SITE-WIDE SECURE WASTE DISPOSAL AREA
FEASIBILITY STUDY

CARPENTER-SNOW CREEK MINING DISTRICT NPL SITE
CASCADE COUNTY, MONTANA

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Attachment 1 Identification of Applicable or Relevant and Appropriate Requirements for this action

ACRONYMS AND ABBREVIATIONS

amsl	Above mean sea level
ARAR	Applicable of relevant and appropriate requirements
ATV	All-Terrain Vehicle
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act, as amended
CSCMD	Carpenter-Snow Creek Mining District
COC	Contaminant of Concern
CWA	Clean Water Act
CY	Cubic Yard
DEQ	Montana Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
ESAT	Environmental Services Assistance Team
FS	Feasibility Study
GRA	General Response Action
NCP	National Contingency Plan
NPL	National Priorities List
O&M	operation and maintenance
OU	Operable Unit
PRAO	Preliminary Remedial Action Objectives
PWT	Pacific Western Technologies
RAO	Remedial Action Objectives
RI	Remedial Investigation
ROD	Record of Decision
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
TBC	To be considered
TCLP	Toxicity Characteristic Leaching Procedure
Tetra Tech	Tetra Tech, Inc.
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

EXECUTIVE SUMMARY

The Carpenter-Snow Creek Mining District Superfund Site in and near Neihart, Montana is a geographic area where extensive mining and exploration occurred over the past several decades. The contaminated waste material from these activities at the site consists of mining-related wastes, such as tailings, mill waste and mine overburden from underground mines, as well as contaminated soils and sediments associated with this waste. The Environmental Protection Agency, in consultation with the United States Forest Service and the Montana Department of Environmental Quality, has been addressing the contamination at the site for several years since it was listed on the Superfund National Priorities List. The site is divided in three operable units – the Town of Neihart (OU1), the Watershed Area (OU2), and the Silver Dyke Complex and Streams (OU3).

The Environmental Protection Agency has already selected a remedial action for the Town of Neihart, OU1. The 2009 Record of Decision for that operable unit requires the removal of certain wastes and soils within and around the town of Neihart and placement of those materials in a secure waste disposal area, although the 2004 Record of Decision did not specifically identify a waste disposal area location. An ongoing Superfund removal action at OU3 addressing large tailings piles has addressed wastes at and below the Silver Dyke Complex, and current removal evaluations indicate that certain wastes in this area will need to be excavated and disposed of in a secure disposal area as well. The Environmental Protection Agency, the United States Forest Service and the Montana Department of Environmental Quality are completing a site-wide remedial investigation, and will be initiating feasibility studies for the remaining operable units. Those processes will result in Record of Decisions for each of the remaining operable units.

The Environmental Protection Agency's prior and ongoing cleanup decisions and the Environmental Protection Agency's experience with mining site cleanups in general, indicate that the removal of mining wastes from current locations and the disposal of those wastes in a secure waste disposal area indicate a need for the selection of the secure waste disposal area or repository. In order to complete the prior and ongoing decisions, and to facilitate future cleanup decisions, the Environmental Protection Agency, the United States Forest Service and the Montana Department of Environmental Quality decided jointly to initiate a site-wide remedial decision making effort to select the secure waste disposal area or repository location.

This Feasibility Study analyzes various options for the placement of mining wastes which have been or will be removed under other removal or remedial actions taken at the Carpenter-Snow Creek Mining District Superfund site in a secure waste disposal area. It identifies a no action alternative (which is required under the Superfund law), a no further action with continued monitoring alternative, an off-site disposal option, and specific on-site disposal options. It also describes a screening process by which certain on-site locations were not fully analyzed and certain on-site locations were analyzed.

The Feasibility Study analyzes the options remaining after screening against seven criteria described in the Superfund law (42 U.S.C. §§ 9601 et seq., also known as the Comprehensive Environmental Response, Compensation and Liability Act or CERCLA) and its implementing regulations found at 40 CFR Part 300 (also known as the National Contingency Plan or the NCP) – overall protectiveness of human health and the environment; compliance with applicable or relevant and appropriate requirements; long term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short term effectiveness; implementability; and cost.

Finally, the Feasibility Study concludes with a description of the Environmental Protection Agency's preferred approach in this matter, by tentatively indicating that MacKay Gulch and the Silver Dyke Glory Hole are appropriate on-site repositories, and that MacKay Gulch should be utilized first.

The Feasibility Study was preceded by a remedial investigation report addressing this same scope. The disposal location remedial investigation, this feasibility study and the administrative record supporting these reports and studies will be used by the Environmental Protection Agency in consultation with the United States Forest Service and the Montana Department of Environmental Quality, to propose and ultimately select, after consideration of public comment, a remedial action addressing the need for a secure waste disposal location for removed waste on a site-wide basis.

1.0 INTRODUCTION

Tetra Tech, Inc. (Tetra Tech) was tasked by the Montana Department of Environmental Quality (DEQ) and the United States Environmental Protection Agency (EPA), in consultation with the United States Forest Service (USFS), to prepare a Feasibility Study (FS) for remedial action at the Carpenter-Snow Creek Mining District (CSCMD) National Priorities List (NPL) site in Cascade County, Montana 55 miles south of Great Falls. The remedial action will be a decision concerning whether and where a secure disposal location should be located and constructed for waste which will be removed from the operable units within the CSCMD site under other response decision documents.

The CSCMD site consists of more than 96 abandoned mines and mine features. These mines were part of the Neihart Mining District, a major producer of silver, lead, and zinc in Montana in the late 1800's and early 1900's. The current CSCMD site boundaries and operable units (OU) are shown in Figure 1.0-1. These boundaries and OU designations are subject to change as more information becomes available.

The FS is prepared in accordance with the Comprehensive Environmental Response, Compensation and Liability Act as amended (CERCLA or Superfund), the regulations governing Superfund response actions known as the National Contingency Plan (the NCP), and EPA's guidance directive "*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA"*, EPA OSWER Directive 9355.3-01 (EPA 1998), and other applicable guidance. The FS is done with EPA acting as the lead agency, DEQ as the support agency, and in consultation with the USFS, the U.S. Fish and Wildlife Service (USFWS). Data used in this FS are summarized in the Site-Wide Secure Disposal Area Remedial Investigation (RI) Report (Tetra Tech 2014b).

1.1 PURPOSE OF REPORT

An EPA Record of Decision (ROD) for OU1 of the CSCMD site was signed in 2009, addressing residential soils impacted by mine waste in Neihart. That Record of Decision requires the excavation and removal of certain wastes and contaminated soils from properties in the town of Neihart. The excavation and disposal of contaminated soils from OU1 requires a permanent repository location to dispose of the waste. An ongoing removal action of mine waste currently impacting Carpenter Creek, occurring in 2014, will likely require the excavation and removal of certain wastes and contaminated soils, and also requires a disposal location. In addition, investigations into the nature and extent of contamination within the CSCMD site boundaries estimate the current volume of mine waste and contaminated soil to exceed 1.2 million cubic yards. Other response actions to be selected at the CSCMD site may require the excavation

and removal of contaminated material and placement in a permanent repository. It is likely that more than one repository will be required for full site cleanup.

The purpose of this FS is to identify and compare mine waste disposal alternatives, including off-site disposal and on-site repository locations, and to evaluate these options against seven criteria specified in the National Contingency Plan (NCP), 40 CFR Part 300. This information, along with information regarding community concerns and State of Montana concerns (two additional criteria), along with the above referenced remedial investigation and other information contained in the administrative record for this action, will be used by EPA, in accordance with the NCP, to make an appropriate remedial decision regarding where removed wastes from past, ongoing and future response actions from the CSCMD site should be placed for long term management after removal. The selected remedy will be documented in a ROD. This FS is intended for use in comparing and selecting mine waste disposal options and locations, not for characterizing contamination and developing removal options for any particular source area. Those decisions have already been made, as noted above, or will be made in the next few years. The characterization of mine waste will be evaluated in a site-wide RI Report that is scheduled to be completed in early 2015, and feasibility studies for the remaining operable units are planned for later dates.

1.2 SITE BACKGROUND

The following sections summarize the CSCMD site setting, history, and current site conditions. This section focuses on information most pertinent to the selection of secure mine waste disposal options and locations.

1.2.1 Site Description

The CSCMD site is in the southeastern end of Cascade County, Montana. OU1 contains the town of Neihart. OUs 2 and 3 are in the Carpenter Creek drainage basin, Snow Creek drainage basin, drainages on the slopes east of Neihart (Spring Gulch, Rock Creek, Compromise Gulch, Broadwater Gulch, and an unnamed gulch), and the Belt Creek Floodplain from downstream of Neihart to Monarch. The upper end of the contamination in the town of Neihart is near latitude and longitude of 46º 55’ 24.20” north, 110º 43’ 29.05” west, and the site extends down Belt Creek to the town of Monarch near latitude and longitude of 47º 5’ 38.47” north, 110º 50’ 7.17” west. The CSCMD site encompasses the western Snow Creek drainage basin and extends up Carpenter Creek to a latitude and longitude of 46º 58’ 28.18” north, 110º 41’ 40.43” west (Figure 1.0-1). The CSCMD site includes mixed private and federal lands under the jurisdiction of the U.S. Forest Service.

1.2.2 Site History

The Neihart Mining District (also referred to here as the Carpenter-Snow Creek Mining District) was a major silver producer in Montana and the primary producer in Cascade County, producing about $16 million in silver between 1882 and 1929 (GCM 1991). The first claim in the district was made in July 1881 (Schafer 1935). Development of the district was first limited by the lack of transportation and then by fluctuations in silver prices. In the 1880s high grade ore was shipped by wagon to Fort Benton and then by boat to Omaha for smelting. As high grade deposits were depleted production slowed during the mid- to late-1880s. Production began to increase again after construction of the Great Falls smelter and the Belt Mountain branch of the Great Northern Railroad, connecting Neihart with Great Falls in 1891. During this period the Broadwater, Florence, Benton, and Big Seven mines were active. From 1898 to 1915, because of low prices for silver, only the highest grade mines operated—the Broadwater, Florence, Galt, Benton, Ripple, Silver Belt, Hartley, Queen of the Hills, Moulton, and Big Seven mines. In 1916 silver prices started to increase and the Blackbird, Alice and Harley, Cornucopia, Fair Play, London, and Tom Hendricks became important producers. Much of the ore was shipped directly to smelters and some was processed at mills at the Evening Star, I. X. L. Eureka, and Broadwater mines, and at the Neihart Mill on the south side of the town at the current location of the Neihart Community Center. There were several mills along Snow Creek and its tributaries but the absence of large tailings piles suggests there was little production.

At the Silver Dyke Mining Complex, one million tons of ore were blocked out beginning in 1921 when mining began and a 500-ton flotation mill was constructed. The Silver Dyke operated at capacity throughout the decade. In 1926, the capacity of the mill at the Silver Dyke was increased to 950 tons. Because of the clayey nature of the ore and its sticky properties, the open pit mining departed from the usual glory hole practice (Hayes 1936). Two pairs of vertical raises were extended upward from adits below the current glory hole and ore was loaded out from below. After the initial raises were completed, the pit was extended by blasting drill holes from above the mine. The Silver Dyke operated until 1929, when the blocked-out ore was depleted and no new deposits could be found. During its operation, the Silver Dyke was the largest producer of ore in the Neihart mining district, and its silver production was second only to Silver Bow County (Schafer 1935). The operations at the Silver Dyke Mining Complex resulted in several tailings deposits at the CSCMD site. The Silver Dyke tailings dam, east of the Silver Dyke mill, was damaged by an earthquake in 1925 releasing a flood of tailings into the valley below. After the rupture of the tailings dam, the tailings were conveyed downhill and deposited in the upper and lower tailings impoundments along Carpenter Creek.

Since 1930 there has been little production from the Neihart Mining District. The production that has occurred includes re-mining of waste rock piles and small scale contract mining. Additional exploration has occurred throughout the CSCMD site since 1930. While only small amounts of ore were produced from exploration activities, the activities resulted in many additional roads being built throughout the area that now serve as recreational trails.

1.2.3 Current Site Conditions

The majority of solid mine waste, tailings and contaminated soils and sediment (hereinafter referred to as "mine waste") is in four main areas at the CSCMD site; the Carpenter Creek drainage, the Snow Creek drainage, the Neihart Slope (consisting of the west slopes of Neihart Baldy Mountain above the town of Neihart), and the Town of Neihart. The mine waste consists of mill tailings, waste rock, overburden, metals contaminated soils, and metals-contaminated sediment. Current volume estimates project the volume of waste rock and tailings (including the lower and upper tailings piles) in Carpenter Creek to be 404,000 cubic yards, in Snow Creek to be 113,000 cubic yards, and on the Neihart Slope to be 361,000 cubic yards (Tetra Tech 2013b). The volume of metals contaminated streamside soil in Upper Carpenter Creek is estimated to be 244,000 cubic yards. The current estimated volume of mine waste in OU1 is approximately 105,000 cubic yards (PWT 2014). Overall, the total current volume is estimated at 1,242,000 cubic yards of mine waste. Volumes of mine waste contaminated streamside soil in Lower Carpenter, Snow Creek, Rock Creek, Compromise Creek, and Belt Creek have not been estimated.

The tailings and waste piles are in an erosive condition and metal contaminants and arsenic from these areas are being eroded into the surface waters of the CSCMD site. Groundwater in the vicinity of some of the waste features is locally contaminated with metals and arsenic. Sampling and monitoring activities have documented the nature and extent of the contaminants throughout the Site.

1.3 CONCEPTUAL SITE MODEL

A conceptual model developed for the CSCMD site links the mine waste, pathways of exposure to contaminants of concern which are part of the mine waste, and potential harm to human and ecological receptors. Receptors are human or environmental organisms that may be affected by the mine waste. Exposure pathways are the routes that the contamination travels from the source to the receptor. Figure 1.3-1 contains the conceptual site model for the area.

The sources of contamination are scattered at abandoned mill and mine sites throughout the CSCMD site. The sources of contamination include waste rock, tailings, and contaminated soil that contain elevated concentrations of metals and arsenic.

In areas within the CSCMD site with no mine waste, there are no exposure pathways. In areas where there is mine waste, water from precipitation and snow melt that contacts the surface of the waste mobilizes metals through chemical oxidation or erosion and transports the metals to nearby soils or surface water and/or infiltrates into local groundwater. The weight of the larger tailings impoundments that are placed over alluvium compacts the mine waste downward into the alluvium contaminating the groundwater with metals. Wind erosion mobilizes small particles from tailings and waste rock into the air and to the surrounding area. In areas where mine waste was used to build roads and trails, vehicle and All Terrain Vehicle (ATV) traffic crush the waste into fine powders that are mobilized into the air through mechanical processes. Human or ecological receptors can be exposed through ingestion, inhalation, or dermal contact with contaminated soils and water.

A conceptual model was also developed for a mine waste repository (Figure 1.3-2). By removing the mine waste and contaminated soils and consolidating them in a properly designed, constructed, and maintained repository, the materials are capped and isolated from physical disturbance, precipitation, snow melt, and groundwater and most exposure pathways become incomplete. The only potentially complete exposure pathway is excavation and maintenance workers who transport the waste and who could disturb the mine waste after it has been placed in the repository. However, excavation and maintenance workers should be trained and have personnel protective equipment to minimize exposure.

1.4 REPORT ORGANIZATION

In accordance with EPA RI/FS guidance, the sections of the report are:

- Section 1.0: Introduction and purpose of the report;
- Section 2.0: Applicable or relevant and appropriate requirements (ARARs);
- Section 3.0: Identification of mine waste disposal alternatives;
- Section 4.0: Development of the alternatives;
- Section 5.0: Detailed analysis of alternatives;
- Section 6.0: Comparative analysis of the alternatives and a description of a phased approach for future remedial actions; and
- Section 7.0: The recommended, preferred repository site(s).

2.0 POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

This section identifies and evaluates potential federal and State of Montana applicable or relevant and appropriate requirements (ARARs), and sets forth DEQ and EPA's determinations regarding potential ARARs for each response action alternative retained for detailed analysis in this FS. Section 2.1 summarizes the definitions and concepts pertinent to ARAR determinations and describes the three categories of ARARs—chemical-, location- and action-specific. Section 2.2 references the ARARs evaluated by EPA, DEQ as the support agency, and in consultation with the USFS and USFWS, for the selection of a repository at the CSCMD site.

2.1 SUMMARY OF CERCLA AND NCP REQUIREMENTS

Section 121(d) of CERCLA, 42 U.S.C. Section 9621(d)) states that remedial actions on CERCLA sites must attain (or the decision document must justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria or limitations that are determined to be legally applicable or relevant and appropriate.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address the situation at a CERCLA site. The requirement is applicable if the jurisdictional prerequisites of the law or regulation directly address the circumstances at a CERCLA site. An applicable federal requirement is an ARAR. An applicable state requirement is an ARAR only if it is more stringent than federal ARARs.

If the requirement is not legally applicable, then the requirement is evaluated to determine whether it is relevant and appropriate. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable, address problems or situations similar to the circumstances of the proposed response action and are well suited to the conditions of the site (EPA 1998). A requirement must be determined both relevant and appropriate to be considered an ARAR.

