 | $189,000 | $419,000 | $639,000 | 0.00004 | $26 |
| 150 | $0 | $31,000 | $189,000 | $422,000 | $642,000 | 0.00004 | $26 |
| 151 | $0 | $31,000 | $189,000 | $419,000 | $639,000 | 0.00004 | $26 |
| 152 | $0 | $31,000 | $189,000 | $419,000 | $639,000 | 0.00003 | $19 |
| 153 | $0 | $31,000 | $189,000 | $419,000 | $639,000 | 0.00003 | $19 |
| 154 | $0 | $31,000 | $189,000 | $419,000 | $639,000 | 0.00003 | $19 |
| 155 | $1,072,000 | $31,000 | $189,000 | $422,000 | $1,714,000 | 0.00003 | $51 |
| 156 | $0 | $0 | $277,000 | $0 | $277,000 | 0.00003 | $8 |
| 157 | $0 | $0 | $277,000 | $0 | $277,000 | 0.00002 | $6 |
| 158 | $0 | $0 | $277,000 | $0 | $277,000 | 0.00002 | $6 |
| 159 | $0 | $0 | $277,000 | $0 | $277,000 | 0.00002 | $6 |
| 160 | $0 | $0 | $277,000 | $0 | $277,000 | 0.00002 | $6 |
| **TOTALS:** | $23,647,000 | $5,935,000 | $4,436,000 | $66,769,000 | $100,787,000 | | $10,443,039 |

**TOTAL PRESENT VALUE OF SELECTED REMEDY (FULL IMPLEMENTATION) [5]** **$10,443,000**

**Notes:**

[1] The period of analysis is assumed to be 160 years post initial construction.

[2] Capital costs are assumed to be capital costs distributed as indicated in the initial portion of this table

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADFT for details.

[5] Total present value is rounded to the nearest $1,000. Inflation and depreciation are excluded from the present value cost.

Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.

Costs presented are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

Unit costs represent total cost divided by the estimated quantity for each item and are rounded to the nearest whole number. Due to the rounding in the unit costs, multiplying the estimated quantity by unit cost may not exactly equal the total cost.

The cost estimates are prepared solely to facilitate relative comparisons between alternatives for FFS evaluation purposes.

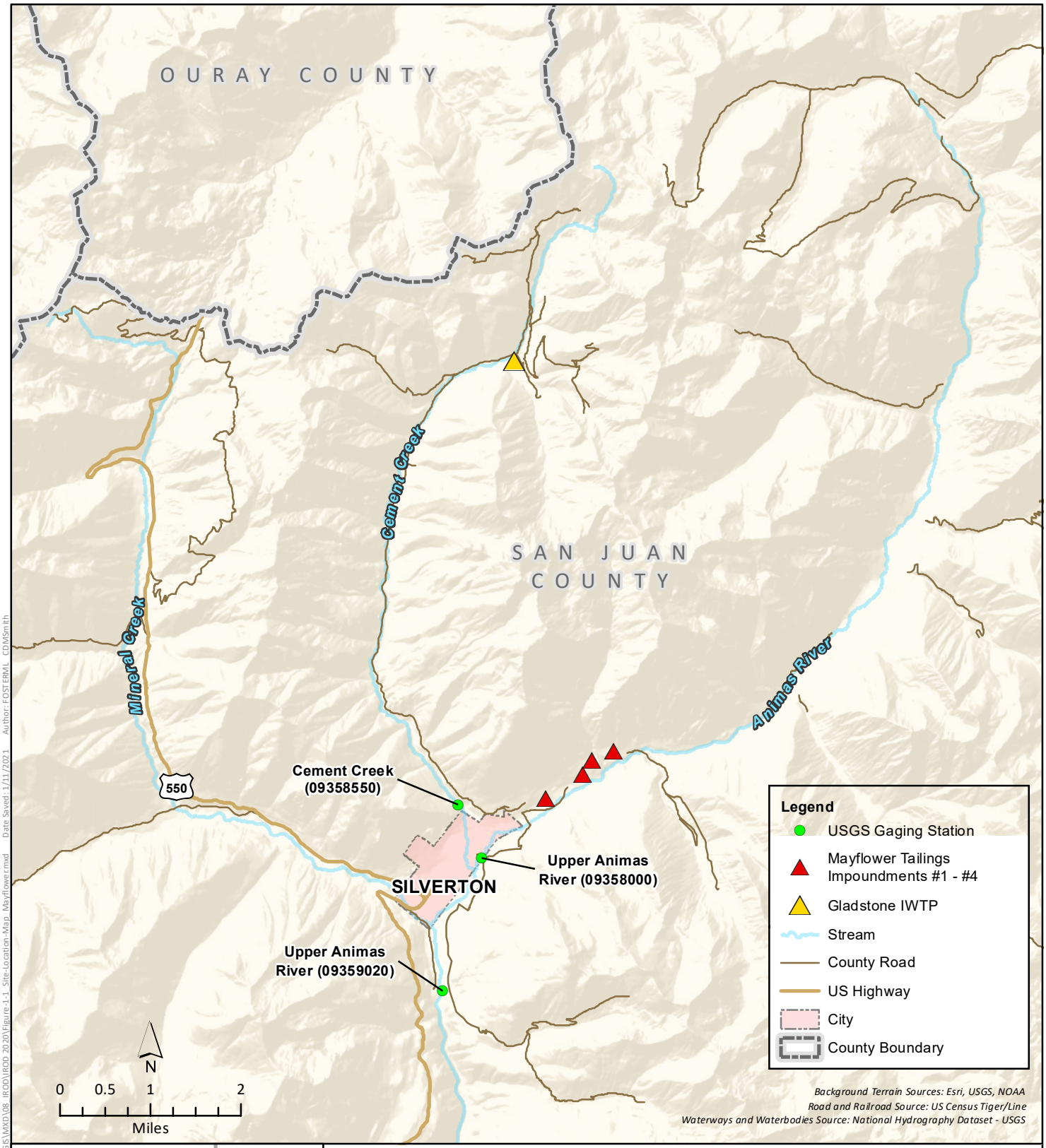
The information in this table is based on the best available information regarding the anticipated scope of the Bonita Peak Repository selected interim remedy. Changes in the cost elements may occur as a result of new information and data collected during the engineering design of the selected interim remedy.

Assumptions used to develop costs in the tables will be documented in the Basis of Estimate, to be included as part of Appendix B of the Final IROD.

**Abbreviations:**

| | |
|---|---|
| ECY | Embankment Cubic Yard |
| DY | Day |
| HR | Hour |
| LS | Lump Sum |
| YR | Year |

# FIGURES





Document Path: E:\...Projects\79171-BonitaPeak\MXD\GIS\MXD\08_IROD\IROD 2020\Figure 1-1_Site-Location-Map_Mayflower.mxd Date Saved: 1/11/2021 Author: FOSTERM1 CDMSmith

**Figure 1-1**
Site Location Map

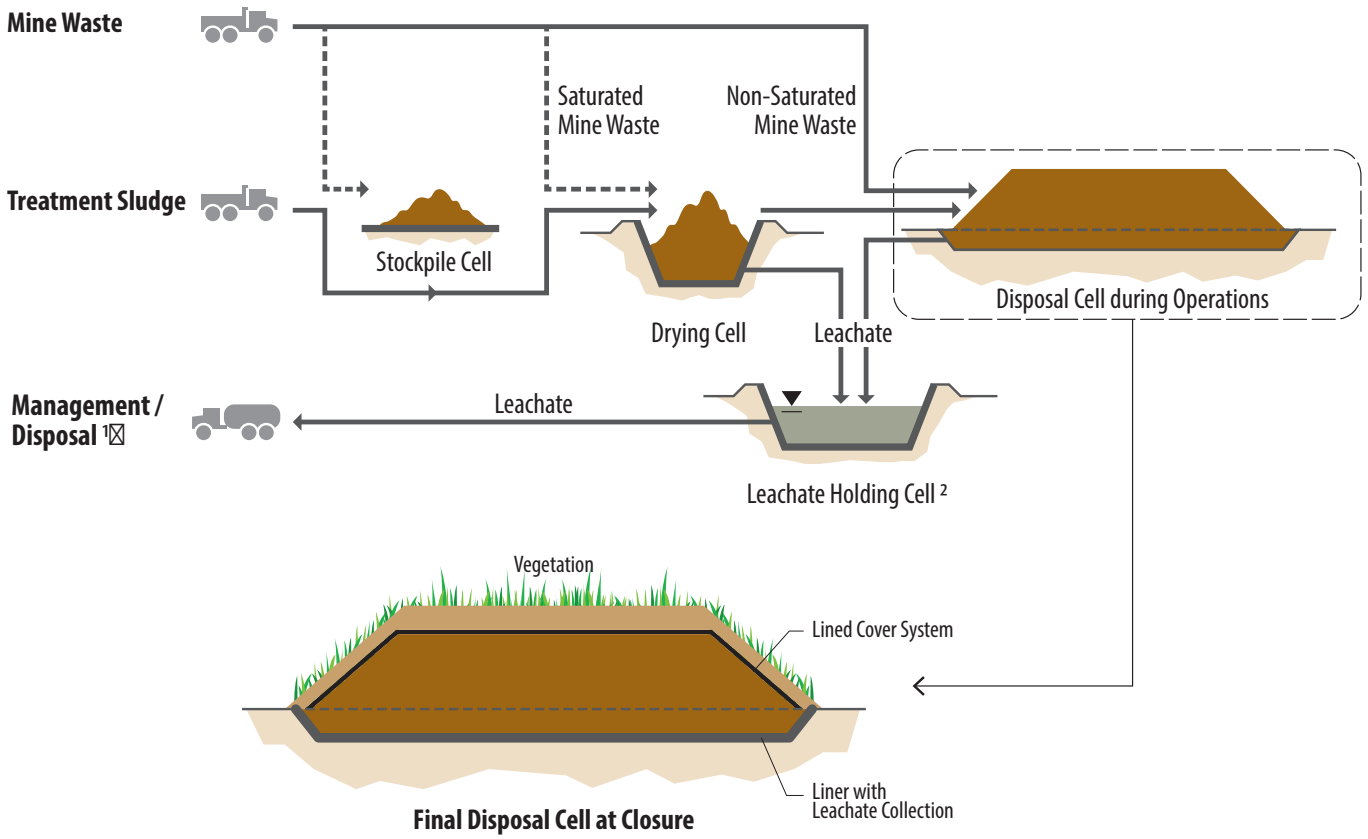
Bonita Peak Mining District Superfund Site
San Juan County, CO
Bonita Peak Repository - Interim Record of Decision

CDM Smith


**Figure 1-2**
Mayflower Tailings Impoundments

Bonita Peak Mining District Superfund Site | San Juan County, CO
Bonita Peak Repository - Interim Record of Decision

CDM Smith

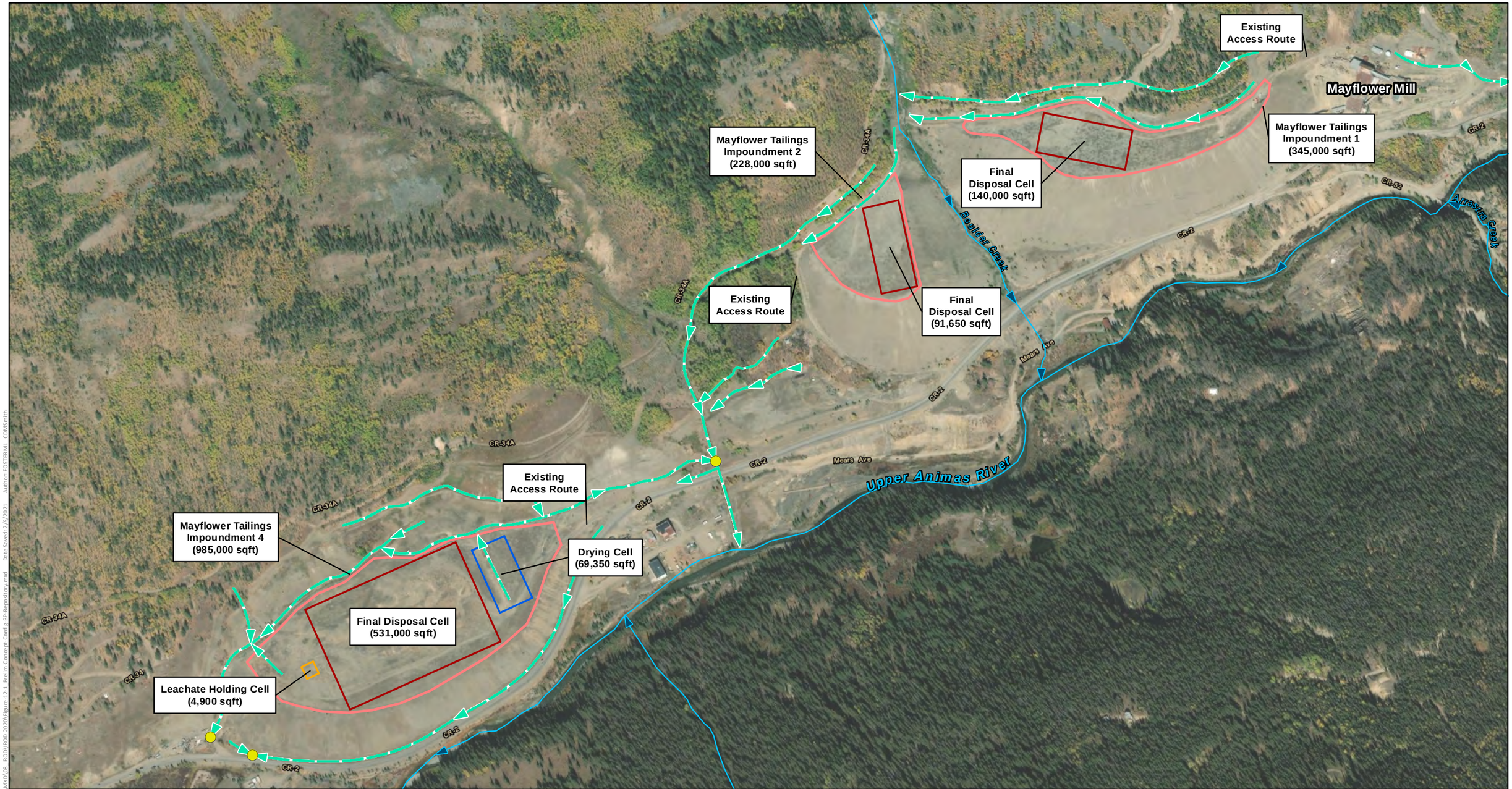



**Notes:**
Repository components shown in this figure are conceptual and will be re-evaluated during remedial design.
1 - Temporary approach for management / disposal is treatment and discharge at Gladstone IWTP.
2 - A leachate holding tank could be considered in lieu of leaching holding cell.