The criteria for determining relevance and appropriateness, as listed in 40 CFR Section 300.400(g)(2), are:

- Purpose of the requirement and the purpose of the CERCLA action

- Medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site
- Substances regulated by the requirement and the substances found at the CERCLA site
- The actions or activities regulated by the requirement and the remedial action contemplated at the CERCLA site
- Any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site
- Type of place regulated and the type of place affected by the release or CERCLA action
- Type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action
- Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resources at the CERCLA site.

A requirement may be "applicable" or "relevant and appropriate," but not both. Identification of ARARs is done on a site-specific basis and involves a two-part analysis: first, a determination whether a given requirement is applicable; then, if it is not applicable, a determination whether it is nevertheless both relevant and appropriate. When the analysis determines that a requirement is both relevant and appropriate, such a requirement must be complied with to the same degree as if it were applicable (EPA 1998).

To qualify as a state ARAR under CERCLA and the NCP, a state requirement must be:

- A state law or regulation
- An environmental or facility siting law or regulation
- Promulgated (of general applicability and legally enforceable)
- Substantive (not procedural or administrative)
- More stringent than the federal requirement
- Identified in a timely manner
- Consistently applied

To constitute an ARAR, a requirement must be substantive. Therefore, only the substantive provisions of requirements identified as ARARs in this analysis are considered ARARs. Permits are considered procedural or administrative requirements. Provisions of generally relevant federal and state statutes and regulations determined to be procedural or non-environmental, including permit requirements, are not considered ARARs.

There are three types of ARARs:

- **Chemical-specific ARARs** are generally health- or risk-based numerical values or methodologies applied to site-specific conditions that result in the establishment of a cleanup level.

- **Location-specific ARARs** are restrictions on the concentrations of hazardous substances or the conduct of activities solely because they are in specific locations. Special locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats.

- **Action-specific ARARs** are technology- or activity-based requirements or limitations on actions taken with respect to hazardous substances. These requirements are triggered by the particular response actions selected in the ROD.

Non-promulgated advisories or guidance issued by federal or state governments are not legally binding and do not have the status of ARARs. Such requirements may, however, be useful, and are "to be considered" (TBC). TBC requirements may complement ARARs but do not override them and are not mandatory. TBC requirements are useful for guiding decisions regarding cleanup levels or methodologies when regulatory standards are not available.

Additional, general information regarding ARARs may be found in EPA's *CERCLA Compliance with Other Laws Manual: Volumes 1 and 2* (EPA 1988 and 1989). Specific ARARs issues are also discussed in the March 8, 1990, *Federal Register* notice publishing the final rule for the National Contingency Plan (see 55 *Federal Register* 8666, et seq.)

2.2 ARARs

EPA and DEQ, in consultation with USFS, have responsibility for identifying federal and state ARARs at the CSCMD site. Attachment 1 contains the ARARs, descriptions, and determinations that EPA evaluated for this feasibility study.

2.3 PRELIMINARY REMEDIAL ACTION OBJECTIVES

A goal of this FS is to identify appropriate, secure mine waste disposal alternatives. Mine waste disposal alternatives must be protective of human health and the environment, comply with ARARs or justify a waiver of ARARs, which are threshold requirements. Alternatives are also evaluated using the following additional seven criteria: (1) long-term effectiveness and permanence; (2) reduction of toxicity, mobility, and volume through treatment; (3) short-term effectiveness; (4) implementability; (5) cost; (6) state acceptance; and (7) community acceptance.

Preliminary Remedial Action Objectives (PRAOs) are media-specific, non-numeric objectives for preventing unacceptable exposure to contaminants in order to protect human health and the environment. In feasibility studies which address long term cleanup options and health or environmental risks, PRAOs address various chemicals of concern, media of concern, exposure pathways and receptors, current and likely future land and water uses, and preliminary remediation goals. For example, detailed remedial action objectives have been developed for the Neihart OU1 ROD.

Overall PRAOs for the CSCMD site, as developed by EPA in consultation with DEQ and the USFS, to be used in future feasibility studies are as follows:

2.3.1 Groundwater

The nature and extent of mine waste contamination of groundwater at the CSCMD site will be defined by the site-wide RI and include several contaminants of concern (COCs). The following PRAOs are proposed for contaminated groundwater at the CSCMD site for the primary COCs:

- Prevent human health exposure to groundwater that is contaminated above ARAR or acceptable risk levels;
- Prevent or minimize further contact of mine waste and groundwater; and
- Prevent or minimize the leaching of COCs from mine waste and mine impacted areas to groundwater.

2.3.2 Surface Water

DEQ classifies surface water bodies in upper Carpenter Creek (upstream of mine impacts) and Belt Creek as a B1 streams. This classification states that the water quality of the stream must be sufficient to support recreational activities such as bathing and swimming; growth and propagation of salmonid fishes and associated aquatic life and other wildlife; agricultural and industrial water supply; and drinking and culinary purposes (after conventional treatment).

From a human health standpoint, Carpenter Creek and Belt Creek do not currently meet the requirements for suitable drinking, culinary or food processing use. Water quality in these creeks exceeds water quality standards set for arsenic, copper, lead, and zinc. Samples indicate that Carpenter Creek and portions of Belt Creek also exceed acute or chronic aquatic life standards for aluminum, cadmium, lead, and zinc. The surface water PRAOs proposed are as follows:

- Prevent or minimize leachate from mine waste to surface water.

- Prevent or minimize the release of COCs to surface waters that result in unacceptable dermal and incidental risks for visitors and recreationists.
- Prevent or minimize the release of COCs to surface waters that result in unacceptable risks to terrestrial and aquatic species.
- Comply with surface water ARARs, or appropriately waive those standards.

2.3.3 Mine Wastes and Impacted Soils

The nature and extent of mine waste and impacted soils at the CSCMD site will be defined by the site-wide RI and include several COCs. The PRAOs for mine waste and soils are as follows:

- Prevent or reduce human exposure to soils, mine tailings, and waste rock contaminated with COCs where incidental ingestion, dust inhalation, or direct contact would pose an unacceptable health risk.
- Prevent or reduce unacceptable risk to ecological systems (including aquatic and terrestrial) from contaminated waste rock/soils containing elevated levels of metals (arsenic, cadmium, copper, lead, and zinc).

These clean-up PRAOs are subject to further revisions and refinement as the site-wide remedial investigation and operable unit specific feasibility studies are completed and undertaken.

As noted above, the scope of this secure disposal facility feasibility study is narrow – it is for the purpose of examining the appropriate location and design of repositories for the containment of removed mine waste. For the limited scope of this focused feasibility study, PRAOs are as follows:

- Prevent exposure of humans and the environment to the removed mine waste placed in the repository;
- Prevent the migration of mine waste contamination out of the repository through erosion and leaching; and
- Site secure waste disposal locations appropriately in practical places where access and proximity issues can be addressed readily.

3.0 IDENTIFICATION AND SCREENING OF MINE WASTE DISPOSAL ALTERNATIVES

The first step to developing remedial alternatives, following or concurrent with the development of preliminary remedial action objectives, requires the identification of likely response scenarios. The EPA *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA 1988), calls these general response actions (GRAs). GRAs are media-specific measures that may satisfy the preliminary remedial action objectives alone or in combination.

During the development of alternatives, an initial determination is made of areas or volumes of media to which a GRA might be applied. Defining areas or volumes of media should include consideration of acceptable exposure levels and potential exposure routes, as well as site conditions and nature and extent of contamination. The interaction between areas or volumes of media is accounted for in the development of site-wide alternatives.

Potential treatment, resource recovery, and containment technologies that will accomplish these measures are proposed subsequent to the identification of GRAs.

> "In this step, the universe of potentially applicable technology types and process options is reduced by evaluating the options with respect to technical implementability." (EPA 1988)

Following the identification and screening of remedial technologies, representative process options are selected to represent the remedial technology through alternative development and analyses. Process options, on a medium-specific basis and relative to specific GRAs, are screened using effectiveness, implementability, and cost. Remedial technologies and process options may still be retained that would not necessarily meet effectiveness requirements for all media, the full site, or as standalone technologies (EPA 1988).

This section summarizes the potential alternatives for the disposal of solid mine waste at the CSCMD site. Selection of the appropriate waste disposal alternatives for the CSCMD site depends, in part, on complying with the OU1 ROD disposal requirements and the ongoing OU3 removal action disposal requirements, as well as anticipated future disposal needs. Section 3.1 identifies the general mine waste disposal options. Section 3.2 describes results of the initial technology screening.

3.1 COMMON ELEMENTS

The proposed secure waste disposal area locations and design alternatives share some common elements in their development. The common elements are described in this section, referenced in the various alternatives, and included as part of the remedial cost estimate where appropriate in Section 6.7. In addition to these likely common elements, EPA will, with DEQ and USFS consultation, establish appropriate institutional controls to address site access, secure long-term operation and maintenance, and address other relevant issues to protect the remedy.

Remedial actions for this FS include, in addition to the no action and the monitoring option, disposal options for mine waste located in and removed as part of the cleanup actions for the CSCMD site and include the following common elements:

- **Protection of Human Health and the Environment:** The protection of human health and the environment is the overall goal of all GRAs at the CSCMD site. Protection can be achieved through the isolation of mine waste through disposal of removed waste in an on-site or off-site repository or facility. Protection of human health and the environment cannot be achieved through the no-action alternative.
- **Minimize Further Migration of the Mining Waste:** The migration of mine waste from a secure waste disposal area may result in the contamination of areas where current risk of exposure is considered acceptable. Migration pathways include erosion by wind or surface water, leaching by infiltrating water, and adit discharge. Erosion and leaching can be minimized through the stabilization or capping of mine waste or disposal in an on-site or off-site repository or facility. Minimization of further migration of mining waste cannot be achieved through the 'no action' alternative.
- **Minimal Operation and Maintenance:** To minimize long term costs at the CSCMD site, one of the goals of every GRA will be to minimize operation and maintenance costs. This can be achieved by selecting GRAs that are effective over the long term and have minimal associated operation and maintenance costs.

3.2 GENERAL IDENTIFICATION OF MINE WASTE DISPOSAL OPTIONS

In this section, the various secure mine waste disposal area options are described in more detail for use in developing remedial alternatives for mine waste. Treatment of mine waste such as soil amendments, or engineering controls, may be used in conjunction with the alternatives discussed in this section. However, treatment should be evaluated on a case-by-case basis for individual waste sources because it is dependent on factors such as the location and physical characteristics of the waste. Treatment and similar control options for the mine waste will be evaluated in the future OU-specific Feasibility Studies. Whether the mine waste is treated or not, some areas of the CSCMD site will require the excavation and disposal of mine waste in a properly constructed repository (as noted, OU1's ROD and the ongoing removal action both require the excavation of mine waste and disposal in a secure waste disposal area location). While the wastes being placed in the repository (secure mine waste disposal area) may not be treated, the remedy will reduce the mobility of the wastes by isolating them in a protective disposal location which will effectively contain the hazardous substances. This FS evaluates the disposal options and design considerations for mining waste. Each option is generally discussed below.

3.2.1 No Action

In compliance with the NCP, the no further action must be retained as an alternative for consideration as the baseline against which other alternatives are compared. Under the no action option, no waste disposal option would be recommended for the CSCMD site. Mine waste sources are left in their existing condition with no attempt to control or cleanup. The exposed waste rock and tailings will continue to

remain devoid of vegetation, allowing for erosion and downstream migration in surface waters and stream sediments. Soils contaminated above action levels would remain in place. The no action alternative will be retained through the detailed analysis of alternatives.

3.2.2 No Further Action with Monitoring

Under this option, no waste disposal option would be recommended for the CSCMD site, but waste distribution would be monitored on an annual basis. Mine waste sources are left in their existing condition with no attempt to control or cleanup. The exposed waste rock and tailings will continue to remain devoid of vegetation, allowing for erosion and downstream migration of contaminated waste rock and soil in surface waters and stream sediments. Contaminated soils above action levels would remain in place. This alternative would not reduce metals migration from the mine waste or prevent unacceptable exposure of human or ecological receptors to the mine waste.

3.2.3 Institutional and Engineering Controls

Institutional controls, acting alone or in combination with engineering controls that restrict access, would not reduce metals migration from the mine waste, but could potentially be used to protect human health and the environment by precluding future access or development of affected areas. In addition, these restrictions may be used to supplement and protect a future implemented action such as the establishment of a repository or secure waste disposal area. Potentially applicable institutional controls need to be consistent with future land use and access restrictions.

Land use restrictions, comprised of zoning, deed restrictions, or environmental control easements, would limit potential future uses of the land that could result in adverse effects to response actions and unacceptable risks due to human exposure to mine contamination or loss of action integrity (for on-site options, repository failure).

Zoning. Zoning may be implemented to control present and future land uses on or around waste and source areas consistent with the potential hazards present, the nature of response action implemented, and future land-use patterns. The objective of zoning would be to prevent public or private misuse of waste and source areas that could jeopardize the effectiveness of response action or pose an unacceptable potential for human exposure to the contaminants present in the waste and source areas.

Deed Restrictions. Environmental deed restrictions, which are specifically authorized under State of Montana law, would be used to limit uses of property and prevent the transfer of property without notification of limitations. Deed restrictions may define specific requirements related to preservation and

protection of the effectiveness of the implemented response action alternative. Both elements are intended to limit the potential for human exposure to waste and source area contamination.

Environmental Control Easements. Environmental control easements are enforceable property easements that grant access and/or impose restrictions on the use of a site. The easement mechanism is intended for use at sites that contain or may contain hazardous wastes or substances that may threaten public health, safety, or welfare, or the environment if certain uses are permitted on these sites or if certain activities are not performed on these sites. Protection may be enhanced by application and enforcement of certain restrictions on the future use of the site or requirements for performance of certain activities through this mechanism.

Access Restrictions. Access restrictions are engineered controls and typically include physical barriers, such as fencing, that could prevent both human and wildlife access to contamination and mine waste to limit exposure and to protect the integrity of the action. Fencing can be installed around the perimeter of mine waste source areas or to repositories to prevent human and animal access to the areas. Posted warnings would identify the potential hazards present from the mine waste and source areas to deter trespass and misuse. However, even with these controls fencing can be ignored by both humans and wildlife and will require future maintenance to maintain integrity.

Institutional and engineering controls could be implemented as a stand-alone action, or in combination with other alternatives. A local government, private third party, or a state or federal agency would likely enforce institutional controls that are developed as part of a selected response action alternative. Therefore, these entities must be involved in developing and eventually implementing any institutional controls.

Institutional controls do not, by themselves, achieve a specific cleanup goal or comply with all ARARs. Considering the contaminant concentrations present and potential migration from mine waste contaminated areas, institutional controls alone or in combination with engineering controls are not considered adequate to mitigate potential human health and ecological risk and impacts. However, institutional controls will be considered in conjunction with other mitigation alternatives.

3.2.4 Off-Site Disposal

Off-site disposal involves placing excavated contaminated material in an engineered and licensed waste repository at a location outside of the CSCMD site. Off-site disposal options may be applied to pretreated or untreated contaminated materials. Materials failing to meet the leachability criteria for metals as

determined by the Toxicity Characteristic Leaching Procedure (TCLP) (Class 1 mine waste) would be considered a hazardous waste, and, if disposed of outside the CSCMD site, would require disposal in a permitted Resource Conservation and Recovery Act (RCRA) facility, or pre-treatment and disposal in an existing State-licensed solid waste landfill facility. Class 2 wastes (wastes that pass TCLP) could be disposed of at an existing State-licensed solid waste landfill. The two options for off-site disposal are discussed in the following section.

Off-Site Disposal at a Permitted Landfill. Under this alternative, excavated mine waste from the CSCMD site would be removed, treated if necessary (such that it is a Class 2 waste), and hauled 68 miles to the High Plains Landfill northeast of Great Falls, Montana, which is the closest existing State-licensed solid waste landfill. Tipping fees would be charged per ton of mine waste disposed of at the landfill. The benefit of this alternative is that the facility already exists and has been designed and permitted to accept waste and the O&M cost are also transferred to the landfill operator. However, disposal at a permitted facility such as High Plains Landfill is very costly due to the large volume of waste involved (over 1.2 million cubic yards) and the high cost for transportation and disposal ($32 to $120 million depending on amount of waste). If excavated mine waste could not be treated to become a Class 2 mine waste and was instead a Class 1 RCRA waste, disposal would have to occur at a RCRA permitted facility, which would be outside of the State of Montana. This would further add to the costs of this alternative. This option does not comply with the OU1 ROD, which states a preference that residential soils from OU1 be placed in an on-site repository.

3.2.5 On-Site Disposal

In constructing and developing on-site disposal locations, called repositories, certain assumptions have been made. As noted, the EPA's prior and ongoing cleanup decisions, and the EPA's experience with mining site cleanups in general, indicate that the removal of mining wastes from current locations and the disposal of those wastes in a secure waste disposal area will likely be warranted under future feasibility studies and resulting remedial decisions. It is also EPA's experience that most of the mining waste that will be excavated will not be RCRA hazardous waste (because of the Bevill Exclusion), but instead will be solid waste (either because of its inherent characteristics or because it can be treated to become solid waste prior to disposal). Under the ARARs identified for this action, this means that the repositories will not need to be lined with a synthetic liner and leachate collection systems will not be needed, as long as there is adequate separation between the repository bottom and underlying groundwater. These assumptions are part of the analysis given below.

Permanent, on-site disposal in a repository would fulfill the requirement of the existing response decision documents and assist with future response decision making. On-site disposal does not require a permit. The on-site disposal alternative conceptually includes excavation and consolidation of waste into one or more constructed disposal areas as a permanent source control measure. It may involve installing physical barriers (geo-membranes or geo-synthetic clay liners) above the waste with another layer - usually two feet - of clean fill on top of the liner. These added barriers may be needed to provide additional protection of groundwater from potential leachate contamination - a preliminary remedial action objective - and may be needed to meet ARAR requirements.

On-site disposal options may be applied to treated or untreated contaminated materials. As materials are excavated and moved during this process, treatment in addition to on-site disposal may become a cost-effective option. The treatment processes, if needed, as well as the design configuration of an on-site repository would depend on the toxicity and type of material requiring disposal. The design could range in complexity from an earthen cover to an engineered mine waste repository with additional protections.

Factors to consider in remedial design for a repository or cells within a repository include but is not limited to access (for equipment, land ownership, permit requirements, road building, timber removal), physical condition of the contaminated media to be removed to the facility, topography, slope stability, earthquake hazard, proximity to surface water, site hydrogeology, precipitation, depth to groundwater, current groundwater quality, area groundwater use, and applicable groundwater standards. Desired land use following cover or cap construction should be considered in cover or cap design. Each location or cell will also need a site specific engineering design which could eliminate a repository location from further consideration if data collected during the remedial design shows the location has potential issues that prohibit its use as a repository that were not foreseen during the initial remedial investigation work.

Mine waste material can be excavated using conventional earth-moving equipment, using accepted hazardous materials handling procedures and best management practices. Steep slopes in the waste rock and tailings areas may require use of specialized equipment or construction methods.

3.3 INITIAL SCREENING OF OPTIONS

The purposes of option screening, the second step in the alternative development process, are to (1) evaluate the potential repository location options (as noted, the no action alternative will be carried through to full evaluation without further screening) based on the NCP criteria of short and long term effectiveness; reduction of toxicity, mobility, and volume through treatment; implementability; and relative costs; and (2) to use this evaluation to eliminate, if appropriate, repository location options to

reduce the number of alternatives developed and carried forward for alternative development in Section 4.0 and detailed analysis in Section 5.0. Under this step, a technology or process option can be eliminated from further consideration if it does not meet the effectiveness or implementability criteria, or if its cost is substantially higher than other technologies or process options, and at least one other technology or process option is retained that offers equal protectiveness.

In this section, the options are screened against the criteria described above. Table 3.2-1 provides the initial screening summary and identifies options that are carried forward and screened and the rationale for the screening decisions. Of the six options available, four options are carried forward:

1. On-site disposal will be further evaluated in this FS because it meets PRAOs, it complies with the OU1 ROD, and otherwise meets the screening criteria described above. Within this category, different, specific locations for on-site repositories will be evaluated
2. Off-site disposal in a licensed solid waste landfill repository (assuming removed mine waste can be treated to be a Class 2 waste) is also being evaluated because it meets PRAOs, is implementable, and otherwise meets the screening criteria described above.
3. The No-Action alternative is evaluated as a baseline alternative in accordance with EPA guidance and the NCP.
4. The No further action with continued monitoring alternative is evaluated because it is a more likely action than the baseline No Action alternative.

Off-site disposal at a RCRA facility, assuming the removed mine waste was RCRA waste and could not be treated, was eliminated from consideration due to very high costs and the likelihood that treatment could address any such issues. Institutional controls are eliminated as a standalone or in combination with access restrictions alternative because they do not have short or long-term effectiveness for protection of ecological receptors. However, institutional controls will be retained as components of other remedial alternatives.

Because the OU1 ROD identifies on-site disposal as the remedial option for the disposal of the Neihart Community Soils, potential on-site repository locations at the CSCMD site have been investigated for the CSCMD site-wide RI. Section 4.0 develops the no-action and off-site disposal alternatives and evaluates and further refines initial on-site repository locations for mine waste disposal.

4.0 DISPOSAL ALTERNATIVE DEVELOPMENT

Sections 4.1 through 4.3 describe the development of the no action, no further action with continued monitoring and off-site disposal alternatives. Section 4.4 identifies and evaluates and further develops the potential on-site repository options. Section 4.5 identifies the specific alternatives to be carried forward to

Section 5.0. Section 5.0 presents a detailed assessment of the alternatives. Section 6.0 presents a comparative assessment of alternatives and the recommendation for selecting a repository for the mining waste at the CSCMD site.

Previous repository siting evaluations identified and screened other potential repository options (CDM 2004, PWT 2011, Tetra Tech 2012, Tetra Tech 2013a). The locations retained herein include repositories identified in previous efforts and new locations.

The OU1 ROD concluded that residential soils from OU1 require excavation and placement in an on-site repository. An ongoing removal action is being expanded to address the removal of mine waste at the Silver Dyke tailings impoundment and will likely require an on-site repository. At remote mine sites with large volumes of metals-contaminated mine waste such as the CSCMD site, on-site disposal in a repository is typically the cheapest and most protective technology for mine waste disposal. This FS is focused on evaluating the remaining potential repository locations that are retained for further consideration.

The estimated volume of all the mine waste at the CSCMD site is currently estimated to exceed 1.2 million cubic yards and will likely require several repositories since, assuming much of the waste will be removed, there is no potential repository location large enough to accept this total volume due to topographical limitations.

The current scheduled OU1 remedial action and Silver Dyke tailings impoundment removal actions will require a volume of approximately 140,000 cubic yards (CY). Five potential repository locations were carried forward to the FS. Seven other potential repositories were screened out in Section 1.3.1 of the RI report because they did not meet ARARs or have adequate capacity for this action. This will not preclude the consideration of these locations as repositories for later remedial actions.

The potential on-site repository locations identified for further evaluation in this FS are:

1. Mackay Gulch
2. The Silver Dyke Glory Hole
3. Lower Snow Creek
4. The Evening Star Mine and Mill
5. The Neihart Slope

Each of these locations is shown on Figure 4.0-1. Each disposal alternative carried through the initial screening and the specific, potential repository locations are discussed in the following sections.

4.1 NO ACTION

The no action alternative is included as a baseline alternative for comparison to the other alternatives. Under this alternative no repository location would be selected. This is not in accordance with the OU1 ROD that declares a repository will be chosen for the disposal of residential soils and roadways contaminated with mine waste from the town of Neihart. This alternative would not allow the ongoing removal action at the former Silver Dyke tailings impoundment to proceed, which would allow the continued erosion of tailings into Carpenter Creek; nor would it provide suitable secure disposal options for future actions. No costs are associated with this alternative.

4.2 NO FURTHER ACTION WITH CONTINUED MONITORING

The no further action with continued monitoring action alternative is included as a baseline alternative for comparison to the other alternatives. Under this alternative no repository location would be selected. This is not in accordance with the OU1 ROD that declares a repository will be chosen for the disposal of residential soils and roadways contaminated with mine waste from the town of Neihart. This alternative would not allow the ongoing removal action at the former Silver Dyke tailings impoundment to proceed, which would allow the continued erosion of tailings into Carpenter Creek; nor would it provide suitable secure disposal options for future actions. Costs of approximately $270,000 over 30 years are associated with this alternative to fund continued monitoring on an annual basis.

4.3 OFF-SITE DISPOSAL

Under this alternative, contaminated soil from the OU1 remedial action, the removal action at the former Silver Dyke tailings impoundment, and waste from future remedial actions would be placed in a licensed solid waste facility 68 miles from the CSCMD site. For the purposes of this FS, it is assumed that the facility would be protective of human health and the environment.

The costs of disposing of the mine waste at an off-site solid waste facility are considered high compared to the repository options on-site due to the increased haul distance. This option would be difficult and/or costly to implement because of the high cost of disposal fees and transportation costs. The expected off-site facility costs are detailed in Section 5.2.2.

4.4 ON-SITE DISPOSAL

This section develops the on-site waste disposal options for the CSCMD site. Five on-site repository locations were identified in the Site-Wide Secure Waste Disposal Area Remedial Investigation Report as suitable for the CSCMD site (Tetra Tech 2014b). They are discussed in greater detail in Sections 4.2 - 4.6 of the RI report.

4.4.1 Mackay Gulch Repository

Under this alternative, contaminated soil from the OU1 remedial action, the ongoing removal action at the former Silver Dyke tailings impoundment after the existing CSCMD action memorandum is amended, and waste from future remedial actions would be placed in a repository at the Mackay Gulch repository shown on Figure 4.4.1-1. The repository would be designed to accept waste in multiple stages from multiple response actions, probably in cells. Access to this repository location is already developed and only needs minor improvements. Soil borings have shown the average depth to bedrock to be approximately 14 feet (Tetra Tech 2012). Use of this location would also provide ample cover and top soil for a repository cap. Current repository capacity estimates are approximately 675,000 CY, which could be increased or decreased during design. Groundwater has not been detected in piezometers installed to bedrock. The location is currently treed with grasses and young lodgepole pines that would need to be removed during the development of the repository. EPA will need to obtain access from the landowner for this property. The costs of developing the Mackay Gulch repository are considered medium compared to other on-site repository options at the CSCMD site. The costs are detailed in Section 5.2.4. This alternative would comply with ARARs, as materials can be transported in accordance with those requirements and a repository could be designed at this location to meet those requirements. The Mackay Gulch repository is also located approximately 2 miles from the mine waste located within the floodplain in Carpenter Creek where an estimated 600,000 cubic yards of mine waste will need to be excavated thus reducing the carbon footprint of the response action.

4.4.2 Silver Dyke Glory Hole Repository

Under this alternative, contaminated soil from the Town of Neihart OU1 remedial action, the ongoing removal action at the former Silver Dyke tailings impoundment after the action memorandum is amended, and waste from future response actions would be placed in the Silver Dyke Glory Hole shown on Figure 4.4.2-1. The Silver Dyke Glory Hole is a mining excavation at the former Silver Dyke Mine. The bearing capacity of the underlying ground in the area is likely suitable for a repository; however, the potential for the collapse of the adit and drifts that underlie the Glory Hole is unknown. In 1927, the adit was

approximately 1,000 feet long with three drifts. The southern drift extended along the southern side of the open pit.

High, sheer walls at the site are a safety hazard because there are several ATV trails in close proximity to the site. The site was fenced at one time, but the fencing has since deteriorated. There is adit drainage with high concentrations of heavy metals (particularly zinc) and sulfides coming from the adit underneath the Silver Dyke Glory Hole. Filling the Silver Dyke Glory Hole with mine waste to create positive drainage may reduce the amount of adit drainage. The capacity estimate for Silver Dyke Glory Hole is approximately 569,000 CY if the Silver Dyke Glory Hole is filled to original grade (Tetra Tech 2012). If waste were placed above the original grade the capacity for waste could be increased. Current access is a rough, four-wheel drive trail. A haul road would have to be constructed for the last steep quarter-mile.

The Silver Dyke Glory Hole has vertical walls on three sides, at least one of which is a safety hazard that may have to be addressed during site development. There is no cover soil or topsoil at this location, so these would have to be imported from an off-location borrow source such as Mackay Gulch. EPA will need to obtain access to this land for use as a repository. The costs of developing and using the Silver Dyke Glory Hole as a repository are considered medium to high compared to other repository options at the CSCMD site. The costs are detailed in Section 5.2.5. This alternative would comply with ARARs. Its use as a repository would eliminate a large mine (human) safety hazard at the CSCMD site and possibly reduce ongoing acid mine drainage from the Silver Dyke adit. The information available suggests the Silver Dyke Glory Hole is a suitable repository location, subject to further remedial design work. The Silver Dyke Glory Hole is also located approximately 2 miles from the mine waste located within the floodplain in Carpenter Creek where an estimated 570,000 cubic yards of mine waste will need to be excavated thus reducing the carbon footprint of the response action.

4.4.3 Lower Snow Creek Repository

Under this alternative, contaminated soils from the town of Neihart OU1 remedial action, the ongoing removal action at the former Silver Dyke tailings impoundment after the action memorandum is amended, and waste from other future response actions would be placed at a repository in Lower Snow Creek shown on Figure 4.4.3-1. This location is located at an area with shallow depth to groundwater. Use of this location would not comply with ARARs due to the shallow groundwater depth. A repository at this location would require an ARAR waiver and a design that incorporates groundwater protection, such as double lined cells and leachate collection. The location was evaluated in detail in 2011, and EPA, DEQ and USFS have decided to eliminate this location as a potential repository for this action because of the

presence of shallow groundwater (Tetra Tech 2012). This does not preclude the location from future investigation or consideration.

4.4.4 Evening Star Mine and Mill Repository

Under this alternative, contaminated soils from the town of Neihart OU1 remedial action, the ongoing removal action at the former Silver Dyke tailings impoundment after the action memorandum is amended, and waste from other future remedial actions would be placed at a repository to be constructed at the Evening Star Mine and Mill repository north of Neihart near Highway 89 as shown on Figure 4.4.4-1. Use of this location would not provide cover and topsoil for a repository cap and soil would have to be imported. This repository location was evaluated for the disposal of residential waste from OU1 in 2011 (PWT 2011). The conclusion was that the repository had a capacity of 50,800 CY for mine waste and the repository design and construction would be costly ($4.7 million). The residential waste volume estimate for OU1 has since been currently estimated at approximately 105,000 CY. The Evening Star Mine and Mill repository does not have the capacity to meet the minimum requirements necessary for a repository location for this action and would require costly construction improvements to prepare and maintain the location.

4.4.5 Neihart Slope Repository

Under this alternative, contaminated soils from the town of Neihart OU1 remedial action, the ongoing removal action at the former Silver Dyke tailings impoundment after the action memorandum is amended, and waste from other future response actions would be placed at a repository to be constructed at a clearing on the northern Neihart Slope as shown on Figure 4.4.5-1. The repository would be designed to accept waste in multiple stages from multiple response actions. Access to this location is already developed, but would need major improvements before it would be suitable for transporting mine waste.

Soil borings have shown the average depth to bedrock ranged from 15-23 feet (Tetra Tech 2014c). Use of this location would provide ample cover material and topsoil for a repository cap. If the repository were excavated to a depth of 5 feet, the estimated mine waste capacity is estimated to be approximately 92,000 CY. Initial waste volumes at the Neihart Slope are estimated at 361,000 CY, which far exceeds the current capacity estimates.

Groundwater was not detected in piezometers installed to bedrock at the repository. The costs of developing the Neihart Slope repository are considered high compared to other repository options at the CSCMD site, primarily due to the cost of constructing a haul route through the steep terrain (2:1 slopes).

Initial volume capacity estimates indicate that this repository may not have the capacity for the contaminated soils from the town of Neihart OU1 remedial action and the ongoing removal action at the former Silver Dyke tailings impoundment after the action memorandum is amended, there is potential to expand the size of the repository if some trees are removed. If the footprint used for the capacity estimate was expanded, the repository may have the necessary capacity.

The repository location has five different owners, including USFS administered lands. This repository option would be difficult to implement due to the number of landowners. While the access road passes multiple waste rock piles being considered for inclusion in a repository, the proposed haul route crosses 22 different parcels of land owned by 15 different land owners. Access would be required to improve the road and allow heavy equipment to move excavated soils and waste rock to the repository.

4.4.6 Repository Site Initial Screening Summary

Selection of appropriate mine waste disposal locations for the CSCMD site from the list above for further development and analysis is based on: (1) the investigation data available for selecting a potential repository location for waste disposal, (2) the physical characteristics of the potential repository location including capacity and depth to groundwater which is a key ARAR compliance issue, (3) the accessibility of the repository, and (4) property ownership of the repository location and the haul route required to bring waste to the potential repository. The initial screening and rationale is summarized in Table 4.4-1.

Three locations were determined as not implementable for purposes of this FS, and the subsequent Proposed Plan and Record of Decision, and therefore are not the subject of further development and analysis, as follows:

1. Lower Snow Creek Repository (ARARs – shallow depth to groundwater, proximity to Carpenter Creek)
2. Evening Star Mine and Mill Site (insufficient capacity, cost)
3. Neihart Slope Repository (insufficient capacity; implementability - number of landowners)

The remaining two (Mackay Gulch and Silver Dyke Glory Hole) have sufficient capacity, adequate depth to groundwater, a minimal number of landowners to obtain access , and investigation data necessary to be considered viable repositories. These repositories may also be able to meet the timeline necessary for removal and remedial actions planned for 2014 and 2015. The Mackay Gulch and the Silver Dyke Glory Hole alternatives will be developed and evaluated further in this FS. These two locations will be carried forward to Section 5.0 for detailed analysis.

This initial screening does not eliminate the other three locations screened out for this action or other repository locations from future consideration. Several locations identified in this document and eliminated in the initial screening may be viable repositories, but require further investigation before they can be considered. As further response decision documents are developed, further investigation and evaluation for these repository locations may occur. Additionally, there may be other on site repositories that may be viable that would also require further investigation before they can be considered.

4.5 MINE WASTE DISPOSAL ALTERNATIVES IDENTIFIED FOR DETAILED ANALYSIS

In accordance with the NCP (40 CFR 200.430(e)) and EPA guidance, five alternatives will be evaluated in the remainder of this FS:

1. No action,
2. No further action with continued monitoring;
3. Off-site disposal at a licensed solid waste facility,
4. On-Site disposal at the Mackay Gulch location, and
5. On-Site disposal at the Silver Dyke Glory Hole.