**Figure 9-1**
Conceptual Process Flow Diagram for Remedial Alternatives

Bonita Peak Mining District Superfund Site
San Juan County, CO
Bonita Peak Repository - Interim Record of Decision

CDM Smith





N

0 100 200 400

Feet

*Background Terrain: ESRI World Imagery*
*Road and Railroad Source: US Census Tiger/Line*
*Waterways and Waterbodies Source: National Hydrography Dataset - USGS*

- Outfall
- Existing Surface Water Drainage Control (with Flow Direction)
- River (with Flow Direction)
- Approximate Extent of Repository Footprint
- Drying Cell
- Leachate Holding Cell
- Waste Disposal Cell

**Notes:**

- New access routes may be developed at locations not shown

- Additional processing cells may be needed at Mayflower tailings impoundments 1 and 2. This determination will be made during the remedial design.

- All configurations and associated quantities are assumed based on conceptual information and are subject to change during the remedial design.

**Figure 12-1**
Preliminary Conceptual Configuration for the Bonita Peak Repository

Bonita Peak Mining District Superfund Site
San Juan County, CO
Bonita Peak Repository - Interim Record of Decision

CDM Smith

APPENDIX A

SUMMARY OF FEDERAL AND STATE ARARS

**Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered Information (TBC)**
**Bonita Peak Repository Interim Record of Decision**
**Bonita Peak Mining District Superfund Site (Site)**

| Location | Requirements | Prerequisite | Citation(s) |
|---|---|---|---|
| **Federal Location-Specific ARARs** | | | |
| Presence of the Mayflower Mill and potentially additional cultural resources | This statute and implementing regulations require federal agencies to take into account the effect of this response action upon any district, site, building, structure, or object that is included in or eligible for the National Register of Historic Places (generally, 50 years old or older). A cultural resource survey must be conducted to determine if cultural resources are present. If cultural resources on or eligible for the national register are present, a technical assessment must be conducted to make a determination of no effect, no adverse effect, or determination of adverse effect. If adverse effects are identified, the project planning and design must avoid, minimize, or mitigate the effects.<br>Additional special requirements for protecting National Historic Landmarks must be considered with the presence of the Mayflower Mill. It will be necessary, during remedial design and remedial action to determine if there will be an adverse effect, and if so, how the effect may be minimized or mitigated.<br>The substantive provisions of the National Historic Preservation Act implementing regulations are applicable to the remedial action. | Identification of cultural resources by surveys.<br>The Mayflower Mill was listed as a National Historic Landmark on February 16, 2000, and is located directly adjacent to one of the impoundments evaluated for the placement of the Bonita Peak Repository. | National Historic Preservation Act (NHPA) 16 United States Code (U.S.C.) § 470 and Implementing Regulations 36 Code of Federal Regulations (CFR) §§ 800.4, 800.5. 800.6, and 800.10(a) |
| Potential habitat for bald and/or golden eagles | This statute makes it unlawful for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any bald or golden eagle, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations. In addition to immediate impacts, this requirement also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.<br>If bald or golden eagles are identified during remedial design and remedial action, activities must be modified and conducted to conserve the species and their habitat. The actions that must be avoided through planning and design are applicable and are outlined in this statute. | Identification of bald or gold eagles and actions that could impair the species and their habitat. | Bald and Golden Eagle Protection Act 16 U.S.C. § 668(a) |

**Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered Information (TBC)**
**Bonita Peak Repository Interim Record of Decision**
**Bonita Peak Mining District Superfund Site (Site)**

| Location | Requirements | Prerequisite | Citation(s) |
|---|---|---|---|
| Potential habitat for federally endangered or threatened species in San Juan County | This statute and implementing regulations provide that federal activities not jeopardize the continued existence of any threatened or endangered species. 16 U.S.C. 1536(a) of the Endangered Species Act (ESA) requires consultation with the U.S. Fish and Wildlife Service to identify the possible presence of protected species and mitigate potential impacts on such species. Substantive compliance with the ESA means that the lead agency must identify whether a threatened or endangered species, or its critical habitat, will be affected by a proposed response action. If so, the agency must avoid the action or take appropriate mitigation measures so that the action does not affect the species or its critical habitat. If, at any point, the conclusion is reached that endangered species are not present or will not be affected, no further action is required.<br><br>If threatened or endangered species, listed in 50 CFR 17, are identified during remedial design and remedial action, activities must be modified and conducted to conserve the species and their habitat, following the substantive applicable requirements outlined in 15 USC 1536 and 50 CFR 17.21, 17.31, 17.61, 17.71 and 17.82.<br><br>Canada Lynx (federally threatened mammal) and southwestern willow flycatcher (federally endangered bird) have been identified in San Juan County, but not necessarily found at the Site. A survey to identify the presence of any endangered or threatened species must be conducted. | Actions that may negatively impact the species and their habitat. | Endangered Species Act 16 U.S.C. § 1536, and Implementing Regulations 50 CFR §§ 17.21, 17.31, 17.61, 17.71, 17.82 |
| Potential habitat for migratory birds | This statute and implementing regulations makes it unlawful for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to these regulations.<br><br>If migratory birds, listed in 50 CFR 10.13, are identified during remedial design and remedial action, activities must be modified and conducted to conserve the species and their habitat, in accordance with the applicable regulation, 16 U.S.C. § 703(a). | Actions that may negatively impact the migratory birds and their habitat. | Migratory Bird Treaty Act 16 U.S.C. § 703(a) |
| **State Location-Specific ARARs** | | | |
| Relevant wildlife habitat | Prohibits willfully damaging or destroying any wildlife den or nest, or their eggs, or harassing any wildlife. “Harass” means to unlawfully endanger, worry, impede, annoy, pursue, disturb, molest, rally, concentrate, harry, chase, drive, herd, or torment wildlife. *See* C.R.S. § 33-1-102(24) (Definitions) | Performing response activities in relevant wildlife habitat. | Colorado Wildlife Enforcement and Penalties Act, Colorado Revised Statutes (CRS) § 33-6-128 |
| Relevant wildlife habitat | Prohibits harassment, taking or possession of nongame species and subspecies, including threatened or endangered wildlife, with limited exceptions. The designations of species as endangered, threatened, or a nongame species, are made pursuant to 2 C.C.R. 406-10:1002-4. This regulation incorporates definitions of terms found in the Colorado Wildlife Enforcement and Penalties Act, C.R.S. § 33-1-102. | Performing response activities in relevant wildlife habitat. | Colorado Non-game, Endangered, or Threatened Species Act, CRS §§ 33-2-104(3) and Colorado Wildlife Commission Regulations, 2 Code of Colorado Regulations (CCR) 406-10:1002-1004 4(Protected Species) |

**Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered Information (TBC)**
**Bonita Peak Repository Interim Record of Decision**
**Bonita Peak Mining District Superfund Site (Site)**

| Location | Requirements | Prerequisite | Citation(s) |
|---|---|---|---|
| Locating the Bonita Peak Repository with respect to wetlands, seismic impact zones, faults, and floodplains | Solid waste landfills must not be located in wetlands, within 200 feet of a fault that has had displacement in Holocene time, in a seismic impact zone, or within a floodplain, unless the owner or operator submits to the department or local governing body having jurisdiction that all components of the landfill are designed to resist the maximum horizontal acceleration in lithified earth material for the site and that the facility was designed to ensure that the integrity of the structural components of the facility will not be disrupted. | Actions are made on jurisdictional wetlands, or the repository is placed within 200 feet of a fault with Holocene displacement, in a seismic impact zone, or within a floodplain.<br>Wetlands are indicated as present on the Mayflower tailings impoundments, as indicated by the National Wetland Inventory. | Colorado Department of Public Health and the Environment (CDPHE) Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.1 (Location Restrictions) |
| Actions taken in a designated aquifer recharge area. | No significant aquifer recharge areas, as may be designated by the Colorado State Engineer's Office or Water Quality Control Commission, shall be adversely impacted by solid waste disposal. | Performing response activities in a designated aquifer recharge area. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.5 (Minimum Standards – aquifer recharge areas) |
| Noxious weeds area | Requires use of integrated methods to manage noxious weeds, if noxious weeds are likely to be materially damaging to the land of neighboring landowners. Integrated methods include: biological management, chemical management, cultural management, and mechanical management (as defined in C.R.S. § 35-5.5-103(9)(a-d)). | Performing response activities in an area with noxious weeds. | Colorado Noxious Weed Act, C.R.S. § 35-5.5-104 (Duty to Manage Noxious Weeds) |
| Noxious weeds area | Prohibits allowing any plant of any population on "List A" to produce seed or develop other reproductive propagules. (Section 3.1 sets forth "List A.")<br>Prescribed management techniques must be applied to every population of List A noxious weeds including:<br>• Elimination of plants of every population of List A prior to seed development.<br>• Once all mature plants are eliminated, appropriate efforts must be made to detect and eliminate new plants arising from seed, reproductive propagule, or root stock for the duration of the seed longevity for the particular species.<br>• Any plant with flowers, seeds, or other reproductive propagules must be placed in sealed plastic bags and disposed of by:<br>  ○ High intensity burning in a controlled environment that completely destroys seed viability<br>  ○ Removal of plant materials to a solid waste landfill which covers refuse daily with six inches of soil or alternative material; or<br>Any other method approved by the Colorado Department of Agriculture Commissioner. | Performing response activities in an area with "List A" noxious weeds. | Rules Pertaining to the Administration and Enforcement of the Colorado Noxious Weed Act, 8 C.C.R. 1206-2, Sections 3.1, 3.3, and 3.4 |

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| Noxious weeds area | Prohibits allowing any plant of any population on "List B" to produce seed or develop other reproductive propagules after the time specified in the San Juan County elimination Plan. (Section 4.1 sets forth "List B.")<br><br>Prescribed management techniques for species on List B include:<br>• Elimination prior to seed development in the year specified in the county management plan<br>• Any population that is discovered in areas designated for elimination subsequent to the year specified for elimination must be eliminated prior to the development of viable seed. If the population is discovered after seed development has occurred, then efforts must be made to minimize the dispersion of seed and elimination is required prior to seed development in the following year.<br>• Once all plants are eliminated, appropriate efforts must be made in subsequent years to detect and eliminate new plants arising from seed, reproductive propagule, or root stock prior to seed development for the duration of the seed longevity for the particular species.<br>• In order to ensure that seeds or other reproductive propagules are not produced or spread, any plant with flowers, seeds, or other reproductive propagules must be placed in sealed plastic bags and disposed of by:<br>  ○ High intensity burning in a controlled environment that completely destroys seed viability;<br>  ○ Removal of plant materials to a solid waste landfill which covers refuse daily with six inches of soil or alternative material; or<br>  ○ Any other method approved by the Colorado Department of Agriculture Commissioner.<br><br>Additional species-specific techniques for specified areas in San Juan County detailed in 8 C.C.R. 1206-2-4.8 | Performing response activities in an area with noxious weeds. | Colorado Noxious Weed Act and San Juan County Noxious Weed regulations, CRS § 35-5.5-104 (Duty to Manage Noxious Weeds); 8 CCR 1206-2, Sections 4.1, 4.4, and the San Juan County Plan B Species elimination plan, available on November 3, 2020 at:<br><br>https://docs.google.com/spreadsheets/d/1fHXmYI_VY0MGNqe0ZZzJ8NwXON-Lr3Rs8i_KvBY0Vug/edit?pref=2&pli=1#gid=156907804 |

**Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered Information (TBC)**
**Bonita Peak Repository Interim Record of Decision**
**Bonita Peak Mining District Superfund Site (Site)**

| Location | Requirements | Prerequisite | Citation(s) |
|---|---|---|---|
| Area where waste left in place above unrestricted use standards or where engineered features are incorporated into the remedy | Requires environmental covenants (ECs) or notice of environmental use restrictions (RNs) whenever residual contamination not safe for all uses is left in place or an engineered feature or structure that requires monitoring, maintenance, or operation is included in the remedy.[1] | Performing response activities in locations leaving waste in place above standards for unrestricted use or incorporating engineered features or structures. | Colorado Environmental Covenants Statute CRS § 25-15-317 et seq. |
| Relevant land use zone | Sound levels that exceed the above limits at a distance of 25 feet from the property line or greater are prima facie evidence of a public nuisance.<br>Activities must be conducted in a manner so that any noise produced is not objectionable due to intermittence, beat frequency, or shrillness.<br>For construction projects, maximum noise levels will be those specified for industrial zones for the time period within which construction is to be completed. For industrial zones, the maximum permissible sound level from 7:00 am to the next 7:00 pm is 80 A-weighted decibels (db[A]) and from 7:00 pm to the next 7:00 am is 75 db(A). | Location of response activities is within a designated land use zone subject to noise regulation. | Colorado Noise Abatement Statute, C.R.S. § 25-12-103 (Maximum Permissible Noise Levels) |
| Relevant land use zone | Sets forth maximum permissible noise levels specific to off-highway vehicles defined in 25-12-102 (5.6) as a self-propelled vehicle with wheels or tracks in contact with the ground that is designed primarily for use off the public highways:<br>(a) If manufactured before January 1, 1998; 99 db(A);<br>(b) If manufactured on or after January 1, 1998; 96 db(A).<br>Measurements should be conducted using SAE J1287. | Use of off-highway vehicles in response activities | Colorado Noise Abatement Statute, CRS § 25-12-103 (Maximum Permissible Noise Levels) and CRS § 25-12-110 (Off-highway vehicles) |

[1] The repository is an engineered feature and an area where waste will remain above unrestricted use standards. An EC or RN will be required for the repository and any other area within the Site where engineered components exist or where waste is left in place above unrestricted use standards. CRS. § 25-15-321 authorizes CDPHE to accept, refuse to accept, conditionally accept, hold, modify, and terminate ECs and RNs. Concurrence on the record of decision (ROD) constitutes CDPHE's agreement to accept land use restrictions associated with remaining waste and engineered remedial features. Further, CDPHE states through concurrence on the ROD that ECs and RNs will only be modified or terminated to reflect changes made to the Superfund remedy (i.e., changes to the engineered remedial features).

**Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered Information (TBC)**
**Bonita Peak Repository Interim Record of Decision**
**Bonita Peak Mining District Superfund Site (Site)**

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|---|---|---|---|
| **Federal Action-Specific ARARs** | | | |
| Operation of the Bonita Peak Repository for disposal of treatment sludge and mine wastes generated from response activities | This regulation establishes operating criteria with which municipal solid waste landfills must comply to ensure protection of human health and the environment.<br>Part 258.28(a)(2) provides the relevant and appropriate definition of waste that is derived from the facility. Part 258.28(b)(2) places relevant and appropriate requirements on the use of bulk or containerized liquid waste. No liquid waste can be placed in the facility, with the exception of household waste (other than septic) and leachate or gas condensate derived from the facility. | Municipal solid waste is generated for on-site disposal from activities at the Site.<br>While treatment sludge and mine wastes that may be generated for disposal at the Bonita Peak Repository are likely solid wastes, they are not expected to be identified as municipal solid waste. | RCRA Subtitle D, 42 U.S.C § 6901 and Implementing Regulations 40 CFR (Criteria for Municipal Solid Waste Landfills) Subpart C (Operating Criteria), Sections 258.28(a)(2) and 258.28(b)(2) |
| **State Action-Specific ARARs** | | | |
| Locating the repository | Solid waste landfills must not be located in wetlands, seismic impact zones, floodplains, or within 200 ft of a fault. Wastes shall not be placed in surface or groundwater. (see also section 2.1.17) | Locating a solid waste landfill | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.1 (Location restrictions) |
| Designing and constructing the repository | Solid waste landfills located in an unstable area must incorporate engineering measures to ensure that the integrity of the structural components will not be disrupted. Unstable area determinations shall consider on-site or local soils conditions, geologic or geomorphologic features, and human-made features or events (both surface and subsurface). | Designing/constructing a solid waste landfill. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.1.5 (Site standards – unstable areas) |
| Designing and constructing the repository | Solid waste landfills must meet design requirements based on geologic, hydrologic and engineering data. Requirements include liner design components in Section 3.2.5 that incorporate, among other things, a leachate collection and removal system, and surface water control systems in Section 3.2.6. | Designing/constructing a solid waste landfill. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.2.5(B) through (D), 3.2.6 (Design Requirements)[2] |

[2] As part of the schematic design and design development reports prepared to support construction documents and specifications for the repository, EPA will collect and consider data to illustrate that the repository design will achieve the minimum elements outlined in Sections 3.1.5 , 3.2.3, and 3.2.4 of the Colorado Regulations Pertaining to Solid Waste Sites and Facilities (6CCR 1007-2).

**Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered Information (TBC)**
**Bonita Peak Repository Interim Record of Decision**
**Bonita Peak Mining District Superfund Site (Site)**

| Action | Requirements | Prerequisite | Citation(s) |
|---|---|---|---|
| Constructing, operating, and maintaining the repository | If more than 5 acres of land are cleared in attainment areas, or more than one acre of land is cleared in nonattainment areas, then any owner or operator engaged in clearing land, or owners or operators of land that has been cleared, shall "use all available and practical methods which are technologically feasible and economically reasonable" in order to minimize fugitive emissions.<br><br>Construction activities shall not result in fugitive emissions that exceed 20% opacity or result in off-property transport of emissions.<br><br>Control measures or operational procedures to be employed may include, but are not necessarily limited to, planting vegetation cover, providing synthetic cover, watering, chemical stabilization, furrows, compacting, minimizing disturbed area in the winter, wind breaks and other methods or techniques approved by CDPHE's Air Quality Control Division. | Construction, operational, and closure activities generating fugitive dust. | Colorado Fugitive Dust Control Plan/Opacity, Regulation No. 1, 5 CCR 1001-3(III)(D)(2)(b) (Particulate Matter – Construction Activities), pursuant to Colorado Air Pollution Prevention and Control Act, CRS § 25-7-101 et seq. |
| Managing storm water runoff during repository construction and closure. | The Colorado Discharge Permit System general permit COR40000 includes the following substantive requirements:<br><br>1. Control measures must be installed before the commencement of activities at the site that could contribute pollutants to stormwater discharges. Such control measures should minimize the discharge of pollutants at the site. The control measures must meet the following requirements:<br>a. Where vehicle tracking occurs, vehicle tracking controls that minimize vehicle tracking of sediment from disturbed areas.<br>b. Containment or filtration of stormwater flows from disturbed areas and soil storage areas, such that flows from such areas must go to at least one control measure.<br>c. Where there are discharges from basins and impoundments, outlets that withdraw water from or near the surface (unless infeasible).<br>d. Maintenance of pre-existing vegetation or equivalent control measures for areas within 50 horizontal feet from receiving waters.<br>e. Minimization of soil compaction where there are infiltration control measures, or final stabilization, from vegetative cover.<br>f. In areas where vegetative final stabilization is utilized, preservation of topsoil (unless infeasible).<br>g. Minimization of soil exposed during construction activity.<br>h. Where there is bulk storage of liquid chemicals (including petroleum products), secondary containment or equivalent protection.<br>i. Concrete washout control measures sufficient to ensure the washing activities do not add pollutants to stormwater runoff or receiving waters. Discharges to the ground of concrete washout waste must go through soil with buffering capacity, and cannot occur in areas near natural drainages, shallow groundwater, springs, or wetlands.<br>j. For earth disturbing activities, temporary stabilization measures such as tarps, soil tackifier, and hydroseed, which must be implemented wherever construction activity disturbed the ground and has ceased for fourteen days | Discharging storm water from a construction activity. | Colorado Discharge Permit System (CDPS) Regulations 5 C.C.R. 1002-61.3(2)(a) and (f)(ii), and CDPS general permit No. COR400000 (Stormwater discharges associated with construction activity), pursuant to CRS § 25-8-501<br><br>Permit available (as of November 3, 2020) at: https://drive.google.com/file/d/1CsnfVYo-sTVmStX9pwtnpKoN7DYmumYP/view |

| Action | Requirements | Prerequisite | Citation(s) |
|---|---|---|---|
| | or is permanently ceased.<br>k. For all construction sites after all ground surface disturbing activities have ceased, final stabilization that achieves vegetative cover with plant density at least 70% of pre-disturbance levels, or an equivalent stabilization measure.<br>2. All control measures must remain in effective operating condition and be protected from activities that would make them less effective.<br>3. The adequacy of control measures must be monitored, and corrective action must be taken when a measure becomes inadequate.<br>4. Discharges may not cause, have the reasonable potential to cause, or measurably contribute to an exceedance of any applicable water quality standard.<br>5. Site inspections with one of the following minimum frequencies:<br>a. One per every 7 calendar days<br>b. One per every 14 calendar days, and post storm event inspections within 24 hours after the end of any precipitation or snowmelt event that causes surface erosion.<br>c. If the two options above are impractical, an alternate schedule.<br>d. If the site is temporarily idle or completed, less frequent inspections depending on the circumstances. | | |
| Operating the repository during disposal activities | Solid waste sites and facilities shall not knowingly receive any hazardous waste. | Operating a solid waste disposal site and facility. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.2 (Site and Facility Standards-hazardous waste prohibited) |
| Operating the repository during disposal activities | Nuisance conditions shall not exist at or beyond the site boundary. Sites and facilities must be managed to control noise, dust, and odors to avoid hazards to human health.[3] | Operating a solid waste disposal site and facility. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.3 (Site and Facility Standards-nuisance conditions prohibited) |
| Operating the repository during disposal activities | Section 2.1.4 requires that water pollution shall not occur at or beyond an established point of compliance. Section 2.1.15 requires that solid waste sites and facilities must demonstrate groundwater protection standards are met at an established point of compliance. | Operating a solid waste disposal site and facility. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.4 (Site and Facility Standards – water pollution prohibited) and 2.1.15 (Site and Facility Standards-groundwater protection standards compliance) |

[3] Compliance with the fugitive dust and noise control laws identified herein satisfies this regulation.

**Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered Information (TBC)**
**Bonita Peak Repository Interim Record of Decision**
**Bonita Peak Mining District Superfund Site (Site)**

| Action | Requirements | Prerequisite | Citation(s) |
|---|---|---|---|
| Operating the repository during disposal activities | Solid waste sites and facilities must maintain a run-on control system to prevent flow onto the facility during the peak discharge from a 25-year, 24-hour storm; and a runoff control system to collect runoff from a from a 25-year, 24-hour storm event; and control the water volume resulting from a 100-year, 24-hour storm event (see also Section 2.5.7). | Operating a solid waste disposal site and facility. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.6 (Site and Facility Standards – run-on and runoff control systems required) |
| Operating the repository during disposal activities | Solid waste sites and facilities must control public access and prevent unauthorized vehicular traffic. Effective artificial barriers, or natural barriers, or both may be used in lieu of fencing. | Operating a solid waste disposal site and facility. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.8 (Site and Facility Standards – public access restricted) |
| Operating the repository during disposal activities | Solid waste disposal sites and facilities shall not place wastes below or into surface water or groundwater. (see also Section 3.1.9). | Operating a solid waste disposal site and facility. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.1.17 (Site and Facility Standards – disposal below or into surface water or groundwater prohibited) |
| Operating the repository during disposal activities | Solid waste sites and facilities shall implement a groundwater monitoring program unless a waiver is appropriate pursuant to 6 CCR 1007-2, Part 1, Section 1.5 and 6 CCR 1007-2, Part 1, Appendix B. | Operating a solid waste disposal site and facility. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.2 (Ground Water Monitoring – groundwater monitoring required) |
| Operating the repository during disposal activities | Use of "all available practical methods which are technologically feasible and economically reasonable" to minimize emissions.<br>Emissions shall not exceed 20% opacity or be transported off-property.<br>Control measures or operational procedures to be employed may include, but are not necessarily limited to, the use of enclosures, covers, stabilization, compacting, watering, limitation of fines and other methods or techniques approved by CDPHE's Air Quality Control Division. | Operation activities generating fugitive dust. | Colorado Fugitive Dust Control Plan/Opacity, Regulation No. 1., 5 C.C.R. 1001-3(III)(D)(2)(c) (Particulate Matter – Storage and Handling of Materials) |
| Operating the repository during disposal activities | Use of "all available practical methods which are technologically feasible and economically reasonable" to minimize emissions.<br>Emissions shall not be allowed to go off-property.<br>Control measures or operation procedures to be employed may include but are not necessarily limited to, covering the materials, washing or otherwise treating loaded haul trucks to remove materials from the exterior of the vehicle prior to transporting materials, limiting load size, wetting the load and other methods or techniques approved by CDPHE's Air Quality Control Division. | Use of haul trucks generating fugitive dust during Repository operations. | Colorado Fugitive Dust Control Plan/Opacity, Regulation No. 1., 5 C.C.R. 1001-3(III)(D)(2)(f) (Particulate Matter – Haul Trucks) |

**Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered Information (TBC)**
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| Action | Requirements | Prerequisite | Citation(s) |
|---|---|---|---|
| Closing the repository | Precautions must be taken after closure at solid waste sites and facilities to prevent unauthorized disposal.[4] | Closing a solid waste disposal site and facility. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.5.4 (Closure of Solid Waste Disposal Sites and Facilities – prevent unauthorized disposal) |
| Closing the repository | Water pollution shall not occur at or beyond an established point of compliance after closure. | Closing a solid waste disposal site and facility. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.5.5 (Closure of Solid Waste Disposal Sites and Facilities – prevent water pollution) |
| Closing the repository | Nuisance conditions shall not exist at or beyond the site boundary after closure. | Closing a solid waste disposal site and facility. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.5.6 (Closure of Solid Waste Disposal Sites and Facilities – prevent nuisance conditions) |
| Closing the repository | Permanent surface water diversion structures remaining after closure shall control run-on and runoff from the 100 year, 24-hour storm event. | Closing a solid waste disposal site and facility. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 2.5.7 (Closure of Solid Waste Disposal Sites and Facilities – run-on/runoff controls required) |
| Closing the repository | Solid waste landfills shall meet final closure grading criteria to promote surface water runoff and minimize erosion, and shall have slopes no less than 5 percent (%) (20:1) and no greater than 25% (4:1). Variations from these standards may be acceptable if demonstrations of the adequacy of proposed variance are made to the Department by the owner or operator. | Closing a solid waste landfill. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.5.2 (Closure – grading requirements) |
| Closing the repository | Final covers for solid waste landfills shall not exceed permeability of the landfill liner and shall comprise either (1) an earthen material soil cover with an 18-inch infiltration layer and a 6-inch erosion layer capable of sustaining native plant growth; or (2) a composite cover with a 6-inch soil foundation layer and a minimum 30-millimeter-thick geomembrane layer adequate for the intended purpose. Alternatives to the above designs may be approved by the department based on waste type and site-specific technical information. | Closing a solid waste landfill. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.5.3 (Closure – final cover permeability) |

[4] Compliance with the Colorado Environmental Covenants law identified herein satisfies this regulation. Compliance with the EC law requires placing an EC or RN on the repository. The EC or RN must contain activities and use restrictions prohibiting further disposal.

**Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered Information (TBC)**
**Bonita Peak Repository Interim Record of Decision**
**Bonita Peak Mining District Superfund Site (Site)**

| Action | Requirements | Prerequisite | Citation(s) |
|---|---|---|---|
| Maintaining repository postclosure | Solid waste landfills must meet postclosure care requirements to prevent nuisance conditions; maintain cover integrity; operate, maintain, and monitor the leachate collection system and groundwater monitoring systems; and monitor groundwater. | Maintaining a solid waste landfill postclosure. | CDPHE Regulations Pertaining to Solid Waste Sites and Facilities, 6 CCR 1007-2, Part 1, Section 3.6 (Post Closure Care and Maintenance – post closure requirements) |
| Maintaining repository postclosure | Requires ECs or RNs whenever residual contamination not safe for all uses is left in place or an engineered feature or structure that requires monitoring, maintenance, or operation is included in the remedy.[5] | Performing response activities leaving waste in place above standards for unrestricted use or incorporating engineered features or structures. | Colorado Environmental Covenants Statute, CRS § 25-15-317 et seq. |
| **Federal TBC** | | | |
| Activities conducted on federally managed lands within the Site | Activities conducted during remedial action on federally managed lands within the Site would consider the substantive requirements of the San Juan National Forest (SJNF) and Tres Rios Field Office (TRFO) Land and Resource Management Plan (LRMP).<br>The purpose of this LRMP is to provide strategic guidance for future management of all National Forest System lands managed by SJNF and lands managed by the TRFO administered by the Bureau of Land Management (BLM), except for those lands included in the BLM's Canyons of the Ancients National Monument. This LRMP guides the restoration or maintenance of the health of these lands to promote a sustainable flow of uses, benefits, products, services, and visitor opportunities. It provides a framework for informed decision making, while guiding resource management programs, practices, uses, and projects. It does not include specific project and activity decisions.<br><br>The SJNF and NRFO LRMP is available at:<br>https://www.fs.usda.gov/detail/sanjuan/landmanagement/planning/?cid=stelprdb5432707 | Actions supporting repository construction and operation and maintenance conducted on federally managed lands within the Site. | San Juan National Forest and Tres Rios Field Office Land and Resource Management Plan |

[5] The repository is an engineered feature as well as an area where waste will remain above unrestricted use standards. An EC or RN will be required for the repository and any other area within the site where engineered components exist or where waste is left in place above unrestricted use standards. CRS § 25-15-321 authorizes CDPHE to accept, refuse to accept, conditionally accept, hold, modify and terminate ECs and RNs. Concurrence on the ROD constitutes CDPHE's agreement to accept land use restrictions associated with remaining waste and engineered remedial features. Further, CDPHE states through concurrence on the ROD that ECs and RNs will only be modified or terminated to reflect changes made to the Superfund remedy (i.e., changes to the engineered remedial features).

APPENDIX B

SUPPLEMENTAL COST TABLES FOR PHASE COSTING SCENARIO

**Table B-1: Cost Estimate Summary of Selected Interim Remedy for Interim Record of Decision - Initial Construction of First Phase of Impoundment 4**

**CAPITAL COSTS: (Assumed to be Incurred During Year 0) (Initial Construction at Impoundment 4)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Legal Controls | 1 | LS | $13,443 | $13,443 |
| Mobilization/Demobilization | 1 | LS | $8,318 | $8,318 |
| Access Road Improvements (Impoundment 4) | 1 | LS | $37,365 | $37,365 |
| General Conditions - Project-Dedicated Supervisory Staff (Repository Initial Development) | 1 | LS | $292,766 | $292,766 |
| General Conditions - Construction Facilities (Repository Initial Development) | 1 | LS | $27,896 | $27,896 |
| Surveying (Repository Initial Development) | 1 | LS | $50,181 | $50,181 |
| Erosion and Sediment Controls and Temporary Access Controls | 1 | LS | $24,057 | $24,057 |
| Dust Supression and Decontamination | 400 | HR | $185 | $74,027 |
| Borrow Material Development and Import of Materials (Impoundment 4 Phase 1) | 1 | LS | $331,582 | $331,582 |
| Preparation of Repository (Impoundment 4 Phase 1) | 1 | LS | $77,006 | $77,006 |
| Construction of Liner System for Drying Cell (Impoundment 4) | 1 | LS | $70,561 | $70,561 |
| Construction of Liner System for Disposal Cell (Impoundment 4 Phase 1) | 1 | LS | $540,266 | $540,266 |
| Construction of Leachate Holding Cell (Impoundment 4) | 1 | LS | $17,891 | $17,891 |
| Construction of Stockpile Cell | 1 | LS | $1,870 | $1,870 |
| Construction of Lined Drainage Channels (Impoundment 4 Phase 1) | 1 | LS | $16,754 | $16,754 |
| Community Awareness Activities | 1 | LS | $5,824 | $5,824 |
| SUBTOTAL | | | | $1,589,807 |
| Contingency (Scope and Bid) | 25% | | | $397,452 |
| SUBTOTAL | | | | $1,987,259 |
| Project Management | 6% | | | $119,236 |
| Remedial Design | 12% | | | $238,471 |
| Construction Management | 8% | | | $158,981 |
| TOTAL | | | | $2,503,947 |
| **TOTAL CAPITAL COST** | | | | **$2,504,000** |

**Summary of Present Value Analysis**

| Year[1] | Capital Costs[2] | Annual Costs | Post-Closure Costs | Periodic Costs | Total Annual Expenditure[3] | Discount Factor (7.0%) | Present Value[4] |
|---|---|---|---|---|---|---|---|
| 0 | $2,504,000 | $0 | $0 | $0 | $2,504,000 | 1.0000 | $2,504,000 |
| **TOTALS:** | $2,504,000 | $0 | $0 | $0 | $2,504,000 | | $2,504,000 |

**TOTAL PRESENT VALUE OF SELECTED REMEDY (INITIAL CONSTRUCTION OF FIRST PHASE) [5]** **$2,504,000**

**Notes:**

[1] The period of analysis is assumed to be 1 year.

[2] Capital costs are assumed to be capital costs distributed as indicated in the initial portion of this table

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADFT for details.

[5] Total present value is rounded to the nearest $1,000. Inflation and depreciation are excluded from the present value cost.

Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.

Costs presented are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

Unit costs represent total cost divided by the estimated quantity for each item and are rounded to the nearest whole number. Due to the rounding in the unit costs, multiplying the estimated quantity by unit cost may not exactly equal the total cost.

The cost estimates are prepared solely to facilitate relative comparisons between alternatives for FFS evaluation purposes.

The information in this table is based on the best available information regarding the anticipated scope of the Bonita Peak Repository selected interim remedy. Changes in the cost elements may occur as a result of new information and data collected during the engineering design of the selected interim remedy.

Assumptions used to develop costs in the tables will be documented in the Basis of Estimate, to be included as part of Appendix B of the Final IROD.

**Abbreviations:**

| | |
|---|---|
| HR | Hour |
| LS | Lump Sum |

**Table B-2: Cost Estimate Summary of Selected Interim Remedy for Interim Record of Decision - Implementation of First Phase Impoundment 4**

**Impoundment 4: Phase 1**

**CAPITAL COSTS: (Assumed to be Incurred During Year 0) (Initial Construction at Impoundment 4 [Phase 1])**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Legal Controls | 1 | LS | $13,443 | $13,443 |
| Mobilization/Demobilization | 1 | LS | $8,318 | $8,318 |
| Access Road Improvements (Impoundment 4) | 1 | LS | $37,365 | $37,365 |
| General Conditions - Project-Dedicated Supervisory Staff (Repository Initial Development) | 1 | LS | $292,766 | $292,766 |
| General Conditions - Construction Facilities (Repository Initial Development) | 1 | LS | $27,896 | $27,896 |
| Surveying (Repository Initial Development) | 1 | LS | $50,181 | $50,181 |
| Erosion and Sediment Controls and Temporary Access Controls | 1 | LS | $24,057 | $24,057 |
| Dust Supression and Decontamination | 400 | HR | $185 | $74,027 |
| Borrow Material Development and Import of Materials (Impoundment 4 Phase 1) | 1 | LS | $331,582 | $331,582 |
| Preparation of Repository (Impoundment 4 Phase 1) | 1 | LS | $77,006 | $77,006 |
| Construction of Liner System for Drying Cell (Imp | 1 | LS | $70,561 | $70,561 |
| Construction of Liner System for Disposal Cell (Impoundment 4 Phase 1) | 1 | LS | $540,266 | $540,266 |
| Construction of Leachate Holding Cell (Impoundn | 1 | LS | $17,891 | $17,891 |
| Construction of Stockpile Cell | 1 | LS | $1,870 | $1,870 |
| Construction of Lined Drainage Channels (Impoundment 4 Phase 1) | 1 | LS | $16,754 | $16,754 |
| Community Awareness Activities | 1 | LS | $5,824 | $5,824 |
| SUBTOTAL | | | | $1,589,807 |
| Contingency (Scope and Bid) | 25% | | | $397,452 |
| SUBTOTAL | | | | $1,987,259 |
| Project Management | 6% | | | $119,236 |
| Remedial Design | 12% | | | $238,471 |
| Construction Management | 8% | | | $158,981 |
| TOTAL | | | | $2,503,947 |
| **TOTAL CAPITAL COST** | | | | **$2,504,000** |

**CAPITAL COSTS: (Assumed to be Incurred During Year 22) (Closure of Disposal Cell at Impoundment 4 [Phase 1])**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Repository Closure) | 1 | LS | $292,766 | $292,766 |
| General Conditions - Construction Facilities (Repository Closure) | 1 | LS | $20,344 | $20,344 |
| Cover System for Disposal Cell (Impoundment 4 - Phase 1) | 1 | LS | $296,857 | $296,857 |
| SUBTOTAL | | | | $609,967 |
| Contingency (Scope and Bid) | 25% | | | $152,492 |
| SUBTOTAL | | | | $762,459 |
| Project Management | 6% | | | $45,748 |
| Remedial Design | 12% | | | $91,495 |
| Construction Management | 8% | | | $60,997 |
| TOTAL | | | | $960,699 |
| **TOTAL CAPITAL COST** | | | | **$961,000** |

**PERIODIC COSTS: (Assumed to be Incurred During Year 1) (Initial Waste Placement at Impoundment 4 [Phase 1])**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Waste Placement Operations) | 1 | LS | $74,030 | $74,030 |
| General Conditions - Construction Facilities (Waste Placement Operations) | 1 | LS | $12,217 | $12,217 |
| Waste Placement Operations (Sludge from Gladstone IWTP) | 7,300 | ECY | $30 | $218,030 |
| Waste Placement Operations (Mining-Related Waste from 2019 IROD Actions) | 10,700 | ECY | $28 | $304,812 |
| Contaminated Water Management | 20 | DY | $1,358 | $27,160 |
| Winterization | 1 | LS | $33,741 | $33,741 |
| Community Awareness Activities | 1 | LS | $5,824 | $5,824 |
| SUBTOTAL | | | | $675,814 |
| Contingency (Scope and Bid) | 25% | | | $168,954 |
| SUBTOTAL | | | | $844,768 |
| Project Management | 6% | | | $50,686 |
| Technical Support | 10% | | | $84,477 |
| TOTAL | | | | $979,931 |
| **TOTAL PERIODIC COST** | | | | **$980,000** |

**PERIODIC COSTS - (Assumed to be Incurred in Year 2 through 22) (Annual Waste Placement at Impoundment 4 [Phase 1])**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| General Conditions - Project-Dedicated Supervisory Staff (Waste Placement Operations) | 1 | LS | $74,030 | $74,030 |
| General Conditions - Construction Facilities (Waste Placement Operations) | 1 | LS | $12,217 | $12,217 |
| Contaminated Water Management | 20 | DY | $1,358 | $27,160 |
| Winterization | 1 | LS | $33,741 | $33,741 |
| Annual Waste Placement Operations | 3,830 | ECY | $37 | $141,188 |
| SUBTOTAL | | | | $288,336 |
| Contingency (Scope and Bid) | 25% | | | $72,084 |
| SUBTOTAL | | | | $360,420 |
| Project Management | 8% | | | $28,834 |
| Technical Support | 10% | | | $36,042 |
| TOTAL | | | | $425,296 |
| **TOTAL PERIODIC COST** | | | | **$425,000** |

**Table B-2: Cost Estimate Summary of Selected Interim Remedy for Interim Record of Decision - Implementation of First Phase Impoundment 4**

**PERIODIC COSTS - REPLACEMENT OF STOCKPILE LINER (Assumed to be Incurred Once Every 5 Years During Year 1 through 22)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Replacement of Stockpile Liner | 1 | LS | $1,683 | $1,683 |
| SUBTOTAL | | | | $1,683 |
| Contingency (Scope and Bid) | 25% | | | $421 |
| SUBTOTAL | | | | $2,104 |
| Project Management | 10% | | | $210 |
| Technical Support | 10% | | | $210 |
| TOTAL | | | | $2,524 |
| **TOTAL PERIODIC COST** | | | | **$3,000** |