Three of the alternatives have been determined to potentially meet the requirements of upcoming removal and remedial actions at the CSCMD site. The No-Action alternative is carried through as a baseline alternative based on the NCP (40 CFR 200.430(e)) and EPA guidance (EPA 1998). These five alternatives are analyzed in detail in Section 5.0.

5.0 DETAILED ANALYSIS OF REPOSITORY ALTERNATIVES

The repository alternatives that were developed and passed screening in Section 4.0 are analyzed in detail in this section. The detailed analysis of alternatives provides information to facilitate selection of repository locations for disposal of mine waste at the CSCMD site. The detailed analysis of alternatives was developed in accordance with the NCP (40 CFR 200.430(e)) and the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA 1998).

5.1 EVALUATION CRITERIA

As required by the NCP, seven of the following nine Superfund remedy selection criteria were used to evaluate each of the retained alternatives during the detailed analysis. The last two criteria, state and community acceptance, will be evaluated following the receipt of State and public comments on the Proposed Plan, and that evaluation will be described in the Record of Decision for this action.

- 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
- Cost
- State Acceptance
- Community Acceptance

Under the NCP, the selection of the remedy in a Record of Decision is based on the nine evaluation criteria, categorized into three groups:

- **Threshold Criteria** – The overall protection of human health and the environment, and compliance with ARARs (or justification for a waiver of ARARs), are threshold criteria that each alternative must meet to be eligible for selection.
    - Overall Protection of Human Health and the Environment
    - Compliance with ARARs

- **Primary Balancing Criteria** – The five primary balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost.
    - Long Term Effectiveness and Permanence
    - Reduction of Toxicity, Mobility, or Volume Through Treatment
    - Short Term Effectiveness
    - Implementability
    - Cost

- **Modifying Criteria** – The state and community acceptance are modifying criteria that will be considered in final remedy selection.
    - State Acceptance
    - Public Acceptance

Brief, general discussions of these evaluation criteria are in the following text. Detailed analyses of each alternative using the evaluation criteria are in Section 5.2. The comparative analysis of the remedial alternatives is in Section 6.0. A summary of the analysis is in Table 5.1-1.

5.1.1 Overall Protection of Human Health and the Environment

This evaluation criterion assesses whether each alternative provides adequate protection of human health and the environment. The overall assessment of protection draws on the assessments under other evaluation criteria including: long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. The evaluation focuses on whether a specific alternative achieves adequate protection and how risks are eliminated, reduced, or controlled, and whether PRAOs would be achieved.

5.1.2 Compliance with ARARs

Alternatives are assessed as to whether or not they attain ARARs (or whether an ARAR waiver is justified). The determination as to the statutes and regulations that make up the ARARs package, as well as any ARARs that may be waived, is made by the EPA in consultation with DEQ and USFS. ARAR compliance evaluations are summarized for all alternatives in the discussion which follows.

5.1.3 Long-Term Effectiveness and Permanence

Under this criterion, the alternatives are evaluated for long-term effectiveness, permanence, and the degree of risk remaining after the PRAOs have been met. The following components are evaluated:

- Magnitude of residual risks – this analysis assesses the residual risk remaining from untreated wastes or treatment residuals at the conclusion of remedial actions, the remaining sources of risk, and the need for 5-year reviews.

- Adequacy and reliability of controls – this analysis assesses controls that are used to manage treatment residuals or remaining untreated wastes. This assessment includes addressing: the likelihood of technologies to meet required efficiencies or specifications, type and degree of long-term management, long-term monitoring requirements, operation and maintenance (O&M) functions to be performed, uncertainties associated with long-term O&M, potential need for replacement of technical components and associated magnitude of risks or threats, degree of confidence in controls to handle potential problems, and uncertainties associated with land disposal of untreated wastes and residuals.

- PRAO compliance – this analysis assesses whether the alternative can meet the PRAOs described above.

5.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion addresses the statutory preference for remedies that employ treatment as a principal element by assessing the relative performance of treatment technologies contained in the alternative for reducing the toxicity, mobility, or volume of the contaminated media. Specifically, the analysis should examine the magnitude, significance, and irreversibility of the estimated reductions. The degree to which remedial alternatives employ treatment that reduces toxicity, mobility, or volume is assessed by considering these factors:

- The treatment processes the alternative employs, the media the processes would treat, and the threats addressed by the treatment;
- The approximate amount of hazardous materials that would be destroyed or treated;
- The degree of expected reduction in toxicity, mobility, or volume as a result of treatment;
- The degree to which the treatment is irreversible;

- The type and quantity of residuals that would remain following treatment, considering the persistence, toxicity, mobility, and bioaccumulation capacity of the contaminants of concern and impacted media, and
- The ability of alternatives to satisfy the statutory preference for treatment as a principal element.

When applying these criteria to waste disposal options for analysis, it should be noted that treatment was not made part of the alternative development because mine waste treatment is not standard practice and would not reduce volume or mobility. While the wastes being placed in a secure disposal area may not be treated, the remedy will reduce the mobility of the wastes by isolating them from groundwater and infiltration in a protective repository or off-site licensed landfill, which will effectively contain the hazardous substances. This mobility reduction is not due to treatment, however, and mobility could re-occur should a repository or off-site licensed landfill fail. This analysis indicates that the reduction in mobility from repository or off-site licensed landfill is more effective that treatment in producing long term effectiveness.

5.1.5 Short-Term Effectiveness

The assessment of short-term effectiveness during construction or implementation until the RAOs are met includes consideration of these factors:

- Potential short-term impacts to the community during remedial actions and whether risks may be addressed or mitigated;
- Potential impacts to, and protection of, the workers during remedial actions;
- Potential adverse environmental impacts that result from construction and implementation of the alternative, and the reliability of mitigation measures, and
- Time until PRAOs are achieved.

5.1.6 Implementability

The ease or difficulty of implementing a remedial alternative is assessed by considering these factors during the detailed analysis:

- Technical Feasibility:
  - Degree of difficulty or uncertainties associated with constructing and operating the evaluated alternative;
  - Technical difficulties associated with the alternative's reliability that could result in schedule delays;
  - Likelihood of additional remedial actions and anticipated ease or difficulty in implementation, and

- Ability to monitor the effectiveness of the alternative and risks of exposure if monitoring is insufficient to detect repository failure.

- Administrative Feasibility:
  - The need to coordinate with other office and agencies, and obtain necessary approvals and permits, and the relative ease or difficulty of doing so.

- Availability of Services and Materials:
  - Availability of adequate capacity and location of treatment, storage, and disposal services, if required;
  - Availability of necessary equipment and specialists;
  - Availability of treatment technologies comprising the alternative, sufficient demonstration of the technologies, and availability of vendors; and
  - Availability of services and materials, and the potential for obtaining competitive bids.

5.1.7 Cost

A detailed cost analysis is done for each alternative to assess the net present worth cost to implement the remedial actions (EPA 2000). The cost analysis consists of:

- Estimation of capital (direct and indirect) and annual O&M costs;
- Development of costs with an accuracy in the range of plus 50 percent to minus 30 percent, and
- Calculation of the present worth (capital and O&M costs) of the alternative by discounting to a base year or current year using a discount rate of seven percent.

5.1.8 State Acceptance

DEQ is providing ongoing input to the feasibility study process and will continue to do so throughout the public comment period. Assessment of the State concerns may not be completely assessed until comments on the RI/FS are also received. Therefore, this FS does not include any additional discussion about this criterion for any of the alternatives analyzed. State concerns may be discussed, to the extent possible, in the Proposed Plan to be issued for public comment. The State concerns that will be assessed include:

1. The state's position and key concerns related to the preferred alternative and other alternatives and,
2. State comments on ARARs or the proposed use of waivers.

5.1.9 Community Acceptance

This criterion refers to the community's comments on the remedial alternatives under consideration. The community is broadly defined to include all interested parties. Community concerns would be addressed after the public comment period that follows the release of the Proposed Plan. As a result, this FS does not address community acceptance.

5.2 INDIVIDUAL ANALYSIS OF ALTERNATIVES

Each of the alternatives retained in Section 4.0 are evaluated using the threshold, primary balancing, and modifying criteria presented in Section 5.1. Alternatives are evaluated by repository location. The following sections of text provide descriptions of the major components of each alternative.

5.2.1 Alternative 1 – No Action

No action would be taken to address ongoing releases associated with the mine waste and contaminated soils and roadways by excavation or removal and disposition in a repository. Remedies would be limited to actions which do not involve excavation or removal. Benefits of Alternative 1 include:

- No additional action is required.
- A repository will not be built

Potentially significant issues associated with Alternative 1 include:

- This alternative would not allow for the removal and disposal of mine waste and contaminated soils in a properly engineered and constructed repository, and therefore CSCMD response actions would be limited and less effective; and would not likely be protective of human health and the environment;
- This alternative does not comply with the OU1 ROD or the ARARs that are identified as part of the Record of Decision that will be issued for this FS; or with more complete ARARs for the future operable unit specific feasibility studies.

Overall Protection of Human Health and the Environment. Mine waste and contaminated soils and roadways would remain in place. Mine waste from throughout the CSCMD site would remain accessible to human and ecological receptors without implementation of engineering and institutional controls, and those controls may not be permanent or reliable. Residents would potentially continue to be exposed to residential soils and roadways contaminated with mine waste in Neihart, which would not be in accordance with the OU1 ROD. Mine waste would potentially continue to erode into nearby surface water bodies throughout the CSCMD site.

Compliance with ARARs. Repository selection and design ARARs would not apply to a no action alternative.

Long-term Effectiveness and Permanence. This alternative would not be effective in meeting RAOs for OU1, the PRAOs for this action, or protecting human health and the environment in the long term.

Reduction of Toxicity, Mobility, and Volume through Treatment. No actions would be taken to reduce the toxicity, mobility, or volume of mine waste through treatment under this option.

Short-term Effectiveness. Short term effectiveness would be achieved because there is no action associated with this alternative. However, because no action would be taken, this alternative would not be effective in meeting the RAOs for OU1, the PRAOs listed in this FS, or protecting human health and the environment for other response actions in the short-term.

Implementability. This alternative is easily implemented because no further action is required.

Cost. No cost is associated with this alternative.

5.2.2 Alternative 2 – No Further Action with Continued Monitoring

No action would be taken to address ongoing releases associated with the mine waste and contaminated soils and roadways by excavation or removal and disposition in a repository. Natural attenuation of mine waste would be monitored by annual site inspections. Benefits of Alternative 2 include:

- Low costs.
- A repository will not be built.

Potentially significant issues associated with Alternative 2 include:

- This alternative would not allow for the removal and disposal of mine waste and contaminated soils in a properly engineered and constructed repository, and therefore CSCMD response actions would be limited and less effective; and would not likely be protective of human health and the environment;
- This alternative does not comply with the OU1 ROD or the ARARs that are identified as part of this FS; or with more complete ARARs for the future operable unit specific feasibility studies.

Overall Protection of Human Health and the Environment. Mine waste and contaminated soils and roadways would remain in place. Mine waste from throughout the CSCMD site would remain accessible to human and ecological receptors without implementation of engineering and institutional controls, and those controls may not be permanent or reliable. Residents would potentially continue to be exposed to residential soils and roadways contaminated with mine waste in Neihart, which would not be in accordance with the OU1 ROD. Mine tailings would potentially continue to erode into nearby surface water bodies throughout the CSCMD site.

Compliance with ARARs. Repository selection and design ARARs would not apply to the no further action with continued monitoring alternative.

Long-term Effectiveness and Permanence. This alternative would not be effective in meeting RAOs for OU1, the PRAOs for this action, or protecting human health and the environment in the long term.

Reduction of Toxicity, Mobility, and Volume through Treatment. No actions would be taken to reduce the toxicity, mobility, or volume of mine waste through treatment under this option.

Short-term Effectiveness. Short term effectiveness would be achieved because there is no action associated with this alternative. However, because no action would be taken, this alternative would not be effective in meeting the RAOs for OU1, the PRAOs listed in this FS, or protecting human health and the environment for other response actions in the short-term.

Implementability. This alternative is easily implemented because minimal further action is required.

Cost. Annual monitoring costs over a 30-year period have an estimated present worth of approximately $270,000.

5.2.3 Alternative 3 –Off-Site Disposal

Alternative 3 would utilize High Plains Landfill, 68 miles from the CSCMD site. Assuming that the repository would be operated and maintained correctly and in accordance with its permit, this alternative would eliminate exposure routes which protect human health and the environment from exposures to mine waste placed in the repository. For cost purposes it is assumed that all 1.2 million cubic yards of mine waste and contaminated soils identified at the CSCMD site would be placed in the repository. This results in a high cost component.

Potentially significant issues associated with Alternative 2 were:

- High cost due to off-site hauling;
- Does not comply with the OU1 ROD's direction for on-site disposal;
- Would not meet removal action timeframes for the Silver Dyke tailings impoundment; and
- Would result in substantially increased short term risks from increased transportation of removed mine waste on the King Hill Scenic Byway.

Overall Protection of Human Health and the Environment. Protection of human health and the environment would be achieved by utilizing an existing, licensed repository for permanent off-site disposal of residential and roadway wastes from OU1, mine tailings from the former Silver Dyke tailings impoundment under the ongoing removal action, and mine waste from other future remedial actions. Proper maintenance of the repository would ensure that it continues to be protective in the future.

Soil

Consolidation and capping of removed mine waste in a properly operated and maintained off-site disposal facility would prevent the migration of the wastes by air or water to the surrounding soils or surface water bodies such as streams.

Groundwater

By consolidating mine waste in an off-site disposal facility and ultimately covering it with a liner and required cap under solid waste regulations for licensed facilities, this alternative would prevent the infiltration of precipitation and snow melt into the consolidated mine waste and the subsequent transportation of dissolved metals and arsenic to groundwater.

Surface Water

Consolidation of mine waste at an existing, off-site disposal facility would prevent the erosion of mine waste where it is currently located into surface water and a properly maintained repository would ensure that waste does not erode into surface water in the future.

Compliance with ARARs. ARARs would not apply to an existing off-site disposal facility in terms of location and design of the repository (ARARs apply to on-site actions only). ARARs regarding the hauling of materials at the site, before leaving the site, would be complied with through conventional means.

Long-term Effectiveness and Permanence. This alternative would be effective at protecting human health and the environment in the long term. The magnitude of residual risk from mine waste in an off-site disposal facility is very low. Adequacy, reliability, and suitability of controls are assumed to be incorporated into the eventual design for this alternative.

Reduction of Toxicity, Mobility, and Volume through Treatment. No treatment is contemplated for any of the alternatives including this one, based on the assumption that excavated mine waste would not be RCRA waste but instead would be Class 2 solid waste.

Short –Term Effectiveness. This alternative would be not effective at protecting human health and the environment in the short-term. Anticipated risks are associated with occupational hazards to workers using heavy construction equipment for transportation to the licensed facility and substantially increased traffic risks due to the long hauls associated with this alternative.

Implementability. This alternative is technically and administratively feasible but difficult. A factor that may limit implementability is the ability of the agencies to reach agreement with the licensed landfill to

accept the large volume of mine waste contemplated for removal at the CSCMD site, and the ability to work with local and state road maintenance personnel concerning the adverse effects that hauling excavated mine waste to an off-site repository would entail.

Cost. The estimated costs for utilizing the existing, licensed off-site repository are as follows:

Construction Costs	$	65,916,000
Capital Costs	$	24,388,920
Total Cost	**$**	**90,304,920**

Costs were prepared in accordance with EPA guidance (EPA 2000).

5.2.4 Alternative 4 – Mackay Gulch Repository

Alternative 3 would utilize Mackay Gulch as an on-site repository location. No off-site disposal of mine wastes would be required. Assuming that the repository would be designed and maintained correctly, this alternative would eliminate exposure routes affecting human health and the environment from exposures to mine waste placed in the repository. The benefits of Alternative 3 include:

- The location is not located near permanent residences;
- Groundwater has not been detected above bedrock at this location;
- The repository is in close proximity to the majority of the mine wastes located in and around Carpenter Creek;
- There is ample cover and topsoil; and
- This location would comply with the OU1 ROD's requirement for on-site disposal.

No potentially significant issues associated with Alternative 4 were identified.

Overall Protection of Human Health and the Environment. Protection of human health and the environment would be achieved by developing a repository at Mackay Gulch for permanent on-site disposal of contaminated residential soils and roadways from OU1, mine waste from the former Silver Dyke tailings impoundment under the ongoing removal action, and other potential mine waste from future response actions, assuming that the repository design complies with ARARs and otherwise is effective as described below. Proper maintenance of the repository would ensure that it continues to be protective in the future.

Soil

Consolidation and capping in a properly designed and constructed repository containing mine waste at this location would prevent the migration of the wastes by air or water to the surrounding soils or streams.

Groundwater

By consolidating mine waste in this on-site repository and covering it with a liner and evapotranspirative cap, this alternative would prevent the infiltration of precipitation and snow melt into the consolidated mine waste and the subsequent transportation of dissolved metals and arsenic to groundwater. Groundwater has not been observed above bedrock at this location, so the likelihood of the groundwater table rising to a point at or near the bottom of the repository is minimal.

Surface Water

Consolidation of mine waste at this repository location would prevent the erosion of mine waste from the repository into surface water and a properly maintained repository would ensure that waste does not erode into surface water in the future.

Compliance with ARARs. Assuming the repository is designed and constructed correctly, all ARARs would be met. Further discussion of ARARs is found in Attachment 1.