**ANNUAL COSTS (Assumed to be Incurred Annually During Year 1 through 22)**

| DESCRIPTION | QTY | UNIT(S) | UNIT COST | TOTAL |
|---|---|---|---|---|
| Groundwater Monitoring Activities | 1 | LS | $27,316 | $27,316 |
| SUBTOTAL | | | | $27,316 |
| Contingency (Scope and Bid) | 20% | | | $5,463 |
| SUBTOTAL | | | | $32,779 |
| Project Management | 10% | | | $3,278 |
| Technical Support | 10% | | | $3,278 |
| TOTAL | | | | $39,335 |
| **TOTAL ANNUAL COST** | | | | **$39,000** |

**Summary of Present Value Analysis**

| Year[1] | Capital Costs[2] | Annual Costs | Post-Closure Costs | Periodic Costs | Total Annual Expenditure[3] | Discount Factor (7.0%) | Present Value[4] |
|---|---|---|---|---|---|---|---|
| 0 | $2,504,000 | $0 | $0 | $0 | $2,504,000 | 1.0000 | $2,504,000 |
| 1 | $0 | $39,000 | $0 | $980,000 | $1,019,000 | 0.9346 | $952,357 |
| 2 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.8734 | $405,258 |
| 3 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.8163 | $378,763 |
| 4 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.7629 | $353,986 |
| 5 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.7130 | $332,971 |
| 6 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.6663 | $309,163 |
| 7 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.6227 | $288,933 |
| 8 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.5820 | $270,048 |
| 9 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.5439 | $252,370 |
| 10 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.5083 | $237,376 |
| 11 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.4751 | $220,446 |
| 12 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.4440 | $206,016 |
| 13 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.4150 | $192,560 |
| 14 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.3878 | $179,939 |
| 15 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.3624 | $169,241 |
| 16 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.3387 | $157,157 |
| 17 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.3166 | $146,902 |
| 18 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.2959 | $137,298 |
| 19 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.2765 | $128,296 |
| 20 | $0 | $39,000 | $0 | $428,000 | $467,000 | 0.2584 | $120,673 |
| 21 | $0 | $39,000 | $0 | $425,000 | $464,000 | 0.2415 | $112,056 |
| 22 | $961,000 | $39,000 | $0 | $425,000 | $1,425,000 | 0.2257 | $321,623 |
| **TOTALS:** | $3,465,000 | $858,000 | $0 | $9,917,000 | $14,240,000 | | $8,377,432 |

**TOTAL PRESENT VALUE OF SELECTED REMEDY (IMPLEMENTATION OF FIRST PHASE)** [5] **$8,377,000**

**Notes:**

[1] The period of analysis is assumed to be 22 years.

[2] Capital costs are assumed to be capital costs distributed as indicated in the initial portion of this table

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADFT for details.

[5] Total present value is rounded to the nearest $1,000. Inflation and depreciation are excluded from the present value cost.

Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.

Costs presented are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented.

Unit costs represent total cost divided by the estimated quantity for each item and are rounded to the nearest whole number. Due to the rounding in the unit costs, multiplying the estimated quantity by unit cost may not exactly equal the total cost.

The cost estimates are prepared solely to facilitate relative comparisons between alternatives for FFS evaluation purposes.

The information in this table is based on the best available information regarding the anticipated scope of the Bonita Peak Repository selected interim remedy. Changes in the cost elements may occur as a result of new information and data collected during the engineering design of the selected interim remedy.

Assumptions used to develop costs in the tables will be documented in the Basis of Estimate, to be included as part of Appendix B of the Final IROD.

**Abbreviations:**

| | |
|---|---|
| ECY | Embankment Cubic Yard |
| DY | Day |
| HR | Hour |
| LS | Lump Sum |

# RESPONSIVENESS SUMMARY

# RESPONSIVENESS SUMMARY

## 1.0 OVERVIEW OF COMMUNITY INVOLVEMENT

Community involvement is an important aspect of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

The U.S. Environmental Protection Agency (EPA) issued its *Proposed Plan for a Site-Wide Waste Repository* on July 29, 2020. The proposed plan was made available in electronic format at the four site information repositories:

- Silverton Public Library, 1117 Reese Street, Silverton, Colorado
- Durango Public Library, 1900 East Third Avenue, Durango, Colorado
- Farmington Public Library, 2101 Farmington Avenue, Farmington, New Mexico
- Diné College Shiprock Campus Library, 1228 Yucca Street, Shiprock, New Mexico

An electronic notice with links to relevant documents was posted on EPA's BPMD website throughout the public comment period. Because of coronavirus disease 2019 (COVID-19) restrictions on travel and public gatherings, a virtual public meeting for the proposed plan was held on August 11, 2020, via Adobe Connect. EPA gave a presentation on the focused feasibility study (FFS) and the proposed plan, and the public had an opportunity to provide oral and written comment. A stenographer provided transcription services for the meeting, and the transcript and a videotape of the presentation.

The 30-day public comment period for the proposed plan was from July 29 to August 27, 2020. Announcement of the public comment period and public comment meeting were published in the July *Bonita Peak Mining District Update*, which was sent to the site's email list. Notices were published in the *Silverton Standard, Durango Herald*, *Durango Telegraph*, and *Southern Ute Drum*. EPA issues monthly updates for the site in the "Bonita Peak Mining District Update." These two-page updates provide recent activities, upcoming events, items new to the website, and more. Spanish-language versions are also available, and past copies of the update are available to the public on the website.

Continued community involvement will be vital as future response actions are planned. For more information on community involvement throughout the CERCLA process, see Section 3 of Part 2 of this interim record of decision (IROD), and the community involvement plan (CIP) (CDM Smith 2019).

This responsiveness summary is organized as follows:

- Section 1.0, Overview of Community Engagement
- Section 2.0, Breakdown of Comments Received

- Section 3.0, Response to Comments
- Section 4.0, Modifications to the Proposed Plan Made as a Result of Public Comments

## 2.0 BREAKDOWN OF COMMENTS RECEIVED

Twenty-one comment submissions were received on the proposed plan, representing private individuals, citizen's groups, government agencies, sovereign nations, and business interests. They are shown in alphabetical order below.

- BPMD Community Advisory Group (CAG)
- Bureau of Land Management, Colorado Interior Region 7, Royal Gorge/Gunnison Field Office
- Green Energy Metals Corp.
- La Plata County Board of County Commissioners
- Navajo Nation Environmental Protection Agency, Water Quality/NPDES Program
- New Mexico Environment Department and Office of Natural Resources Trustee
- New Mexico Public Works, Water/Wastewater Division
- Private individuals (eight comment submissions)
- San Juan Citizens Alliance
- San Juan County Commissioners
- San Juan County Historical Society
- Sunnyside Gold Corporation (SGC)
- Town of Silverton, Town Administrator
- Utah Department of Environmental Quality (UDEQ), Division of Water Quality

Comments were received by mail, by email, and as oral comments at the virtual public meeting (stenographer's transcript). The submissions that covered different topics were organized into individual comments by topic using best judgement. Each submission was given a comment identification (ID) number that tracked basic information (date received, commenter name, comment method, title).While all comments are compiled into various topics, with responses provided in Sections 3.1 through 3.12, the five topics with the most comment submissions are:

- **Impacts to public features (eight comments)**. Includes comments on impacts to the Mayflower Mill, the nonmotorized trail, local roads that could be used for hauling, the Town of Silverton drinking water supply, and Hillside Cemetery.

- **Design-related details (seven comments)**. Includes comments on leachate collection and disposal issues, repository construction, and use of alternative design types.

- **Community engagement (six comments)**. Includes transparency and document review.

- **Management plans (six comments)**. Includes comments on management plans prepared in the remedial design process (e.g., traffic management, stormwater management).

- **Truck traffic and impacts on tourism (six comments)**. Includes haul routes and seasonal timing of hauling to limit impacts.

Most commenters did not oppose a repository and understood the need for one but had concerns regarding the topics listed above.

# 3.0 RESPONSE TO COMMENTS

The individual comments were sorted into categories to allow a combined response for each category. The 12 comment categories for which responses are provided are shown in alphabetical order below:

- 3.1 Access and security
- 3.2 Alternative R4 as a stand-alone option
- 3.3 Community engagement
- 3.4 Contaminant migration
- 3.5 Design specifications
- 3.6 Impacts to public features
- 3.7 Impoundment safety
- 3.8 Management plans
- 3.9 OU2 RI
- 3.10 Other miscellaneous
- 3.11 Repository location selection
- 3.12 Truck traffic impacts on tourism

EPA's response to public comments is presented below. The various comments received that are not directly related to the Bonita Peak Repository interim remedial action (IRA) are summarized in Section 3.13.

## 3.1 ACCESS AND SECURITY

### 3.1.1 Comment Summary

Two comments were received regarding access and security. They came from the La Plata County Board of County Commissioners and the San Juan County Board of Commissioners.

La Plata County stated that the proposed repository location is highly visible and is in an area where tourism is heavily anticipated. Plans for site security protecting the property from trespassers and protecting users from dangerous scenarios are needed and should include the museum and the hiking trail adjacent to or near the project area.

San Juan County is opposed to the construction of fencing around the repository.

### 3.1.2 EPA Response

As noted in the FFS, EPA will implement access controls at the Bonita Peak Repository to prevent unauthorized access to the repository and protect the safety and health of the general public. Access controls can include a combination of fencing, gates, and signage. EPA understands the concerns of commenters that a fence along the perimeter of the repository would potentially reduce the ability for wildlife to graze in the area. EPA will consider alternative fencing configurations, such as constructing fencing only around specific repository cells rather than fencing the full perimeter of the repository, during the remedial design phase. The specific details of fencing and access will be developed during the remedial design phase.

## 3.2 ALTERNATIVE R4 AS A STAND-ALONE OPTION

### 3.2.1 Comment Summary

Comments regarding use of Alternative R4 as a stand-alone option were received from the Green Energy Metals Corp., the CAG, SGC, and two private individuals.

Green Energy Metals Corp. stated that Mayflower tailings impoundment 4 is the obvious place to dispose of the water treatment sludge as it is a large area and the underlying Mayflower tailings impoundment lacks sufficient recoverable metals for reprocessing.

The CAG commented that it would be more cost effective to develop a repository on Mayflower tailings impoundment 4 and that the impoundment could handle 128 years of treatment sludge, whereas Mayflower tailings impoundments 1 and 2 could only hold 13 and 4 years of sludge, respectively. The CAG stated that EPA should consider development of a repository on Mayflower tailings impoundment 4 in stages, perhaps starting with the northeast side of the pond. Further, the CAG made the points that just a tenth of the repository could store 10 or more years of sludge, giving time for more investigation of potential metal loading from the pond to the Animas River. This would disturb only one tailings impoundment, as opposed to three tailings impoundments.

SGC stated that a repository at Mayflower tailings impoundment 4 is “the most sensible alternative, possessing unmatched feasibility, safety, efficiencies, and long-term- and cost-effectiveness, and singly satisfying all contemplated water treatment sludge and waste storage needs.” Additionally, SGC commented that it preserves the character of and does not risk impacts to the Mayflower Mill, respects property rights, and minimizes impacts to property owners and the environment. They believe that it has been studied comprehensively, but any additional study, if even needed, could be conducted during construction and operation of a repository, and the existing monitoring network would be a plus.

A private individual who supported the use of Alternative R4 alone stated that use of Mayflower tailings impoundments 1 and 2 unnecessarily disrupts local property owners and the public at a much higher cost than use of Mayflower tailings impoundment 4. The private individual suggested that EPA work with SGC to allow use of the impoundment while the OU2 RI is being

completed. They believe that Alternative R4 has the capacity for long-term use, minimizes disruption, has the best access with no need to rehaul between areas by county road access or new haul roads, is cheaper, and allows the project to be done in phases.

### 3.2.2 EPA response

As noted in Section 15.0 of Part 2, EPA has made changes to the preferred alternative presented in the proposed plan. As part of the selected interim remedy presented in Section 12.0 of Part 2 in this IROD, the Bonita Peak Repository will initially be constructed on Mayflower tailings impoundment 4. As the Mayflower tailings impoundment 4 disposal cells reach capacity and additional space for disposal cells there are exhausted, the selected interim remedy would include construction of additional repository cells on Mayflower tailings impoundments 1 and/or 2, if necessary, for further capacity. Utilizing additional repository cells on Mayflower tailings impoundments 1 and/or 2 maximizes the overall capacity of the repository and the resulting long-term effectiveness and permanence of the remedy.

## 3.3 COMMUNITY ENGAGEMENT

### 3.3.1 Comment Summary

Comments regarding community engagement were received from the Navajo Nation, New Mexico Public Works, the San Juan Citizen's Alliance, UDEQ, SGC, and a private individual. Topics included community engagement and transparency in decision-making and document review.

- **Engagement**. The San Juan Citizen's Alliance encouraged EPA to continually engage local communities and stakeholders in decisions that could impact the health of the Animas River and its communities. EPA should provide special care in addressing the concerns of the local community and should consider and address comments provided by residents, planning groups, the CAG, local organizations, and local, state, and tribal governments. New Mexico Public Works requested that they be included in project development. SGC stated that stakeholders and the community must be actually and meaningfully involved in repository site-related actions and decisions, as this will improve the repository and related environmental outcomes. A request was also made by a private individual for more transparency during all phases of repository use.