Long-term Effectiveness and Permanence. This alternative would be effective at meeting RAOs for OU1, PRAOs for this action, and protecting human health and the environment in the long term. The magnitude of residual risk from mine waste in this repository is very low. Adequacy, reliability, and suitability of controls will be met, as the repository will comply with ARARs for construction and other sound engineering practices will be incorporated into the eventual design for this alternative.

Reduction of Toxicity, Mobility, and Volume through Treatment. No treatment is contemplated for any of the alternatives including this one, based on the assumption that excavated mine waste would not be RCRA waste but instead would be Class 2 solid waste. This alternative would eliminate the mobility of the mine waste placed in the repository by consolidating it and isolating it from wind and water erosion, although not through treatment. Toxicity and volume would not be reduced unless the waste is treated before it is placed in the repository. Waste treatment is not planned for contaminated soil and roadways from OU1 or the mine waste that is expected from the former Silver Dyke tailings impoundment under the ongoing removal action.

Short –Term Effectiveness. This alternative would be effective in meeting the RAOs for OU1, the PRAOs for this action, and protecting human health and the environment in the short-term. One anticipated short term risks are associated with occupational hazards to workers using heavy construction equipment for repository development. This risk can be effectively managed through the use of robust health and safety plans and compliance with OSHA safety regulations. There is some short term risk to the public caused by the hauling of mine waste to the repository, via air emissions or increased truck

traffic. Again, this risk can be effectively managed by proper planning and preparation and the use of robust health and safety plans. This alternative would also meet the necessary timeline for the expected removal of mine waste from the former Silver Dyke tailings impoundment once the action memorandum is amended.

Implementability. This alternative is technically and administratively feasible. Construction of this alternative can be completed with standard construction labor and equipment available in the area. Minor infrastructure improvements would be necessary, and the repository would need to be designed and constructed. Long term operation, maintenance, and monitoring would be necessary to ensure the integrity of the repository.

A factor that may limit the implementability is the ability of the agencies to obtain access from local landowners to the repository location and to obtain cooperation with supplementary institutional controls. This will require appropriate planning and dialogue with the landowners, and can be effectively managed.

Cost. The estimated costs for developing the Mackay Gulch Repository are in Table 5.2-3. Although waste excavation, hauling, and placement are not addressed in this FS, a general cost for waste excavation hauling and placement is presented in this cost estimate so that the annual O&M costs, which are estimated as a percentage of the total construction costs, are estimated correctly in a likely construction cost range. The primary components associated with this alternative would include:

- Coordination with local, state and federal agencies, and property owners for property access;
- Project management, repository design, and construction oversight;
- Phased repository construction including:
  - Clearing and grubbing the repository site,
  - Excavation and stockpiling of cover soil and top soil,
  - Preparing the repository base,
  - Placing and compacting the mine waste,
  - Installing liner over the mine waste,
  - Capping the repository,
  - Revegetating the repository cap, and
  - Fencing the repository area.
- Institutional controls;
- 20% Construction contingency;
- Installation of permanent monitoring wells;
- Periodic sampling of groundwater wells and reporting;
- Long term inspections of the repository cap and institutional controls; and
- 30-year general site maintenance.

The estimated construction costs, capital costs, and O&M costs (if the repository is filled to capacity with an estimated 675,000 cys of waste) are:

Construction Costs	$	13,046,250
Capital Costs	$	5,088,038
O&M Costs	$	1,890,439
Total Cost	**$**	**20,024,726**

Costs were prepared in accordance with EPA guidance (EPA 2000).

5.2.5 Alternative 5 – Silver Dyke Glory Hole Repository

Alternative 5 utilizes the Silver Dyke Glory Hole as a repository location. No off-site disposal of mine wastes would be required under this alternative. Assuming that the repository would be designed and maintained correctly, this alternative would eliminate the risks to human health and the environment from exposures to mine waste placed in the repository during removal and remedial actions. The benefits of Alternative 5 include:

- The location is not located near permanent residences;
- The location has been previously excavated;
- The repository is in close proximity to the majority of the mine wastes located in and around Carpenter Creek; and
- This location would comply with the OU1 ROD's requirement for on-site disposal

Potentially significant issues associated with Alternative 4 include:

- Repository development would not meet the timeframe necessary for the Silver Dyke tailings impoundment removal action, if the action memorandum is amended to require removal. A repository design would have to be completed and implemented that would include haul road construction and likely include blasting of the southern headwall to address construction safety concerns.
- This repository location must be filled with approximately 239,000 cubic yards of material to achieve positive drainage (Tetra Tech 2012). The contaminated soils and roadways from town of Neihart OU1 remedial action and the former Silver Dyke tailings impoundment removal action (if the action memorandum is amended) would not be enough to create positive drainage in this repository. This could cause ponding of snowmelt and precipitation on the waste that would lead to infiltration and leaching and possibly discharging from the adit that drain the underground workings below the Silver Dyke Glory Hole. However, ponding and infiltration could be reduced or eliminated using engineering controls.

Overall Protection of Human Health and the Environment. Protection of human health and the environment would be achieved by developing a repository at the Silver Dyke Glory Hole for on-site disposal of contaminated residential soils from the OU1 remedial action, mine waste from the former Silver Dyke tailings impoundment after the action memorandum is amended, and potential mine waste from any future remedial actions that will be conducted at the CSCMD site, assuming that the repository design complies with ARARs and is otherwise effective a described below. Proper maintenance of the repository would ensure that it continues to be protective in the future.

Soil

Consolidation and capping of mine waste in a properly designed and constructed repository at this repository location would prevent the migration of the wastes by air or water erosion to the surrounding soils and streams.

Groundwater

By consolidating mine waste in a repository that has positive drainage and covering it with a permanent cover and evapotranspirative cap, this alternative would prevent the infiltration of precipitation and snow melt into mine waste and the subsequent transportation of the contaminants to groundwater. There is sufficient separation between ground water and the repository bottom. Installation of the repository cap liner at this location may also reduce the flow of water from the Silver Dyke adit.

Surface Water

Consolidation of mine waste at a properly designed and constructed repository at this location would prevent the erosion of mine waste from the repository into surface water. A properly maintained repository would ensure that waste does not erode into surface water into the future.

Additionally, using the Silver Dyke Glory Hole as a repository may improve and or reduce the amount of mine influenced water discharging from the Silver Dyke adit. Currently, the Silver Dyke Glory Hole acts as a large catch basin for snow and precipitation. Precipitation and snowmelt infiltrate through ore and mineralized soils and rock in the bottom of the Silver Dyke Glory Hole into the underground workings beneath. The ore has high sulfate content. As the water reacts with sulfide minerals and oxygen from the air, it creates sulfuric acid that leaches metals from the ore into the underground workings and the adit drainage. Filling the Silver Dyke Glory Hole with mine waste and capping it may prevent the water from contacting the ore in the bottom, preventing the acid generation and metals leaching into the mine workings below which may improve the water quality of the adit drainage.

Ongoing adit flow monitoring from October of 2013 through April of 2014 showed an average flow of approximately 10 gpm. Using the site as a repository could also potentially decrease the seasonal peaks in flow which is estimated to average 43 gallons per minute to the base flow of 10 gpm, which would be much cheaper to address in later remedial actions. The adit drainage is the main contaminant source of Sih-mem Creek flows that enter Carpenter Creek about a half-mile southwest of the Silver Dyke Glory Hole. The adit drainage results in significant degradation of water quality in Carpenter Creek since this adit drainage is the main sources of dissolved metals contamination in Carpenter Creek which is estimated to contribute approximately 30,000 pounds of zinc per year (Tetra Tech 2014a).

Compliance with ARARs. Assuming the repository is designed and constructed correctly, all ARARs would be met. Further discussion of ARARs is found in Attachment 1.

Long-term Effectiveness and Permanence. This alternative would be effective at meeting RAOs for OU1, PRAOs for this action, and protecting human health and the environment in the long term. The magnitude of residual risk from mine waste placed in this repository is low. Adequacy, reliability, and suitability of controls will be met, as the repository will comply with ARARs for construction and other sound engineering practices incorporated into the design for this alternative.

Reduction of Toxicity, Mobility, and Volume through Treatment. No treatment is contemplated for any of the alternatives including this one, based on the assumption that excavated mine waste would not be RCRA waste but instead would be Class 2 solid waste. This alternative would reduce the mobility of the mine waste by consolidating it in a repository and isolating it from wind and water erosion, although not through treatment. The bottom of the Silver Dyke Glory Hole is permeable. To achieve maximum mobility reduction, potential infiltration issues may need to be addressed through repository design or waste treatment.

Short –Term Effectiveness. This alternative would be effective in meeting the RAOs for OU1, the PRAOs for this action, and protecting human health and the environment in the short-term. One anticipated short term risk is occupational hazards to workers from using blasting and heavy construction equipment in repository development. This risk can be effectively managed through the use of robust health and safety plans and compliance with OSHA regulations. There is short term risk to the public caused by the hauling of mine waste to the repository, via air emissions or increased truck traffic. Again, this risk can be effectively managed by proper planning and preparation of robust health and safety plans.

Implementability. This alternative is technically and administratively feasible. Construction of this alternative can be completed with standard construction labor and equipment available in the area. Long term operation, maintenance, and monitoring would be necessary to ensure the integrity of the repository. A factor that may limit the implementability is the ability of the agencies to obtain access from local landowners to the repository location and to obtain cooperation and supplementary institutional controls. This will require appropriate planning and dialogue with the landowners, and can be effectively managed.

Cost. The estimated costs for development of the Silver Dyke Glory Hole as a repository are in Table 5.2-4. The primary components associated with this alternative would include:

- Coordination with local, state and federal agencies and property owners for property access;
- Project management, repository design, and construction oversight;
- Phased repository construction including:
  - Construction of a site access road for heavy haul truck traffic,
  - Preparing the repository area,
  - Mitigating safety concerns of vertical walls of the Glory Hole,
  - Placing and compacting the mine waste,
  - Installing liner over the mine waste,
  - Capping the repository with off-site cover and top soil,
  - Placement of permeability control;
  - Revegetating the repository cap, and
  - Fencing the repository area.
- Institutional controls;
- Installation of permanent monitoring wells;
- 20 percent construction contingency;
- Periodic sampling of groundwater wells and reporting;
- Long term inspections of the repository cap and institutional controls; and
- 30-year general site maintenance.

The following estimate presents annual O&M costs as a percentage of the total construction costs. The estimated construction costs, capital costs, and O&M costs (if the repository is filled to capacity with an estimated 569,000 cys of waste) are summarized in this table:

Construction Costs	$	11,114,850
Capital Costs	$	4,334,792
O&M Costs	$	1,614,799
Total Cost	**$**	**17,064,440**

Costs were prepared in accordance with EPA guidance (EPA 2000).

6.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

In this section, the disposal options for mine waste removed from OU1 remedial action, the former Silver Dyke tailings impoundment removal action once the action memorandum is amended and future CSCMD response actions are evaluated relative to each other in this comparative analysis to identify the advantages and disadvantages of each alternative using the established EPA criteria. The threshold criteria and primary balancing criteria are discussed individually. The alternatives are ranked in each of the seven categories.

6.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

These sections discuss the relative ability of the alternatives to protect human health and the environment.

6.1.1 Soil

The no action and no further action with continued monitoring alternatives (1 and 2) are not protective of site soil. These two alternatives do nothing to prevent water or wind erosion and redeposition of mine waste and contaminated soil. All three secure disposal alternatives (3, 4, and 5) are equally protective of soil. In all three cases, mine waste and contaminated soil would be placed in a secure disposal location and capped with a liner and equal amount of cover and topsoil. The repository cap would be vegetated to promote evapotranspiration of precipitation and snow melt. The likelihood of mobility of metals in soil is considered minimal at each location.

6.1.2 Groundwater

The no action and no further action with continued monitoring alternatives would not be protective of groundwater because precipitation, surface flow, and snow melt would continue to infiltrate exposed metals and arsenic. All three secure disposal alternatives are equally protective of groundwater at the CSCMD site. The off-site, licensed landfill location is assumed to be located where there is adequate distance to groundwater.

No groundwater has been observed in piezometers drilled to bedrock at the Mackay Gulch repository. It is unlikely that metals and arsenic would mobilize through bedrock to affect groundwater in Mackay Gulch.

At the Silver Dyke Glory Hole, the mine workings beneath this area intercept the water table and drain the water through the adit. These workings would drain any upward groundwater fluctuation before it

would contact the mine waste in the repository. Any detrimental effects of this mine on local groundwater have already happened. By using the Silver Dyke Glory Hole as a repository, placed wastes covered by a top liner and soil cap, as well as installation of low permeability material may decrease the flow from the adit, improving surface water which could also improve groundwater.

The repository cap liner and evapotransporative caps that would be installed at each repository would minimize infiltration of precipitation and the migration of metals and arsenic to groundwater.

6.1.3 Surface Water

Because of the proximity of mine waste to surface water, the no action and no further action with continued monitoring alternatives would continue to discharge to surface water during spring runoff and high precipitation events such as summer thunderstorms. The off-site, licensed landfill is assumed to be protective of surface water.

At the Mackay Gulch location, surface water would be protected through the design and maintenance of a repository that isolates the mine waste. Mackay Gulch is high on a ridge above Carpenter Creek with no known surface water flow except spring snow melt, so there is no surface water to affect. The only potential impact to surface water from the MacKay Gulch location would be if the repository had a failure from a catastrophic event. In this unlikely scenario, the mine waste could shift down Mackay Gulch to Carpenter Creek.

At the Silver Dyke Glory Hole location, surface water would be protected through the design and maintenance of a repository that isolates the mine waste. Additionally, the development of a repository with associated top liner and soil cap, as well as installation of low permeability material may greatly reduce the infiltration of water and thus lower the flow rate of water discharging from the Silver Dyke adit. Decreasing the discharge rate may reduce the metals loading rate from Sih-mem Creek to Carpenter Creek.

Ranking of Overall Protection to Human Health and the Environment

The alternatives are ranked for overall protection to human health and the environment, from most protective to least protective. The rankings should be revised if there are additional studies that further quantify the characteristics of these sites.

1. Alternative 3 is overall protective of human health and the environment, and ranked highest because it utilizes a licensed solid waste facility.

2. Alternative 4 is overall protective of human health and the environment, and ranked next highest because the site does not have mine workings that contact groundwater beneath it.
3. Alternative 5 is overall protective of human health and the environment, and ranked next highest because use of the repository could improve surface water quality.
4. Alternatives 1 and 2 are not protective of human health and the environment, and are ranked lowest.

6.2 COMPLIANCE WITH ARARS

The two on-site repository alternatives (Alternatives 4 and 5) are equally able to comply with ARARs, provided they are properly designed and constructed. The No Action alternatives (Alternatives 1 and 2) do not have ARARs. The off-site alternative (Alternative 3) would comply with on-site transportation ARARs, and would be licensed under applicable law for off-site activity.

6.3 LONG TERM EFFECTIVENESS AND PERMANENCE

The three secure disposal alternatives are permanent methods for reducing exposure to mine waste. Assuming the repositories and licensed landfill are properly built and maintained, they should be permanent and effective in the long-term. The no action and no further action with continued monitoring alternatives are not effective at reducing exposure to mine waste in the long-term.

6.4 REDUCTION OF TOXICITY, MOBILITY, AND VOLUME THROUGH TREATMENT

Under this criteria all alternative rank the same since no alternative involves treatment. However, some discussion of mobility reduction is warranted, and applies to the long term effectiveness and permanence criteria and that discussion follows.

The Mackay Gulch repository would reduce the mobility of the mine waste more than the Silver Dyke Glory Hole, although not through treatment. The repository base at Mackay Gulch is composed of finer soils, has no groundwater, is able to receive more waste volume, and does not have mine workings beneath it. The repository base at the Silver Dyke Glory Hole is composed of large, previously disturbed material, with mine workings below it. It is expected to be much more permeable than the Mackay Gulch repository base. The off-site licensed landfill is assumed to reduce waste mobility as much as the Mackay Gulch alternative. The no action and no further action with continued monitoring alternatives do nothing to reduce the toxicity, mobility and volume through treatment.

Toxicity under any of the alternatives would not be reduced unless the waste is treated before it is placed in the repository or licensed landfill. Waste treatment is not planned for mine waste from Neihart OU1, or

the waste from the former Silver Dyke tailings impoundment once the action memorandum is amended. Potential treatment of other mine wastes at the CSCMD site will be addressed in future OU specific FS's.

As noted above, all alternatives rank the same under this criteria as no alternative involves treatment under existing assumptions.

6.5 SHORT TERM EFFECTIVENESS

The no action and no further action with continued monitoring alternatives (Alternatives 1 and 2) are not effective in the short-term. The on-site repository alternatives (Alternatives 4 and 5) would be most effective in meeting the RAOs for OU1, the PRAOs for this action, and in protecting human health and the environment in the short-term. The MacKay Gulch repository would be the quickest and easiest to build and therefore involve the least short term risks. The development of the Silver Dyke Glory Hole repository will likely take 6 months to 1 year to stabilize the high walls on the southern and eastern sides to reduce physical hazards to construction workers. Both on-site alternatives have manageable short term risks to workers and the public. Off-site disposal involves higher short term risks due to increased traffic and safety concerns, and therefore is not as effective for the short term. The Silver Dyke Glory Hole repository and off-site licensed landfill alternatives would not allow for the scheduled removal action at the former Silver Dyke tailings impoundment to proceed once the action memorandum is amended.