- **Document Review**. UDEQ requested that more time be provided in the future for reviewing substantial documents such as the FFS, and the Navajo Nation requested access to supporting information for evaluations used to make FFS decisions.

### 3.3.2 EPA Response

EPA shares the goals expressed above regarding engagement. Section 3.0 of Part 2 summarizes many of the outreach activities we have conducted at the site to date. These activities have included:

- Interviews and community involvement
- Information repositories
- Support of community groups
- Fact sheets
- Published advertisements
- Public meetings
- Proposed plan, public meeting, and public comment period

These activities have focused on notifying and bringing together the collective input of local individuals, local government, tribal government, and representatives of states and communities downstream. This level of outreach extends beyond that required under CERCLA and the National Contingency Plan. EPA will continue work closely with local stakeholders (including the CAG and the Silverton/San Juan County Planning Group), agency partners, and the local community for the duration of the project and is committed to transparency in our decision-making process.

Supporting information for evaluations done in the FFS is provided in the FFS appendices and in the administrative record, which is available for public review.

## 3.4 CONTAMINANT MIGRATION

### 3.4.1 Comment Summary

Three comments were received related to contaminant migration. They came from UDEQ, New Mexico Public Works, and a private individual.

UDEQ expressed the need to prevent contamination in the Animas River. They cited three main avenues for contamination (leachate leakage, snowmelt and/or runoff, and mine waste spills during transport) that they requested be considered in the context of the geographic setting.

New Mexico Public Works echoed this concern and stressed that public water suppliers have concerns with untreated leachate entering the Animas River and its tributaries.

The private individual commented that there was no acceptable migration of contaminants downstream of the waste pile and the goal to “control surface water runoff...to minimize transport and deposition of contaminants of potential concern in a receiving stream...” was unacceptable.

### 3.4.2 EPA Response

EPA agrees that minimizing migration of contamination is a top priority during the construction and operation of the Bonita Peak Repository. The three remedial action objectives (RAOs) outlined for this IROD are focused on that effort and are consistent with CERCLA's statutory mandate for addressing unacceptable risks to human health and environment. While CERCLA does not mandate elimination of all contaminant migration, EPA is taking proactive measures to minimize risk of further migration, as described in the following paragraphs.

The selected interim remedy considers the use of industry standard components and practices for mine waste repositories and represents a robust containment system relative to the type of mining-related materials anticipated for disposal. As discussed in this IROD, the containment elements of the repository proposed for the selected interim remedy would be protective to human health and environment long term by isolating mining-related wastes from the surrounding environment. The elements include lined repository cells with leachate collection to minimize leaching to the underlying tailings and groundwater.

Best management practices will be followed during repository construction, operation, and closure to minimize migration. The repository will minimize transport of contamination in surface water runoff using best management practices, such as berming and sloping, to reduce erosion and generation of MIW leachate from precipitation, snowmelt, and runoff.

In addition, a groundwater monitoring and cell leak detection program will be implemented during mining-related waste placement operations, closure, and postclosure to demonstrate migration of contaminants from the repository to groundwater is minimized.

It is important to distinguish that the tailings that already exist at the Mayflower tailings impoundments are considered part of OU2. Any potential for migration of contamination from those tailings to the groundwater or surface water would be evaluated as part of the OU2 RI and any future OU2 decision documents. This selected interim remedy would focus solely on the Bonita Peak Repository and its potential impacts, but will be integrated with and not be inconsistent with a final remedy for OU2.

## 3.5 DESIGN-RELATED DETAILS

### 3.5.1 Comment Summary

Seven comments were received specific to design-related details regarding the repository. They came from the La Plata County Board of Commissioners, the UDEQ, the Navajo Nation, New Mexico Public Works, the Bureau of Land Management, SGC, and a private individual.

La Plata County commented that the specifics of the leachate management system need to be outlined in the design phase to specify how leachate will be managed, treated, and disposed, and they asked that EPA consider providing a management plan for any and all seepage, leakage, or unanticipated releases. They requested that EPA identify the potential for additional

disturbances, such as additional monitoring wells, expanded parking, etc., and identify how these disturbances will be mitigated. They also suggested that EPA consider identifying additional disturbance areas associated with this location that may be needed for future uses.

The UDEQ asked what controls are in place to prevent and identify leaks that may occur, whether a single or double liner system would be employed, and what type of liner would be used and if it would be appropriate for the type of waste generated. They stated that more detail on all aspects of the leachate liner system and leak detection system should be included, as this portion of the process is critical for preventing surface and groundwater contamination.

The Navajo Nation commented that EPA should consider using a more natural landform design for the cell covers, which might reduce storage capacity but would also reduce or eliminate the need for monitoring and maintenance in perpetuity. The Navajo Nation inquired in their comments about the placement for drying of the treatment sludges from the Gladstone IWTP and if the chosen location in the drying cells at the repository was selected because of insufficient space for drying sludge at the Gladstone location. The Navajo Nation stated that EPA should consider how to reduce the need for hauling leachate back to the IWTP, which could reduce the risk of accidents and/or releases of contaminated material.

New Mexico Public Works commented that they are concerned about what the walls of the repository will be made of and would like to understand how the waste will be contained.

The Bureau of Land Management asked why water and leachate would be trucked to the Gladstone IWTP before the decision about treatment and disposal was made, rather than making those decisions through laboratory analysis before transportation.

SGC commented that a repository liner is unnecessary and may “compromise environmental outcomes.”

The sentiment expressed by SGC was echoed by a private individual. That private individual stated that having a bottom liner would cause “a large proportion of precipitation to report to the collection system with little chance for evaporation in a relatively short time period.” They stated that, without a liner, the high pH leachate may provide additional buffering to underlying material if precipitation infiltrates and there would be a lower possibility that tanker trucks would be needed. The commenter believed that monitoring could detect adverse changes in water quality and, if adverse impacts were detected, EPA could use adaptive management to implement the liner before large impacts occur. They stated that a liner will have to be protected to prevent damage when loading and off-loading, which will be expensive and difficult.

### 3.5.2 EPA Response

The proposed plan and this IROD describe the selected interim remedy and the underlying information that supports the decision for selecting the remedy. Specific details of how the

selected interim remedy will be implemented are typically not included in these CERCLA remedy selection documents, but are developed during the remedial design phase.

A priority of this repository IRA is to isolate mining-related wastes placed in the repository to prevent migration of contamination. RAO 1 notes that mining-related wastes and resulting MIW leachate would be controlled to minimize migration of contamination from the repository to groundwater and surface water outside the repository. RAO 1 will be achieved using a combination of liner and leachate collection systems appropriate for the type of cell and consistent with industry standard concepts and practices. In addition, a leak detection system would be implemented to monitor for migration of contaminants from the repository to groundwater. Further details on the liner will be developed during the remedial design phase.

EPA does not consider nonlined repository cells as a viable option for this interim remedial action. While a commenter notes that high pH (i.e., alkaline) leachate would provide buffering to underlying tailings, that presumes a predominant waste composition (i.e., lime-buffered treatment sludge). However, the exact proportion of mine waste and treatment sludge to be brought to the repository is likely to fluctuate based on future response actions taken throughout the Site at any given time. Thus, the pH and metals concentrations within MIW leachate, as well as the quantities of leachate, that would be generated are uncertain. Depending on the quantity and quality of different waste streams placed in the repository, the resulting MIW leachate could be alkaline (high pH) or acidic (low pH). Given the unknowns associated with leachate generation, lined repository cells provide the most viable option for preventing migration of contamination for this interim remedial action. Furthermore, to comply with applicable or relevant and appropriate requirements (ARARs), the design and construction of this repository must meet substantive requirements of the Colorado Department of Public Health and Environment Regulations Pertaining to Solid Waste Sites and Facilities outlined in Appendix A of this IROD, including requirements for bottom liners and leachate collection systems, unless there is a compelling technical reason to invoke a regulatory variance or waiver. Additionally, as this repository will be designed and constructed in phases, any information gathered during the initial phase of the repository regarding leachate quantity and quality could be used to adjust the future phases of design and construction.

As previously discussed, uncertainties remain regarding the MIW leachate that will be generated. For the purposes of this IROD, it was assumed that treatment of leachate, if necessary, would take place on-site in a manner appropriate for the quality and quantity of the leachate prior to disposal, such as treatment at the Gladstone IWTP prior to discharge. However, EPA will collect data on the leachate quality and quantity as the leachate is generated to inform decisions on treatment needs. There are other options that could be employed depending on the quantity and quality of the leachate, such as treatment of the leachate at the repository location. Treatment and discharge decisions will be re-evaluated once further data is gathered about the resulting leachate.

## 3.6 IMPACTS TO PUBLIC FEATURES

### 3.6.1 Comment Summary

Comments were received from the San Juan County Board of Commissioners, the La Plata County Board of County Commissioners, the Town of Silverton, the CAG, the San Juan Citizen's Alliance, the San Juan County Historical Society, and two private individuals regarding mitigation of impacts to the Mayflower Mill, the Hillside Cemetery, the Town of Silverton's Boulder Gulch water-intake, the nonmotorized trail, and roads proposed for use as haul roads. The request was made that EPA work with local governments to minimize or eliminate these impacts.

- **Mayflower Mill**. The San Juan County Historical Society, San Juan County, and the CAG had concerns about potential impacts to the Mayflower Mill, an important National Historic Landmark. They asked how road access around the Mayflower Mill to Mayflower tailings impoundment 1 could affect parking and the visitor experience. San Juan County and the CAG stated that impacts to the Mayflower Mill must be mitigated or compensated. The historical society stated that a "serious 106 review of this property will need to be taken" and "it is not a sure thing that such use of our property shall be granted by the State Historic Preservation Officer." Visitor safety was cited as a concern, as was road dust created by haul trucks. Dust is currently being monitored by the San Juan County Department of Public Health.

- **Hillside Cemetery**. San Juan County and the Town of Silverton requested that any repository construction or use be completed without having any adverse impact upon the adjoining Hillside Cemetery.

- **Silverton Drinking Water Intake**. La Plata County, the Town of Silverton, the San Juan Citizen's Alliance, and a private individual commented that EPA must ensure that there are no impacts to the Boulder Gulch water intake, an important source of high-quality water for the community.

- **Nonmotorized Trail.** The CAG, San Juan County, the Town of Silverton, and two private individuals expressed concern that repository work would create dust and affect the overall quiet experience of the hiking trail that leads to Boulder Creek. They wanted more details as to how EPA plans to mitigate those issues and asked that EPA consider ways to transport materials that will have the least impact on future recreation.

- **County Roads.** San Juan County commented that any impact to County Roads 2 or 110, or any other county roads, caused by hauling material to the repository must be mitigated at EPA's cost.

### 3.6.2 EPA Response

EPA will work with local governments to mitigate or eliminate the impacts to the public features discussed in this section. As described in Section 12.0 of Part 2, the selected interim remedy will initially construct repository cells at Mayflower tailings impoundment 4, approximately three-

quarters of a mile downstream from the drinking water intake at Boulder Gulch. The proposed repository site is approximately 300 feet lower in elevation than the Mayflower Mill, therefore, that feature will not be impacted. Similarly, the Mayflower Mill is approximately 1 mile from Mayflower tailings impoundment 4. Mayflower tailings impoundment 4 will be accessed using the current access road (gated driveway) connecting County Road 2 to Mayflower tailings impoundment 4. The access road (driveway) that connects County Road 2 to Mayflower tailings impoundment 1 and traverses around the Mayflower Mill will not be utilized during the initial repository operations at Mayflower tailings impoundment 4. Therefore, no impacts to the Mayflower Mill are anticipated beyond additional truck traffic on County Road 2. As noted in Section 3.11, to the extent practical, EPA will focus waste hauling efforts during nonpeak tourist times to minimize traffic impacts to the tourism and the community. The selected interim remedy will not require accessing Hillside Cemetery or the nonmotorized trail, therefore, direct impacts are not anticipated to those features. Dust and noise suppression will be implemented for project equipment to minimize impacts to the community and users of the features closer to Mayflower tailing impoundment 4 (i.e., Hillside Cemetery and the nonmotorized trail). Trucks used as part of this action would follow legal load requirements and pay fuel taxes and other permit fees that support road maintenance, like any other truck traffic not associated with Superfund cleanups. EPA will work with San Juan County to document the existing conditions of the primary county roads used as part of this action and repair road damages, beyond normal wear and tear, that are specific to the action.

Based on the estimated capacity of the Mayflower tailings impoundment 4 presented in this IROD, with optimal waste characteristics, it could be up to 130 years before the capacity at Mayflower tailings impoundment 4 is exhausted and repository operations would transition to Mayflower tailings impoundments 1 and 2. Concerns regarding impacts from operating a repository on Mayflower tailings impoundments 1 and 2 (i.e., impacts to the Mayflower Mill and the nonmotorized trail) will be further addressed as future waste generation and disposal decisions are made.

## 3.7 IMPOUNDMENT SAFETY

### 3.7.1 Comment Summary

Four comments were received that cited concerns with impoundment safety. They were from the San Juan County Board of Commissioners, the San Juan Citizen's Alliance, and two private individuals.

The San Juan County Board referenced the failure on Mayflower tailings impoundment 1 that "caused the culvert and road to be washed out at Boulder Gulch as well as massive amounts of tailings flowing in the Animas River," saying that every precaution must be taken to ensure that a repository is safe. They emphasized that the impoundments must be structurally sound, and mitigation and maintenance is needed to prevent failure.

The San Juan Citizen's Alliance commented that EPA should take extra care to ensure the health and safety of communities downstream of the site and, due to the fact that the proposed repository would be directly upstream from the Town of Silverton and directly adjacent to the mainstem of the Animas River, extra care and consideration must be made to ensure the health and safety of downstream communities. They believe that this includes ensuring that the repository is structurally sound and engineered to last long term using the best available technologies.

Two private individuals asked if there had been an assessment of the structural integrity of the tailings ponds and if it had been demonstrated that no compromise of the groundwater system or leaching into the Animas River could occur, and stated proof was needed before approval of a repository site before was used.

### 3.7.2 EPA Response

EPA remains fully committed to constructing a repository with safety as a foremost priority. It is important to distinguish that the stability of the existing impoundments is primarily an OU2-related issue. This repository IRA focuses on mitigating the additional instability impacts from constructing a repository on top of the impoundments.

As described in Appendix C of the FFS, a geotechnical analysis was conducted to support the evaluations of remedial alternatives in the FFS and to aid in selection of a repository site. The analysis was conducted to evaluate the relative slope stability of the impoundments if a repository was constructed on top of them. Slope stability analysis is the process of calculating and assessing how much stress a particular slope can manage before failing.

The geotechnical analysis indicated that construction of a repository at Mayflower tailings impoundment 4 has the highest slope stability ranking relative to the other impoundments. The selected remedy includes the use of a setback at Mayflower tailings impoundment 4 (the initial repository location for the selected interim remedy). A setback is defined as a set distance away from the impoundment slope in which no repository components would be constructed. A setback would mitigate the likelihood of shallow slope instabilities from impacting the repository components. Further geotechnical evaluations at Mayflower tailings impoundment 4 related to the impacts from the construction of the repository may be planned as part of remedial design. In addition to the geotechnical slope stability evaluations, EPA will follow industry standards and ARARs for designing and constructing mine waste repositories to ensure a safe and structurally sound repository.

As noted in Section 3.6, with optimal waste characteristics, it could be up to 130 years before the capacity at Mayflower tailings impoundment 4 is exhausted and repository operations would transition to Mayflower tailings impoundments 1 and 2, if necessary, based on future waste generation and disposal decisions. The geotechnical analysis presented in FFS also indicated that use of a recommended setback at Mayflower tailings impoundment 1 and 2 would reduce the likelihood of shallow slope instabilities from impacting the repository location. Further

geotechnical evaluations at Mayflower tailings impoundments 1 and 2 related to the impacts from the construction of the repository may be conducted as part of remedial design of those impoundments to address any data needs and any concerns from the past slope failure at Mayflower tailings impoundment 1.

As noted in Section 3.4, it is important to distinguish that the tailings that already exist at the Mayflower tailings impoundments are part of OU2. Any potential for failure of tailings impoundments unrelated to the repository, as well as migration of contamination from tailings impoundments to the groundwater or surface water, would be evaluated as part of the OU2 RI and any future OU2 decision documents. This selected interim remedy would focus solely on the Bonita Peak Repository and its potential impacts, but will not be inconsistent with a final remedy for OU2.

## 3.8 MANAGEMENT PLANS

### 3.8.1 Comment Summary

Six comments were received that had input related to management plans for the IRA from the CAG, the Bureau of Land Management, the San Juan Citizen's Alliance, the Navajo Nation, the UDEQ, and a private individual. Issues these commenters wanted to see addressed include:

- Winterization procedures to prevent snowmelt from infiltrating, and winter maintenance when the primary access road is closed, including the sorts of issues anticipated.
- Steps to address spills that may occur during transport of waste and leachate, given the steep roads in the area and proximity to waterways.
- Monitoring for groundwater and surface water, including specifics of well placement, access, and abandonment; frequency of sampling; and locations of surface water monitoring stations.
- Monitoring of impoundments after disposal cells are installed and access to those wells.
- Abandonment of monitoring wells that fall within the footprint of the repository features.
- Description of leak detection methods used.
- Enhancement of the river corridor (tree planting, weed abatement, and use by wildlife). The piles are important winter elk habitat that could be made better. A clear understanding of requirements of the laws that refer to bald or golden eagles, threatened and endangered species, and migratory birds is required.
- A robust maintenance and monitoring plan to mitigate potential releases.
- Emergency preparedness and response plans in the event of a catastrophic failure.
- A National Wetlands Inventory, before design is started.

- A transportation plan for how and when materials are moved to the site, including dust mitigation on county roads.

- A repository water quality monitoring plan.

It was requested that the plans be developed in collaboration with downstream communities, especially the Town of Silverton.

### 3.8.2 EPA Response

The proposed plan and this IROD describe the selected interim remedy for the Bonita Peak Repository and the underlying information that supports the decision for selecting the remedy. Specific details of how the selected interim remedy will be implemented are typically not included in these CERCLA remedy selection documents but are developed during the remedial design phase. EPA will develop site-specific remediation plans, as appropriate, during the remedial design phase to address many of these concerns. Plans for groundwater monitoring, surface water monitoring, spill control, winterization, transportation, emergency preparedness and response, and operations and maintenance will be determined during remedial design, which is the appropriate time for those types of evaluations. Additionally, a wildlife/habitat survey and a wetland survey will be conducted as part of remedial design efforts. Contact information for community members to communicate concerns to EPA during remedial action construction will be provided.

## 3.9 OU2 RI

### 3.9.1 Comment Summary

Four comments were received regarding the ongoing OU2 RI from the Bureau of Land Management, the Navajo Nation, the San Juan Citizen's Alliance, and SGC.

The Bureau of Land Management stated that results of the OU2 RI should be used to ensure the design of the repository meets all human and environmental health protection requirements, regulations, and laws.

The Navajo Nation stated that a site as big as OU2 that is on the banks of the Animas River should be studied properly and without avoidable hindrances, and that selection of a permanent waste repository site should be based on more than an assumed presumptive approach. They stated that the option of tailings removal at OU2 should be left open until studies determine that action is appropriate, and that EPA should allow the OU2 RI to finish and take those conclusions into account when selecting an alternative. The Navajo Nation further stated that this may require short-term hauling of sludge off-site or finding another temporary site to stockpile it, but it is most important that all sites are remediated in the best way to reduce long-term risk to human health and the environment.

The San Juan Citizen's Alliance submitted extensive comments and is concerned that the OU2 RI must move forward unimpeded and that metals sources impacting the Animas River must be identified. They list OU2 RI items yet to be completed and additional elements they believed are needed. The San Juan Citizen's Alliance stated that development of a repository on any of the impoundments could interfere with or prohibit actions, such as drilling monitoring wells or performing studies, and they ask EPA to complete necessary environmental investigations (especially characterization of the groundwater system) in advance of repository construction. Further, they stated that the phased approach proposed by EPA might allow for the completion of an adequate study at Mayflower tailings impoundment 4, but they remain concerned about premature development of Mayflower tailings impoundments 1 and 2.

Specific questions asked by the San Juan Citizen's Alliance are:

- Will the OU2 RI be completed in advance of EPA's development of a sitewide repository?
- If the RI will not be completed in advance, how might repository development and operation impact the RI?
- Absent a complete understanding of contaminant migration issues and metal loading at OU2, how would EPA monitor for water quality impacts associated with a repository?
- Have investigations and characterization of Mayflower tailings impoundments 1 and 2 already been completed?

Finally, the alliance stated that characterizing existing contaminant migration issues and any metal sources currently impacting water quality in the Animas will be critical for long-term monitoring of the repository and its effectiveness.

SGC stated that a comprehensive and exhaustive investigation of the Mayflower property has demonstrated that the Mayflower facilities, including Mayflower tailings impoundment 4, have little, if any, impact on underlying groundwater, and there is no evidence that indicates the Mayflower is the source of elevated concentrations of metals in the Animas River.

### 3.9.2 EPA Response

The OU2 RI at the Mayflower tailing impoundments is ongoing and EPA remains committed to completing a full and thorough RI. CERCLA response actions, including the repository interim remedial action described in this IROD, follow an ARARs process that determines what environmental laws and regulations are applicable or relevant and appropriate to the remedial action and achieves them or waives them if protectiveness can otherwise be met. As part of the FFS, impacts to the ongoing RI were evaluated under the implementability evaluation criteria. EPA intends to begin implementation of this repository IRA prior to the completion of the OU2 RI. While impacts to the ability to conduct the OU2 RI will be minimal, the following mitigative approaches will be considered to address the potential impacts:

1. Phase the construction of cells. The placement of the initial repository components could be in areas where there are no remaining data needs. Phasing construction of cells allows for only using a portion of the impoundment initially, allowing for future OU2 RI characterization to continue as needed in areas outside of the phased repository footprint.

2. The construction of cells and associated features could be modified to accommodate already installed RI monitoring components such as monitoring wells.

3. The construction of the RI monitoring components, such as wells, could be modified to minimize conflict by offsetting their placement (e.g., use of directional drilling).

4. Abandonment of monitoring wells that are no longer necessary for RI or other future data needs.

Incorporating these approaches will allow for the construction of the Bonita Peak Repository while the OU2 RI is finalized. The selected interim remedy could be implemented in phases, such that the initial phase of repository construction would occupy a relatively small portion of the footprint of Mayflower tailings impoundment 4, thus allowing future OU2 RI characterization to continue as needed in areas outside the phased repository. Therefore, OU2 RI impacts at Mayflower tailings impoundments 1 and 2 are not anticipated.

EPA does not agree with the commenter that indicates that a comprehensive investigation of the Mayflower facilities demonstrates that there is little, if any, impact on underlying groundwater or the Animas River. EPA remains committed to a thorough RI at OU2 to fully identify and investigate sources of contamination within OU2 impacting groundwater and the Animas River.

## 3.10 OTHER MISCELLANEOUS

Comments classified as miscellaneous include those relating to innovation, liability, other wastes, reprocessing metals in Ponds 1 and 2, solar power, text clarifications, wetlands, and avalanches.

### 3.10.1 Innovation

#### 3.10.1.1 Comment Summary

One private individual asked who retained ownership of waste materials deposited at the Mayflower impoundment and what access for innovation would be allowed for research and development. Delta Brick Company, a regional company using waste materials to construct bricks and tiles for sustainable building, was cited as an example of this type of activity.

#### 3.10.1.2 EPA Response

The land associated with the Mayflower tailings impoundments is privately owned, primarily by SGC. RAO 3 notes that this IRA will limit uses of the property that are incompatible with a mine waste repository. Innovative approaches to remediation of the Mayflower impoundments, as necessary, may be considered as part of remedial decisions at OU2.

### 3.10.2 Liability

#### 3.10.2.1 Comment Summary

A private individual was concerned that adding sludge from the treatment of Gold King Mine discharge to the Mayflower tailings impoundments would make it impossible to link SGC to future contamination of groundwater or seeps. The commenter asked if the Mayflower Mill tailings would be removed from the site list of "46 plus 2."

#### 3.10.2.2 EPA Response

The selected interim remedy includes construction of a repository on top of Mayflower tailings impoundments 1, 2, and 4. The repository components, including the liners, the leachate collection systems, and the covers, will be designed to minimize migration of contamination from the repository to the underlying tailings at the Mayflower tailings impoundments and to groundwater and surface water outside the repository. The Bonita Peak Repository will be considered a sitewide action that is managed as part of OU1.The Mayflower tailings impoundments, which are part of OU2, will remain as mining-related sources that make up the larger BPMD Superfund Site.

### 3.10.3 Other Wastes

#### 3.10.3.1 Comment Summary

A private individual asked whether EPA intends to use the repository for more than IWTP sludge.

The San Juan County Board of Commissioners stated that they are opposed to removing the sludge and tailings from Kittimac unless an environmental impact can be demonstrated to warrant the move.

#### 3.10.3.2 EPA Response

As noted in Part 2 of this IROD, the Bonita Peak Repository will be used for placement of treatment sludges from the Gladstone IWTP, wastes generated from the IRAs in the 2019 IROD, and other sources of mine wastes from future response actions, pursuant to future decision documents.

As part of a separate action, treatment sludge from the Gladstone IWTP was transported to Kittimac. This IROD does not address the treatment sludge that was transported to Kittimac. Any changes to the treatment sludge at Kittimac would necessitate further review and analysis.

### 3.10.4 Reprocessing Metals in Tailings Ponds 1 and 2

#### 3.10.4.1 Comment Summary

Green Energy Metals Corp. commented that Mayflower tailings impoundments 1 and 2 had enough metals values to reprocess, which would provide an economic benefit and leave a more benign material behind. They believe that placing sludge disposal cells on the ponds would preclude reprocessing.

#### 3.10.4.2 EPA Response

As noted in Section 3.6, the selected interim remedy will initially construct repository cells at Mayflower tailings impoundment 4. With optimal waste characteristics, it could be up to 130 years before the capacity at Mayflower tailings impoundment 4 is exhausted and repository operations would transition, if necessary, to Mayflower tailings impoundments 1 and 2. Given that Mayflower tailings impoundments 1 and 2 would not be utilized in the immediate future, the selected interim remedy will not directly impede any efforts to reprocess tailings at Mayflower tailings impoundments 1 and 2 in the near term. Any requests to reprocess tailing in the future will be evaluated by EPA at that time.

### 3.10.5 Solar Power

#### 3.10.5.1 Comment Summary

A private individual asked if EPA has a program or funding source that would support installation of a solar farm and if this could this be a mandatory tradeoff for the impact of a repository on the community.

#### 3.10.5.2 EPA Response

Superfund redevelopment opportunities are typically considered after the remedies are completed. Potential types of land redevelopment/reuse at the Mayflower tailings impoundments could be considered in the development of remedial alternatives for an OU2 remedial action.

### 3.10.6 Text Clarifications

#### 3.10.6.1 Comment Summary

A private individual commented that EPA implied that the wastes stayed on-site when moved from Gladstone IWTP to the Mayflower tailings impoundments, meaning that the Town of Silverton was in the BPMD Superfund Site, which is not the case.

Another commenter requested clarification in future documents that there are no public lands involved in the IRA and also wanted clarification of the volume of sludge generated annually.