Ranking of Short-Term Effectiveness and Permanence

The alternatives are ranked for short-term effectiveness, from most effective to least effective.

1. Alternatives 4 ranks highest for short term effectiveness because site access development would not prevent anticipated response actions at OU1 and OU3 from occurring, and have the least amount of short term risks due to safety concerns.
2. Alternative 5 ranks next highest for short term effectiveness, as it could take longer to construct and would involve some hazardous construction actions.
3. Alternative 3 ranks next highest for short term effectiveness, as it has considerable safety risks and construction effects on roads due to the long distance hauling required.
4. Alternatives 1and 2 ranked lowest because they are not effective in the short-term.

6.6 IMPLEMENTABILITY

Both on-site repository alternatives (Alternatives 4 and 5) are technically and administratively feasible. The construction of the Mackay Gulch repository requires less technical expertise because it does not involve blasting and has a substantial amount of available borrow material. Construction of alternatives 4 and 5 can be completed with standard construction labor and equipment available in the area. Long term operation, maintenance, and monitoring would be necessary to ensure the integrity of the repositories.

Access and institutional control issues provide some implementability challenges but can be managed through proper planning.

The off-site, licensed landfill (Alternative 3) is less implementable as the local solid waste landfills may not be willing to accept the large volume of removed mine waste from the CSCMD site.

The no action alternatives (Alternatives 1 and 2) are easily implementable, but not overall protective of human health and the environment.

Ranking of Implementability

The alternatives are ranked for implementability, from most implementable to least implementable.

1. Alternatives 1 and 2 rank highest because No-Action is easiest.
2. Alternative 4 ranks next highest because it is technically and administratively feasible, and the construction methods are less technical than Alternative 5.
3. Alternative 5 ranks next highest because site development requires more planning and preparation than Alternative 4.
4. Alternative 3 ranks the least implementable because of the likely difficulty of finding a willing solid waste facility for the large amounts of mine waste off-site.

6.7 COST

The alternative costs are ranked for cost, from lowest to highest (rounded to the highest $1,000).

1. No Action – No cost
2. No Further Action with Monitoring - $269,000
3. Alternative 5 - $17,065,000
4. Alternative 4 - $20,025,000
5. Alternative 3 - $90,304,920

7.0 SUMMARY

Based on the evaluations, the EPA in consultation with DEQ and the USFS, have tentatively decided on a preferred approach for this action. This section presents the rationale used in selecting the repository locations and the recommended approach for developing the repositories. The preferred approach includes a phased approach to development. The preferred approach does not preclude the future use of a repository location that was not considered as part of this FS.

EPA, in consultation with DEQ and the USFS, has decided that both Alternative 4 (Mackay Gulch) and Alternative 5 (Silver Dyke Glory Hole) are preferred.

Since it is the easiest to implement, the Mackay Gulch repository will be developed first to meet the timeline requirements for the Silver Dyke tailings impoundment removal when the action memorandum is amended and the OU1 remedial action. While mine waste is being placed in the Mackay Gulch Repository, the Silver Dyke Glory Hole Repository will be developed to begin accepting mine waste when the Mackay Gulch repository is full. The rationale behind this decision is that the estimated 1.2 million cubic yards of mine waste at the CSCMD site will eventually require both repository sites. These two repository locations have the capacity to hold the majority, if not all, of the anticipated, removed mine waste from the CSCMD site. The development of Mackay Gulch will be a cover soil and topsoil source for the Silver Dyke Glory Hole Repository. This phased approach for constructing two repositories will meet the short-term and long-term needs of the CSCMD site and is implementable.

However, EPA's Proposed Plan for this action will contain the preferred alternative for this action, in accordance with CERCLA, the NCP, and EPA guidance.

8.0 REFERENCES

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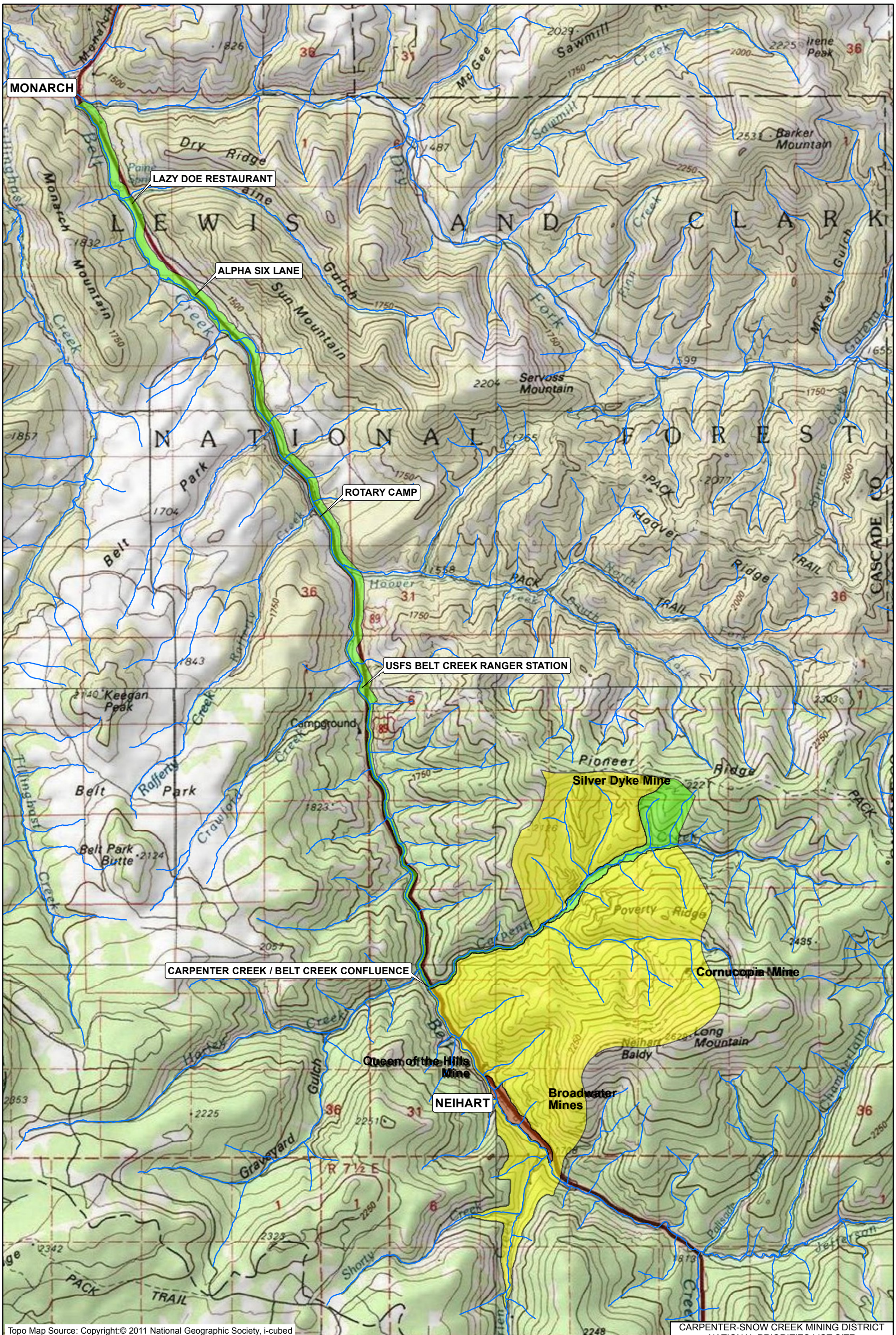
FIGURES



Topo Map Source: Copyright:© 2011 National Geographic Society, i-cubed

LEGEND

- STREAM
- OU1
- OU2
- OU3

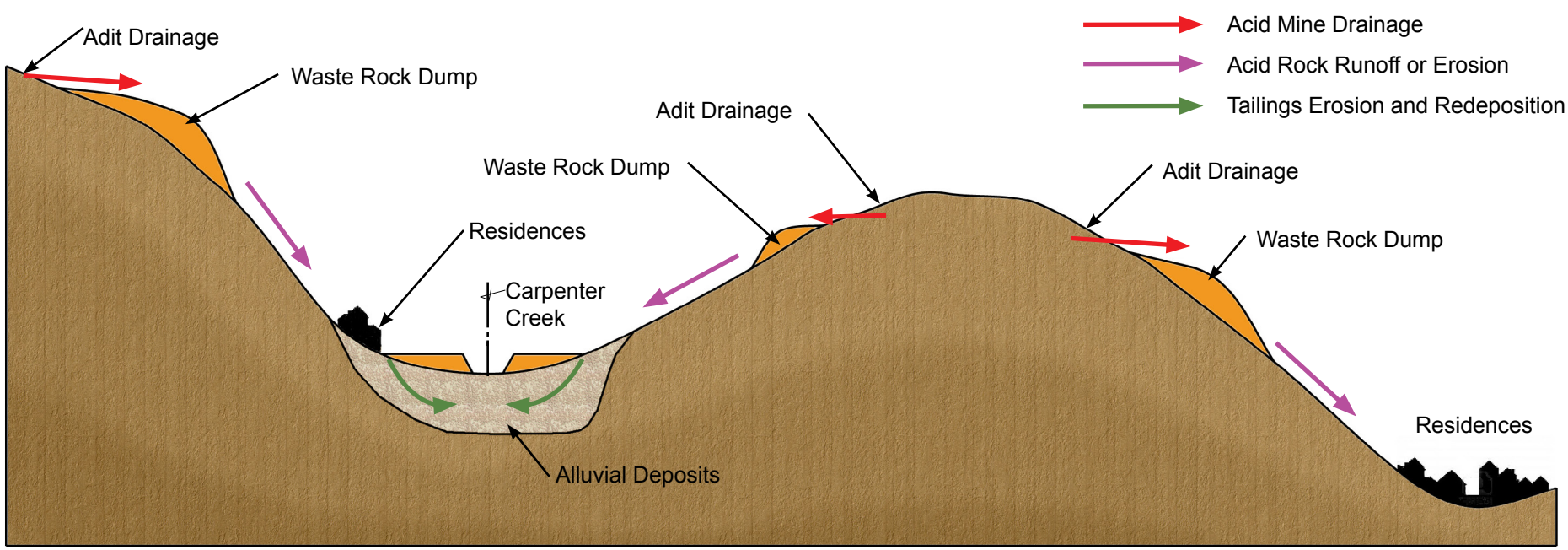
0 0.5 1 1.5 2 Miles

CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 1.0-1
SITE LOCATION MAP

TETRA TECH EM INC.

GIS MAP BY DOUG HEROLD TTEMI-HELENA - Figure_1.0-1_Site_Location_Map_012814.mxd



On-site Resident

Dermal contact, ingestion, and /or inhalation of tailings or surface soil

Dermal contact and/or ingestion of surface water or groundwater

Ingestion of terrestrial food items

On-site ATV Rider

Dermal contact, ingestion, and /or inhalation of tailings, waste rock, or surface soil

Dermal contact and/or ingestion of acid mine drainage and/or surface water

On-site Construction Worker

Dermal contact, ingestion, and /or inhalation of tailings, waste rock, or surface soil

Dermal contact and/or ingestion of surface water

On-site Hiker

Dermal contact, ingestion, and /or inhalation of tailings, waste rock, or surface soil

Dermal contact and/or ingestion of acid mine drainage and/or surface water

On-site Fisherman

Dermal contact, ingestion, and /or inhalation of tailings, waste rock, or surface soil

Dermal contact and/or ingestion of acid mine drainage and/or surface water
Ingestion of fish

On-site Hunter

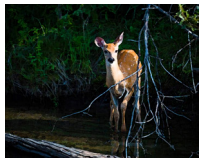
Dermal contact, ingestion, and /or inhalation of tailings, waste rock, or surface soil

Dermal contact and/or ingestion of acid mine drainage and/or surface water
Ingestion of game

On-site Commercial Worker

Dermal contact, ingestion, and /or inhalation of tailings or surface soil

Dermal contact and/or ingestion of surface water or groundwater



Wildlife (Aquatic/ Terrestrial)

Ingestion of acid mine drainage, surface water, tailings, waste rock, surface soil, vegetation, and terrestrial animals

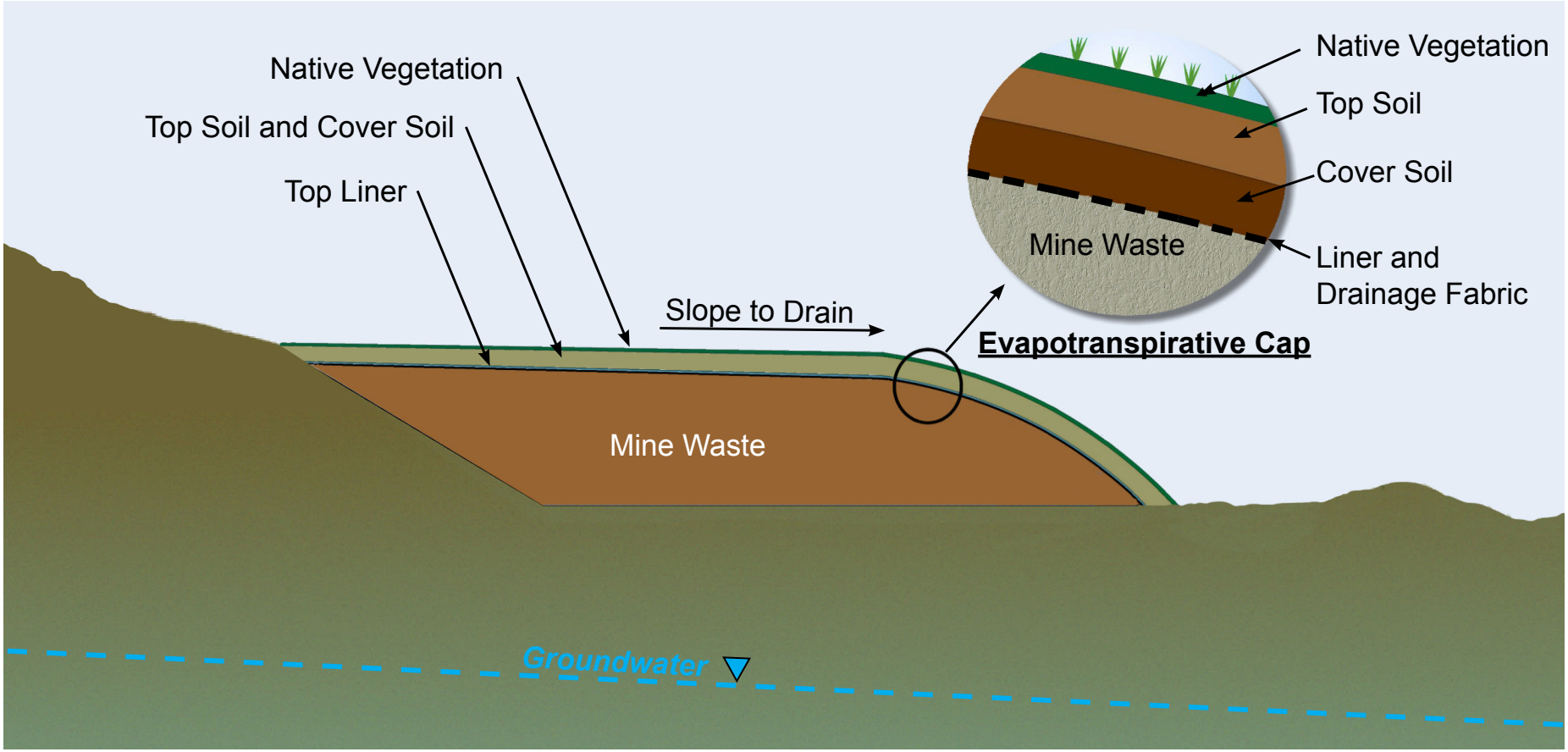
Dermal contact with acid mine drainage, surface water, tailings, waste rock, and surface soil

CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 1.3-1

Site Conceptual Model

TETRA TECH

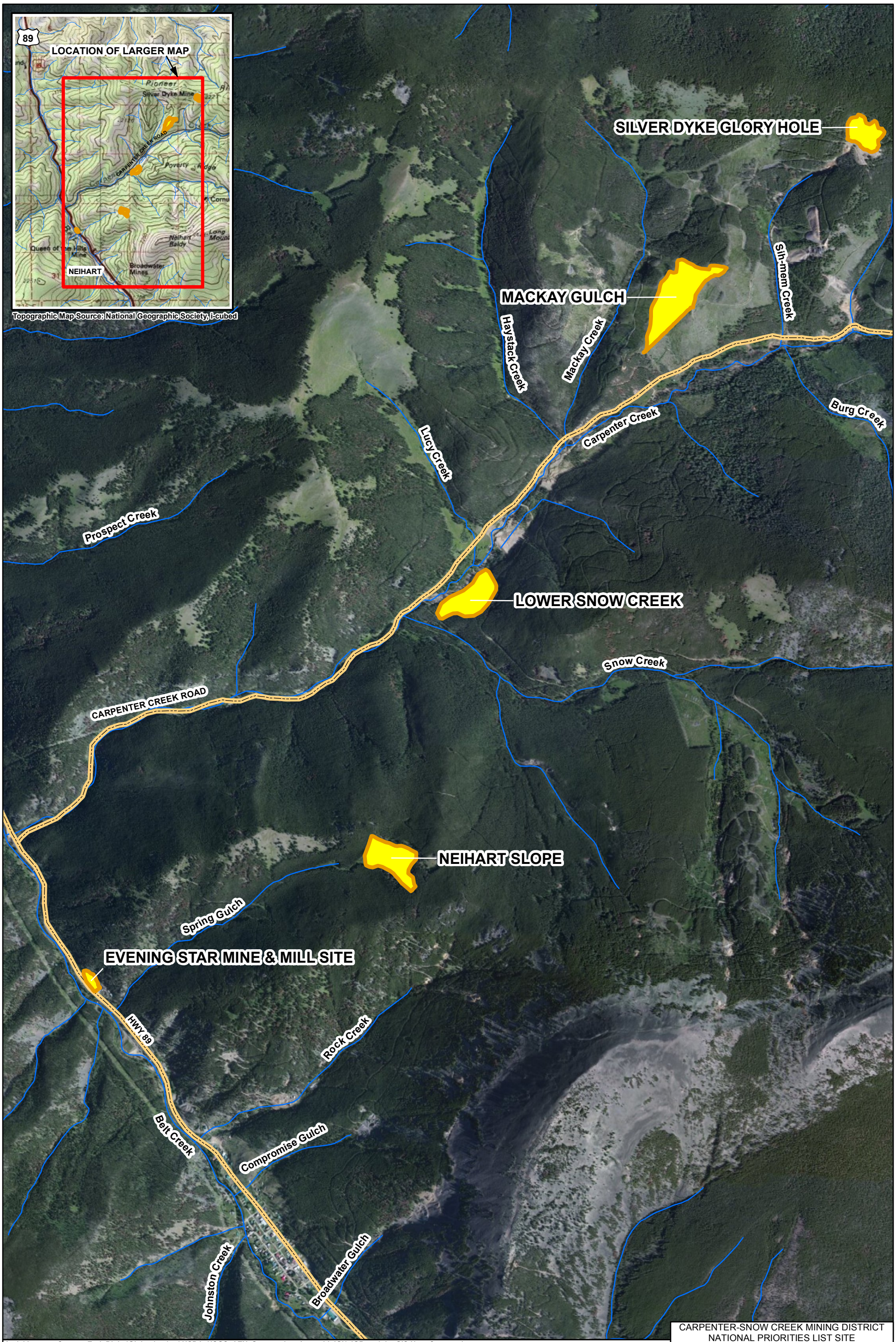


Not To Scale

CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 1.3-2
Conceptual Model of a Repository

TETRA TECH



Aerial Imagery Source: Esri, DigitalGlobe, i-cubed,USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LEGEND

- REPOSITORY BOUNDARY
- ROAD
- STREAM

N

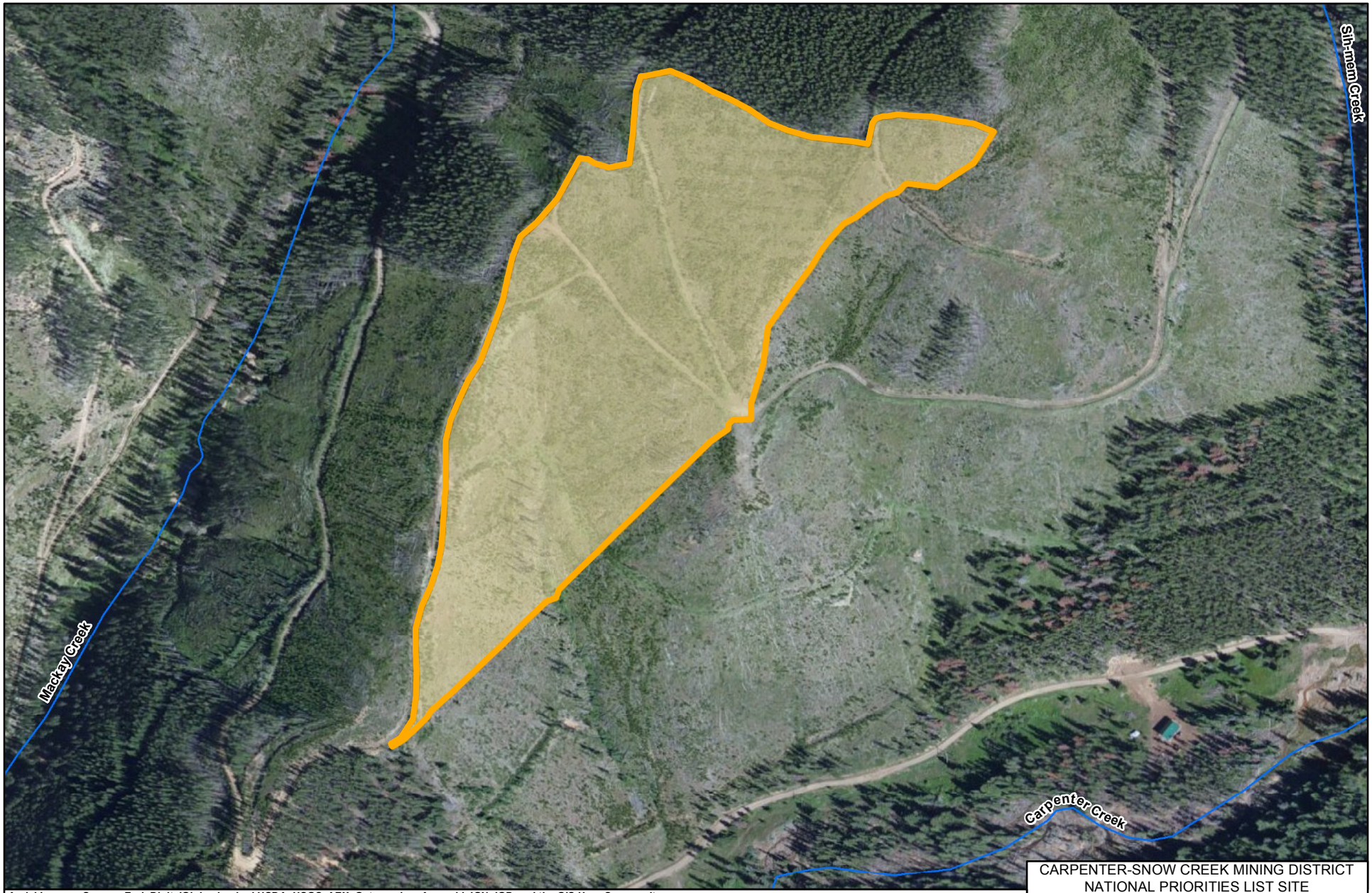
0 1,000 2,000 Feet

CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 4.0-1
POTENTIAL REPOSITORY SITES
ALL LOCATIONS

TETRA TECH

GIS MAP BY DOUG HEROLD TTEMI-HELENA - Figure_4.0-1_Potential_Repo_Sites_ALL_050814.mxd



Aerial Imagery Source: Esri, DigitalGlobe, i-cubed,USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LEGEND

REPOSITORY BOUNDARY

STREAM

N

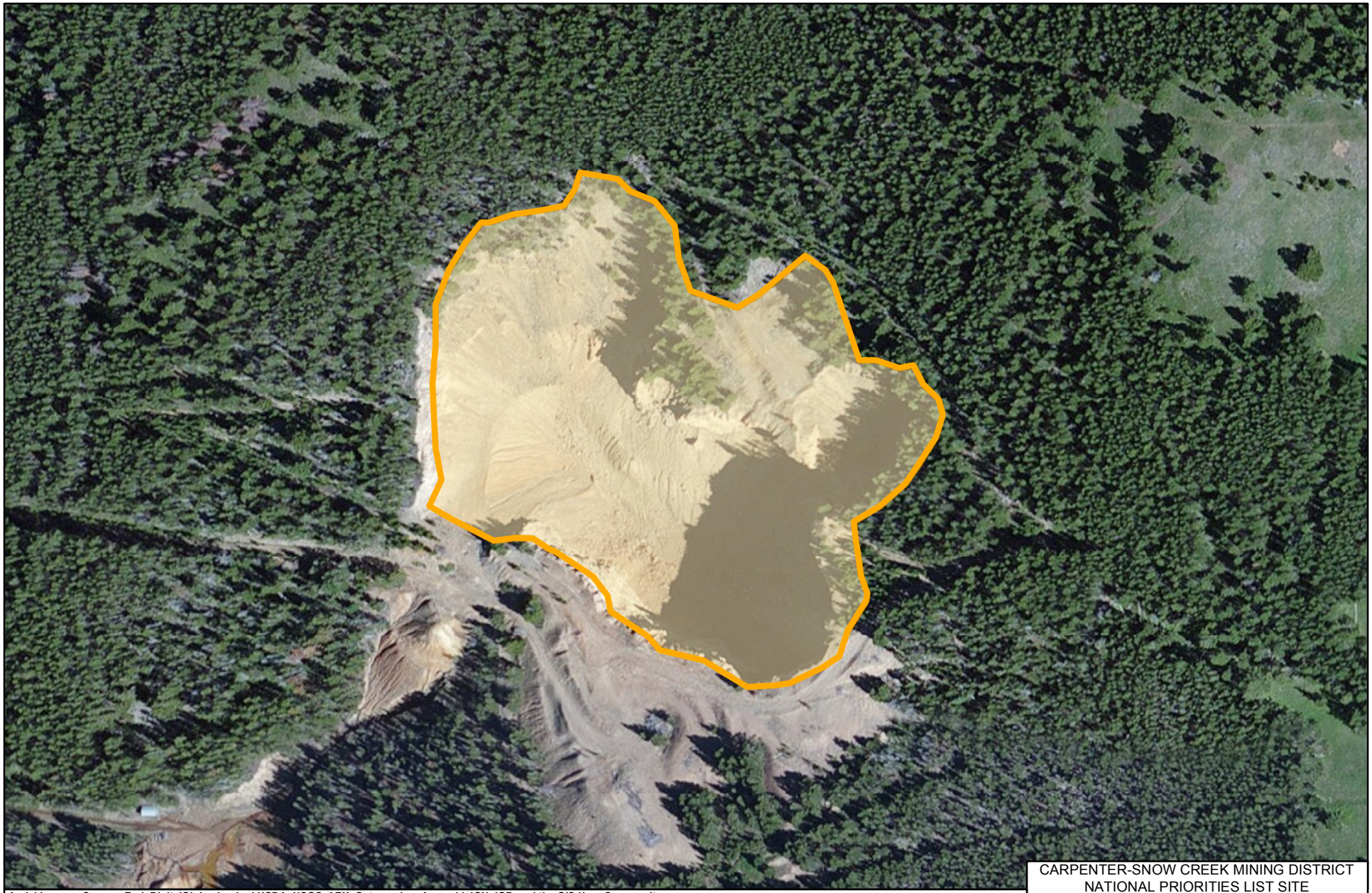
0 300 600 Feet

CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 4.4-1
MACKAY GULCH
POTENTIAL REPOSITORY LOCATION

TETRA TECH

GIS MAP BY DOUG HEROLD TTEMI-HELENA - Figure_4.4-1_Mackay_Gulch_Repo_Site_062714.mxd



Aerial Imagery Source: Esri, DigitalGlobe, i-cubed,USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LEGEND

REPOSITORY BOUNDARY

N

0 200 400 Feet

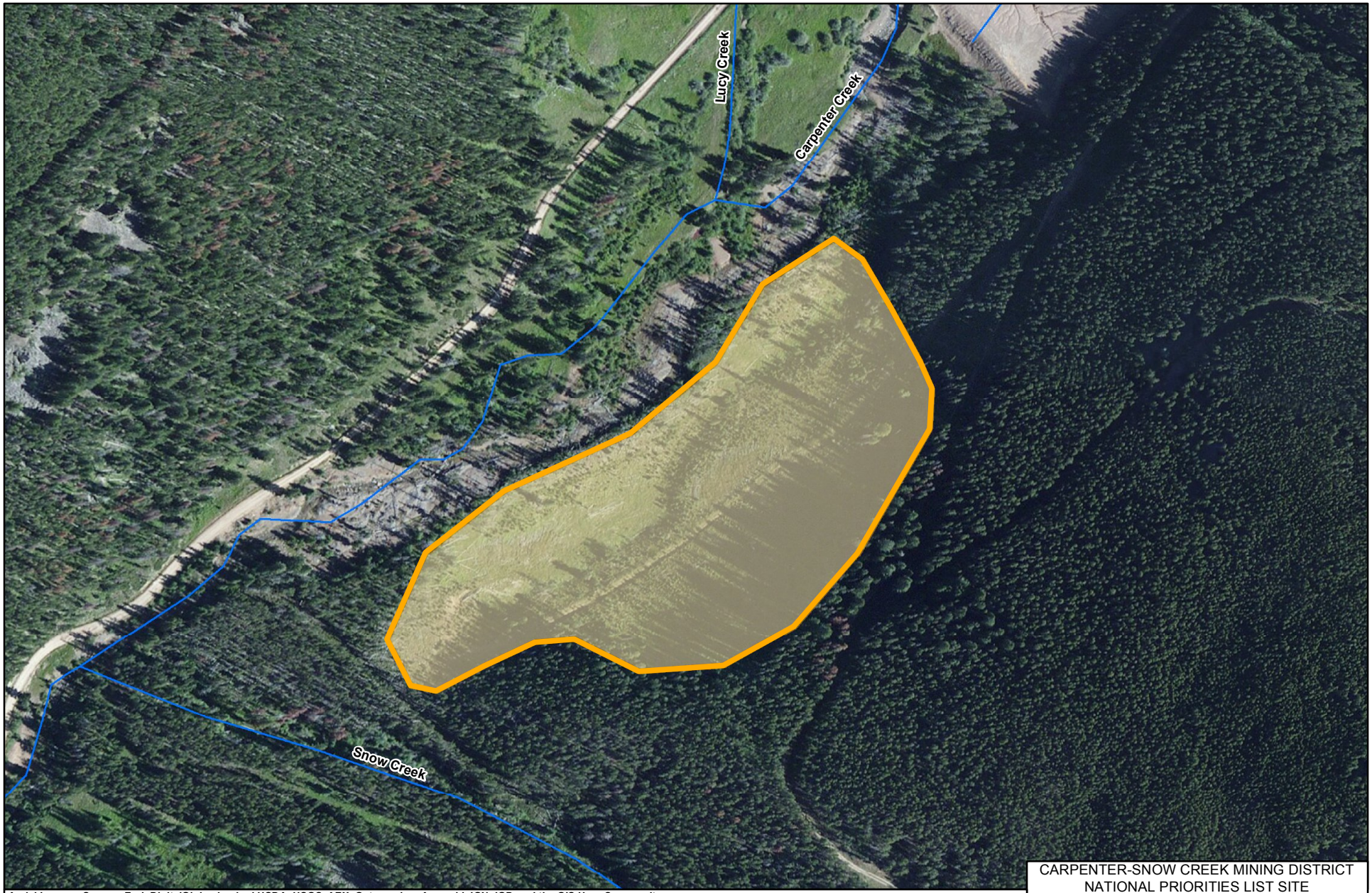
CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 4.4-2

SILVER DYKE GLORY HOLE
POTENTIAL REPOSITORY LOCATION

TETRA TECH

GIS MAP BY DOUG HEROLD TTEMI-HELENA - Figure_4.4-2_Glory_Hole_Repo_Site_062714.mxd



Aerial Imagery Source: Esri, DigitalGlobe, i-cubed,USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LEGEND