#### 3.10.6.2 EPA Response

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations 300.430(e)) defines on-site as "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action." Based on that definition, transportation of treatment sludges from the Gladstone IWTP to the Bonita Peak Repository at the Mayflower tailings impoundments is considered an on-site action. However, that interpretation does not dictate that the Town of Silverton is part of the BPMD Superfund Site.

The locations for the selected interim remedy (including Mayflower tailings impoundments 1, 2, and 4) are on privately owned lands, primarily owned by SGC.

Historically, the average annual sludge generation rate has been approximately 6,000 cubic yards. For the past year, the estimated sludge generation rate is approximately 4,600 cubic yards. For purposes of estimating longevity of the proposed repository, the average annual sludge generation rate of 6,000 cubic yards is assumed for future generation rates.

### 3.10.7 Wetlands

#### 3.10.7.1 Comment Summary

A private individual asked if restoration/enhancement of the wetlands along the Animas River could be required in return for placement of a repository near the Animas River, the Boulder Gulch water intake, and historic structures.

#### 3.10.7.2 EPA Response

The presence of wetlands will be evaluated during wetland surveys, which will be performed prior to construction of the repository. It is not anticipated that any activities associated with this repository IRA will impact any existing wetlands. Therefore, EPA does not anticipate implementing any wetland restoration or enhancement components as part of this IRA.

### 3.10.8 Costs

#### 3.10.8.1 Comment Summary

A private individual asked for a disclosure of how EPA/the state intends to pay for up-front costs and long-term maintenance.

#### 3.10.8.2 EPA Response

The selected interim remedy addressed in this IROD will be federally financed under Superfund (fund-financed) with assurances from the State of Colorado that it will pay 10 percent of the remedial action cleanup costs and provide for all future long-term operation and maintenance.

### 3.10.9 Avalanche, Seismic, and Flooding Considerations

#### 3.10.9.1 Comment Summary

Two comments were received from private individuals that requested that EPA consider and mitigate for avalanches, flooding, and seismic activity.

#### 3.10.9.2 EPA Response

Initial literature searches of faults for the Mayflower tailings impoundments indicates there are no mapped Holocene-displaced faults present. A concealed or inferred fault is approximately 1,700 feet to the south, likely as part of the caldera ring faults formed by the Calderas of the San Juan volcanic field (Tertiary age). Further evaluation of the presence of faults will be conducted as part of the remedial design phase.

Initial literature searches of potential for avalanches indicates a potential avalanche chute between Mayflower tailings impoundments 1 and 2, and no mapped avalanche chutes in the immediate vicinity of Mayflower tailings impoundment 4. Modifications to the selected remedy to initially use impoundment 4 for the repository instead of impoundments 1 and 2 lessen concerns about near-term impacts from the mapped avalanche chute on repository components. Further evaluation of the potential for avalanches will be conducted as part of the remedial design phase.

The location of the proposed repository in the selected interim remedy is on top of Mayflower tailings impoundments 1, 2, and 4. Based on the 1978 Flood Insurance Rate Map, these locations are in the "C" flood zone of the Animas River (an area of minimal flooding), or more related to the now "X" flood zone (outside the 500-year flood event). Therefore, the potential for flooding to impact the proposed repository is minimal. As part of remedial design, any stormwater features associated with the repository will be sized appropriately to handle stormwater runoff from the repository facility footprint by considering rain-on-snow flooding in addition to design storm precipitation events, providing an additional factor of safety.

## 3.11 REPOSITORY LOCATION SELECTION

### 3.11.1 Comment Summary

Comments regarding site selection were received from the Navajo Nation, UDEQ and two private individuals. Topics included distance, decision-making, environmental justice, and document review.

The Navajo Nation commented that EPA states that unacceptable human health and ecological risks from OU2 will be addressed in future remedial decisions and yet the site has been selected as the best location for a permanent waste repository. They believe that risks should be clearly understood and addressed before construction of the repository begins.

The UDEQ stated that it would be helpful to better understand why the site was selected and that they believe the three criteria used to make the selection appear to be the Mayflower impoundments are close to the Gladstone IWTP, are "high and dry," and are already used for mine waste storage. They state that, although these three criteria seem reasonable, they would like to know what other sites were considered and how were they ruled out.

One private individual expressed concern about the distance (10 to 15 miles) from the Gladstone IWTP and was surprised EPA did not propose sites closer to the IWTP or on federally owned land, which would eliminate issues related to EPA's "fraught" relationship with SGC. The individual stated that hauling the sludge from the IWTP to the repository sites would add additional operational costs and expense, while a site closer to the plant would cut down on operational costs and reduce the margin of error for EPA, given the transportation complexities hauling mine sludge presents over mountain roads. That concern was echoed by the second commenter, who also wondered if consolidating mine wastes would introduce different metals of concern to the watershed.

### 3.11.2 EPA Response

As noted in Section 1.1 of the FFS, Mayflower tailings impoundments 1 through 4 were evaluated for the Bonita Peak Repository based on previous location siting evaluations of numerous other potential repository locations within the BPMD Superfund Site. The administrative record released as part of the public comment period included documents (Document IDs 100008277 and 100008278) that describe the sludge management siting evaluation conducted prior to the FFS. Factors screened during the preliminary location siting selection process included topographic considerations (slopes, avalanche potential), water considerations (floodplains, wetlands, drainage features, presence of wells), geologic considerations (soil types, bedrock types, presence of faults, potential for landslides or rock falls), administrative considerations (land ownership, land use), and distance from the Gladstone IWTP (EPA 2017a, 2017b). While distance from the Gladstone IWTP and the watershed location were considerations during the repository selection process, it is anticipated that wastes will be generated from various mining-related sources and watersheds during the repository's lifetime. Therefore, a repository centrally located within the BPMD Superfund Site was also a consideration. Based on the results from this evaluation, EPA selected the Mayflower tailings impoundments for the focus of the repository IRA.

As noted in Section 3.4, the containment elements of the repository proposed for the selected interim remedy would isolate mining-related wastes from the surrounding environment, achieve the RAOs, and be protective to human health and environment in the long term. It is important to distinguish that the tailings that already exist at the Mayflower tailings impoundments are part of

OU2 and will be addressed separately from the Bonita Peak Repository. Any potential for risks from migration of contamination from those tailings to the groundwater or surface water would be evaluated as part of the OU2 RI and any future OU2 decision documents. This selected interim remedy would focus solely on the Bonita Peak Repository and its potential impacts but will not be inconsistent with a final remedy for OU2, which will address OU2-specific risks.

## 3.12 TRUCK TRAFFIC AND IMPACTS ON TOURISM

### 3.12.1 Comment Summary

Six comments were received regarding the mitigation of truck traffic and its impacts on tourism from the Town of Silverton, the San Juan County Board of Commissioners, the San Juan Citizen's Alliance, and three private individuals.

The Town of Silverton requested that the impacts be minimized for the town and San Juan County, stating that traffic that must pass through Silverton should be minimized and Greene Street should be used to the fullest extent possible. They believe that EPA and/or its contractors should work closely with the public works department to develop procedures and schedules to limit traffic impacts.

The San Juan County Board of Commissioners requested that hauling be done in a manner to minimize impacts on tourism and use of local county roads.

The San Juan Citizen's Alliance asked that traffic and dust impacts be minimized and requested that EPA put in place the same types of safety measures used for previous EPA work.

Three private individuals expressed concern about potential shutdowns that might disrupt tourism and impact the local economy, and the suggestion was made to confine truck traffic to low tourist months (e.g., September and October).

### 3.12.2 EPA Response

EPA will develop specific hauling and traffic control plans during the remedial design phase. As part of the development of these plans, EPA will work with the Town of Silverton and San Juan County to minimize the impacts of truck traffic on Silverton and the surrounding areas, and minimize impacts to the community and tourism. EPA will consider input from stakeholders on preferred truck routes and the timing of hauling activities. To the extent practical, EPA will focus waste hauling efforts during nonpeak tourist times to minimize traffic impacts to the tourism industry and the community.

## 3.13 COMMENTS NOT DIRECTLY RELEVANT TO THE IRA

Several comments were received that were not directly relevant to the IRA and are thus not addressed in this responsiveness summary. They came from the San Juan County Board of Commissioners, the La Plata County Board of Commissioners, the New Mexico Environment

Department, and three private individuals. EPA will consider this input, where relevant, in the sitewide RI and the remedial design process.

### 3.13.1 Gladstone Water Treatment Plant

San Juan County and two private individuals submitted comments regarding the need for finding an alternative to the traditional lime treatment plant that could be implemented long before the repository capacity (tailings impoundment 4) was reached. San Juan County and one private individual suggested that without an active commitment from EPA, the extended storage capacity takes away from the urgency to find new technology. The private individual also commented that a portion of EPA's budget should be earmarked for advancement in active treatment methods at the Gladstone IWTP.

One private individual asked if the Gladstone IWTP will continue operating at a limited capacity in perpetuity (i.e., only treating the Gold King Mine discharge), or if a long-term treatment option would be developed for all the draining mines in OU3.

### 3.13.2 Kittimac

A private individual commented that once sludge from the treatment of Gold King discharge is mixed with tailings from a site already on the list of 48 sites, the issue of whose contaminants are entering the river is muddled. The commenter stated that maybe the Kittimac should be removed from that list of sites.

### 3.13.3 Contaminant Hot Spots

The New Mexico Environment Department states that EPA must recover hot spots of Animas River “floodplain tailings'” with high concentrations of metals between Silverton and Eureka, Colorado, and dispose of them at the proposed repository. They wrote that testing has demonstrated that hot spots of floodplain tailings with percentage concentrations of lead and other metals remain in the floodplain downstream from Eureka and, to protect aquatic life and public drinking water systems in New Mexico, EPA must commit in the IROD to remove these contaminated tailings for disposal in the repository.

### 3.13.4 Administrator's Emphasis List

La Plata County is concerned that EPA plans to remove the site from the Administrator's Emphasis List once the site strategic management plan is finalized in September 2020, well before implementation of the repository. They suggest keeping the site on the list for another year or until the first impoundment is constructed.

### 3.13.5 Environmental Justice

The New Mexico Environment Department commented that attention must be paid to environmental justice for minority and low-income communities living along the San Juan River.

They stated that EPA must revise all risk assessments associated with the greater BPMD Superfund activities to correct the environmental justice deficiencies, evaluate all possible exposure pathways, and quantify BPMD-specific and cumulative impacts to vulnerable populations in New Mexico.

## 4.0 MODIFICATIONS TO THE PROPOSED PLAN MADE AS A RESULT OF COMMENTS

Written and oral comments provided on the *Proposed Plan for a Site-Wide Waste Repository* were addressed through clarification and explanation in Section 3.0 of this responsiveness summary. After careful consideration of the comments, new information offered, and recent developments related to the OU2 RI, EPA and the state decided that the selected remedy will initially be constructed in a phased approach at Mayflower tailings impoundment 4, rather than at Mayflower tailings impoundments 1 and 2. The selected interim remedy will still involve a combination of Alternatives R1, R2, and R4 but, as described in Section 12.0 of Part 2 of this IROD, implemented in a different order.

New information provided through public comments include concerns around impacts to the nonmotorized trail (adjacent to Mayflower tailings impoundment 2) and the potential presence of an avalanche chute between Mayflower tailings impoundments 1 and 2. Initial literature searches of potential for avalanches indicates a potential avalanche chute between Mayflower tailings impoundments 1 and 2, and no mapped avalanche chutes in the immediate vicinity of Mayflower tailings impoundment 4. Modifications to the selected remedy to initially use impoundment 4 for the repository instead of impoundments 1 and 2 as discussed in Section 12.0 lessen concerns about the need to use the nonmotorized trail for repository access and near-term impacts from the mapped avalanche chute on repository components. Further evaluation of the potential avalanches will be conducted as part of the remedial design phase.

Additionally, it was noted in the FFS that there were greater data needs for the ongoing OU2 RI at Mayflower tailings impoundment 4. However, since the public release of the FFS and the proposed plan, investigation efforts at Mayflower tailings impoundment 4 have progressed, including completion of necessary infrastructure to better understand nature and extent of contamination within several previously identified areas of data needs. Based on these developments, OU2 RI-related impacts to the implementation of a repository at Mayflower tailings impoundment 4 are expected to be more limited. In addition, utilizing a phased approach to constructing a repository at Mayflower tailings impoundment 4 (i.e., only using a portion of the impoundment 4 footprint initially) would further limit impacts and allow future OU2 RI characterization to continue as needed in areas outside the phased repository footprint.

This modification addresses many of the concerns expressed by the community regarding Mayflower tailings impoundments 1 and 2 for the foreseeable future. Based on the estimated capacity of the Mayflower tailings impoundment 4 presented in this IROD, with optimal waste characteristics, it could be up to 130 years before the capacity at Mayflower tailings impoundment 4 is exhausted and repository operations would transition, if necessary, to Mayflower tailings impoundments 1 and 2. Concerns regarding impacts from operating a repository on Mayflower tailings impoundments 1 and 2 (e.g., impacts to the Mayflower Mill and nonmotorized trail, avalanche potential) will be further addressed if and when that transition occurs in the distant future.

## 5.0 REFERENCES

CDM Smith. 2019. *Bonita Peak Mining District Superfund Site Community Involvement Plan.* Prepared for EPA Region 8, Denver, CO.

EPA. 2017a. *Bonita Peak Mining District, Sludge Management Evaluation Criteria*. EPA Region 8, Denver, CO.

EPA. 2017b. *Interim Sludge Management Facility Location Evaluation, Location Siting Evaluation Criteria Summary Tables, Bonita Peak Mining District Site*. EPA Region 8, Denver, CO.