REPOSITORY BOUNDARY

STREAM

N

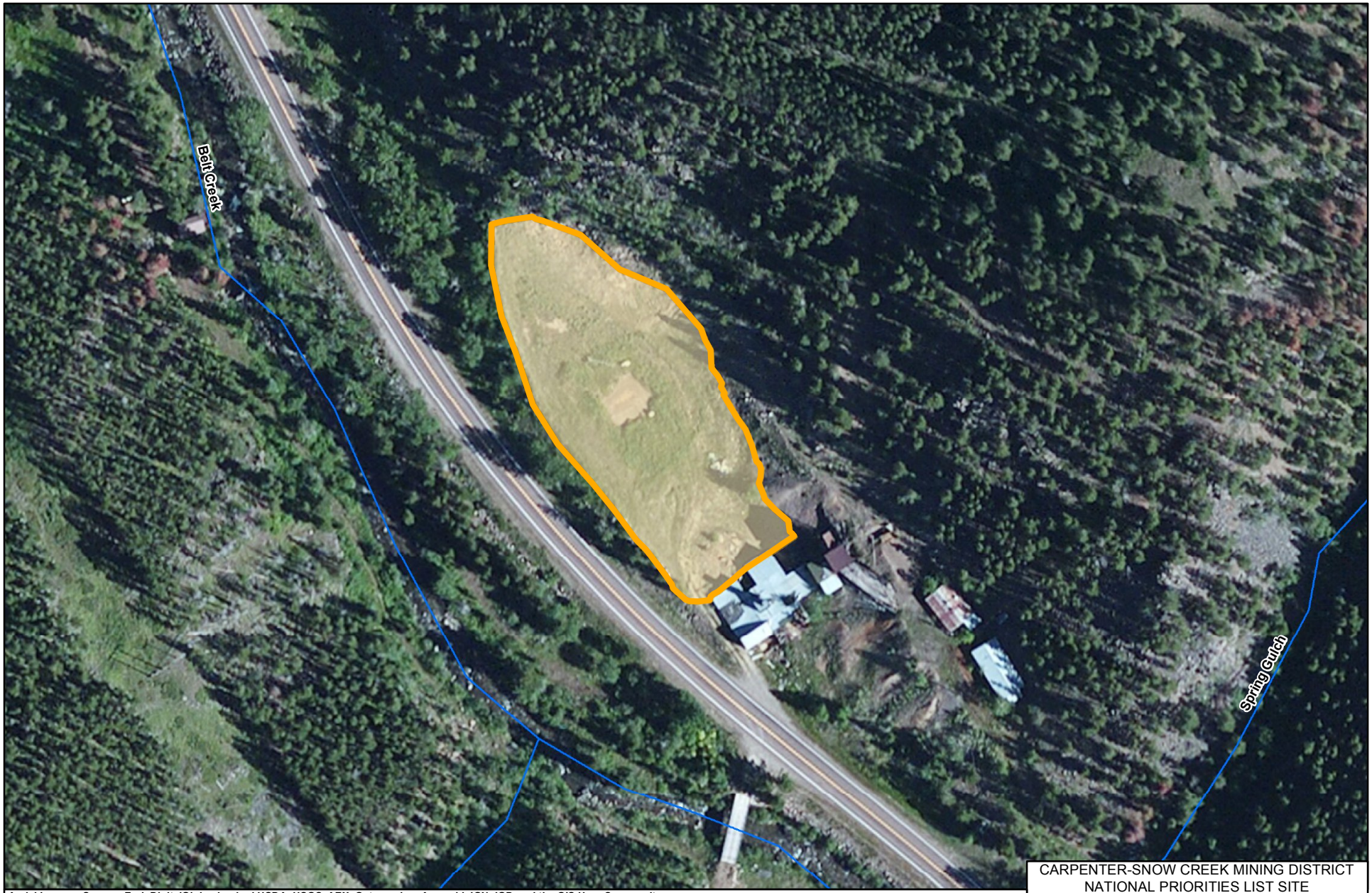
0 250 500 Feet

CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 4.4-3
LOWER SNOW CREEK
POTENTIAL REPOSITORY LOCATION

TETRA TECH

GIS MAP BY DOUG HEROLD TTEMI-HELENA - Figure_4.4-3_Lower_SC_Repo_Site_062714.mxd



Aerial Imagery Source: Esri, DigitalGlobe, i-cubed,USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LEGEND

REPOSITORY BOUNDARY

STREAM

N

0 100 200 Feet

CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 4.4-4

EVENING STAR MINE & MILL SITE
POTENTIAL REPOSITORY LOCATION

TETRA TECH

GIS MAP BY DOUG HEROLD TTEMI-HELENA - Figure_4.4-4_Evening_Star_Repo_Site_062714.mxd

Aerial Imagery Source: Esri, DigitalGlobe, i-cubed,USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LEGEND

REPOSITORY BOUNDARY

STREAM

N

0 200 400 Feet

CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 4.4-5
NEIHART SLOPE
POTENTIAL REPOSITORY LOCATION

TETRA TECH

GIS MAP BY DOUG HEROLD TTEMI-HELENA - Figure_4.4-5_Neihart_Slope_Repo_Site_062714.mxd

TABLES

TABLE ES-1
INITIAL SCREENING OF DISPOSAL OPTIONS SUMMARY

Disposal Option	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume through Treatment	Short-Term Effectiveness	Implementability	Cost
No Action	Not effective or permanent. Does not meet PRAOs.	Does not reduce toxicity, mobility, or volume.	Not effective in the short-term.	Easily implemented.	None
No Further Action with Monitoring	Unknown. The site has not naturally attenuated itself over the last 125 years. Natural attenuation of the mine waste could take hundreds of years.	Does not reduce toxicity, mobility, or volume.	Not effective in the short-term.	Easily implemented.	Low
Off-Site Disposal (at a RCRA Facility)	Effective at preventing human and ecological exposure to mine waste in the long-term. Permanent as long as the landfill is properly constructed and maintained.	Reduces or eliminates mobility. Prevents wind and surface water erosion. Prevents migration to groundwater. Does not affect toxicity or volume.	Effective at preventing human exposure to mine waste in the short-term.	Difficult. Would require shipping over 1.2 million cubic yards of waste 70 miles to the nearest facility.	Very High
On-Site Disposal at a Repository	Effective at preventing human and ecological exposure to mine waste in the long-term. Permanent as long as the repository is properly designed, constructed and maintained.	Reduces or eliminates mobility. Prevents wind and surface water erosion. Prevents migration to groundwater. Does not affect toxicity or volume.	Effective at preventing human and ecological exposure to mine waste in the short-term.	Implementable. Likely the cheapest disposal option. Keeps the waste on-site where CERCLA already applies. Complies with OU1 ROD.	Medium

TABLE 3.2-1
INITIAL SCREENING OF DISPOSAL OPTIONS SUMMARY

Disposal Option	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume through Treatment	Short-Term Effectiveness	Implementability	Cost	Warrants Further Evaluation?	Rationale
No Action	Not effective or permanent. Does not meet PRAOs.	Does not reduce toxicity, mobility, or volume.	Not effective in the short-term.	Easily implemented.	None	Yes	Carried forward as baseline alternative.
No Further Action with Monitoring	Unknown. The site has not naturally attenuated itself over the last 125 years. Natural attenuation of the mine waste could take hundreds of years.	Does not reduce toxicity, mobility, or volume.	Not effective in the short-term.	Easily implemented.	Low	No	Not protective of human health and the environment, not effective over long-term or short-term.
Institutional Controls	Effective in restricting human exposure to the site. Does not restrict ecological receptor exposure.	Does not reduce toxicity, mobility, or volume.	Effective in the short-term at preventing human exposure. Does not restrict ecological receptor exposure.	Implementable. Would require land use surface water and groundwater restrictions. Fencing likely required as well.	Low	Not as a stand-alone alternative. Elements should be incorporated into other options.	Does not prevent ecological receptor exposure and does not reduce waste mobility.
Off-Site Disposal at a RCRA Facility (Landfill)	Effective at preventing human and ecological exposure to mine waste in the long-term. Permanent as long as the landfill is properly constructed and maintained.	Reduces or eliminates mobility. Prevents wind and surface water erosion. Prevents migration to groundwater. Does not affect toxicity or volume.	Effective at preventing human exposure to mine waste in the short-term.	Difficult. Would require shipping over 1.2 million cubic yards of waste 80 miles to the nearest facility.	Very High	No	While this option is effective, the costs are prohibitive, and there is a risk to public safety from haul trucks during transportation of the waste.
Off-Site Disposal at a Repository	Effective at preventing human and ecological exposure to mine waste in the long-term. Permanent as long as the repository is properly designed, constructed and maintained.	Reduces or eliminates mobility. Prevents wind and surface water erosion. Prevents migration to groundwater. Does not affect toxicity or volume.	Effective at preventing human and ecological exposure to mine waste in the short-term.	Moderately difficult. Would require shipping over 1.2 million cubic yards of waste up to 25 miles to the nearest repository site. Would require negotiations with private landowners and/or public agencies. Would require OU1 ROD amendment.	High	Yes	This option is effective, meets the PRAOs, and is implementable. Costs are high, but not prohibitive.
On-Site Disposal at a Repository	Effective at preventing human and ecological exposure to mine waste in the long-term. Permanent as long as the repository is properly designed, constructed and maintained.	Reduces or eliminates mobility. Prevents wind and surface water erosion. Prevents migration to groundwater. Does not affect toxicity or volume.	Effective at preventing human and ecological exposure to mine waste in the short-term.	Implementable. Likely the cheapest disposal option. Keeps the waste on-site where CERCLA already applies. Complies with OU1 ROD.	Medium	Yes	This option is effective, meets the PRAOs, and is implementable. Evaluate on-site options.

TABLE 4.4-1
SUMMARY OF INITIAL REPOSITORY SCREENING

Repository Location	Compliance with ARARs	Capacity (CY)	Investigation Data Available	Property Ownership	Repository Development Can Meet Removal Timelines	Conclusion
No Action	No	NA	NA	NA	NA	Alternative developed as baseline
No Action with Continued Monitoring	No	NA	NA	NA	NA	Alternative retained
Off-site Disposal at State-Licensed Solid Waste Facility	Yes	>1,200,000	NA	One Private Owner	Yes	Suitable location with adequate volume; Develop alternative
Mackay Gulch	Yes	>675,000	Topographic survey, geotechnical soil data, piezometer, test pit data, soil boring data	One Private Owner	Yes	Suitable location with adequate volume; Develop alternative
Silver Dyke Glory Hole	Yes	>569,000	Topographic Survey	One Private Owner	Yes	Suitable location with adequate volume; Develop alternative
Lower Snow Creek	No	Unknown	None	One Private Owner	Yes	Depth to groundwater inadequate; Screened out
Evening Star Mill Site	Unknown	<50,000	Topographic survey, soil boring	One Private Owner	Yes	Capacity inadequate; Screened out
Neihart Slope	Yes	90,000	Topographic survey, test pit data, geotechnical data, soil boring data	1 Public, 3 Private Owners	No	Capacity inadequate; Access development difficult; Screened out

Notes:

<	Less than
>	Greater than
ARAR	Applicable or Relevant and Appropriate Requirement
CY	Cubic yards

TABLE 4.4-1
SUMMARY OF INITIAL REPOSITORY SCREENING

Repository Location	Compliance with ARARs	Capacity (CY)	Investigation Data Available	Property Ownership	Repository Development Can Meet Removal Timelines	Conclusion
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Lower Snow Creek	No	Unknown	None	One Private Owner	Yes	Depth to groundwater inadequate; Screened out
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Neihart Slope	Yes	90,000	Topographic survey, test pit data, geotechnical data, soil boring data	1 Public, 3 Private Owners	No	Capacity inadequate; Access development difficult; Screened out

Notes:

<	Less than
>	Greater than
ARAR	Applicable or Relevant and Appropriate Requirement
CY	Cubic yards

TABLE 5.1-1
SUMMARIZED EVALUATION CRITERIA ANALYSIS

Repository Location	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	Cost
Alternative 1 - No Action	Not protective of human health or the environment.	Does not comply with ARARs	Is not effective at preventing exposure to mine waste.	Does not reduce toxicity, mobility or volume.	Is not effective at preventing exposure to mine waste.	Readily implemented.	Low
Alternative 2 - No further action with continued monitoring	Not protective of human health or the environment.	Does not comply with ARARs	Is not effective at preventing exposure to mine waste.	Does not reduce toxicity, mobility or volume.	Is not effective at preventing exposure to mine waste.	Readily implemented.	Low
Alternative 3 - Off-site disposal as licensed solid waste facility	High degree of protection. Facility is in a dry area with no groundwater observed.	Complies with ARARs	Effective. Eliminates human and environmental exposure to mine waste permanently as long as facility is maintained.	Eliminates mobility to air, surface soil, surface water, and groundwater by consolidation and confinement in a solid waste facility.	Very Effective. Eliminates human and environmental exposure to mine waste permanently as long as facility is maintained.	Readily implemented.	High
Alternative 4 - Mackay Gulch Repository	High degree of protection. Remote, dry area. No groundwater observed above bedrock.	Complies with ARARs	Effective. Eliminates human and environmental exposure to mine waste permanently as long as repository is maintained.	Eliminates mobility to air, surface soil, surface water, and groundwater by consolidation and confinement in a repository.	Very Effective. Eliminates human and environmental exposure to mine waste permanently as long as repository is maintained.	Readily implemented. Existing site access needs minor improvements. Site access and development estimated at <1 month.	Medium to High
Alternative 5 - Silver Dyke Glory Hole Repository	Medium to high protection. Leachate may drain with pre-existing adit drainage. Eliminates large mine hazard.	Complies with ARARs	Effective. Eliminates human and environmental exposure to mine waste permanently as long as repository is maintained.	Eliminates mobility to air and surface soil by consolidation and confinement in a repository. May reduce adit drainage. Must be filled to positive drainage over a short term to prevent ponding.	Very Effective if filled to positive drainage in 1-2 years. Eliminates human and environmental exposure to mine waste permanently as long as repository is maintained.	Implementable. Requires haul road construction and extensive repository site development. Site access and development estimated at 1-2 years. Glory Hole will need to be addressed anyway to mitigate adit drainage. Adit drainage will need to be addressed in the future to meet ARARs.	Medium

Note:
ARAR Applicable or Relevant and Appropriate Requirement

TABLE 5.2-1
No-Further Action Estimated Site Monitoring Costs

Yearly Operation and Maintenance (O&M) Costs				
Annual Site Inspections	1	EA	$20,000.00	$20,000.00
Present Worth of Inspection Costs Based on 30 Year Life @ 7.00%		PF Factor = 12.41		**$248,200.00**
Total Present Worth				**$268,200.00**

Notes:

@	At
%	Percent
EA	Each

TABLE 5.2-2
Alternative 2: Off-Site Repository Estimated Development Costs

Cost Item	Quantity	Unit	Unit Cost	Cost
Capital Costs				
Clearing and Grubbing	30	AC	$4,600.00	$138,000.00
Site Preparation and Storm Water Control	30	AC	$1,000.00	$30,000.00
Top Soil and Cover Soil Stripping and Stockpiling	484,000	CY	$1.95	$943,800.00
Waste Excavation, Hauling and Placement	1,200,000	CY	$24.00	$28,800,000.00
Site Grading	12	100,000 SF	$4,950.00	$59,400.00
Repository Cap (HDPE/GDF/base course)	125,000	SY	$13.50	$1,687,500.00
Repository Cover and Top Soil Application	484,000	CY	$8.25	$3,993,000.00
Fertilize, Seed, and Mulch	30	AC	$2,000.00	$60,000.00
Install Lined Perimeter Drainage Ditch	36,000	SF	$8.00	$288,000.00
Fence Repository Area	6,000	LF	$10.00	$60,000.00
Monitoring Well Installation	4	EA	$3,000.00	$12,000.00
Subtotal Construction Costs				**$36,071,700.00**
Project Management		5% Construction Cost		$1,803,585.00
Remedial Design		6% Construction Cost		$2,164,302.00
Construction Management		6% Construction Cost		$2,164,302.00
Construction Contingencies		20 % of Construction Cost		$7,214,340.00
Total Capital Costs				**$49,418,229.00**
Yearly Operation and Maintenance (O&M) Costs				
Site Inspections	2	EA	$1,000.00	$2,000.00
Site Maintenance		1 % of Construction Cost		$360,717.00
Subtotal O&M Costs				**$362,717.00**
O&M Contingencies		15%		$54,407.55
Total Yearly O&M Cost				**$417,124.55**
Present Worth of O&M Costs Based on 30 Year Life @ 7.00%		PF Factor = 12.41		**$5,176,515.67**
Total Present Worth				**$54,594,744.67**

Notes:

@	At
%	Percent
AC	Acre
CY	Cubic Yard
EA	Each
LF	Linear Feet
PF	Present Worth Factor
SF	Square Feet
SY	Square Yard
O&M	Operation and Maintenance

TABLE 5.2-3
Alternative 3: Mackay Gulch Repository Estimated Development Costs

Cost Item	Quantity	Unit	Unit Cost	Cost
Capital Costs				
Clearing and Grubbing	24	AC	$4,600.00	$110,400.00
Site Preparation and Storm Water Control	24	AC	$1,000.00	$24,000.00
Top Soil Stripping and Stockpiling	31,000	CY	$1.95	$60,450.00
Cover Soil Excavation and Stockpiling	152,000	CY	$6.00	$912,000.00
Waste Excavation, Hauling and Placement	675,000	CY	$15.00	$10,125,000.00
Site Grading	6	100,000 SF	$4,950.00	$29,700.00
Repository Cap (HDPE/GDF/base course)	66,700	SY	$13.50	$900,450.00
Repository Cover and Top Soil Application	89,000	CY	$8.25	$734,250.00
Fertilize, Seed, and Mulch	24	AC	$2,000.00	$48,000.00
Install Lined Perimeter Drainage Ditch	5,000	SF	$8.00	$40,000.00
Fence Repository Area	5,000	LF	$10.00	$50,000.00
Monitoring Well Installation	4	EA	$3,000.00	$12,000.00
Subtotal Construction Costs				**$13,046,250.00**
Project Management		5% Construction Cost		$652,312.50
Remedial Design		8% Construction Cost		$1,043,700.00
Construction Management		6% Construction Cost		$782,775.00
Construction Contingencies		20 % of Construction Cost		$2,609,250.00
Total Capital Costs				**$18,134,287.50**
Yearly Operation and Maintenance (O&M) Costs				
Site Inspections	2	EA	$1,000.00	$2,000.00
Site Maintenance		1 % of Construction Cost		$130,462.50
Subtotal O&M Costs				**$132,462.50**
O&M Contingencies		15%		$19,869.38
Total Yearly O&M Cost				**$152,331.88**
Present Worth of O&M Costs Based on 30 Year Life @ 7.00%		PF Factor = 12.41		**$1,890,438.57**
Total Present Worth				**$20,024,726.07**

Notes:

@	At
%	Percent
AC	Acre
CY	Cubic Yard
EA	Each
LF	Linear Feet
PF	Present Worth Factor
SF	Square Feet
SY	Square Yard
O&M	Operation and Maintenance

TABLE 5.2-4
Alternative 4: Silver Dyke Glory Hole Repository Estimated Development Costs

Cost Item	Quantity	Unit	Unit Cost	Cost
Capital Costs				
Install Access Road to Glory Hole	3,000	LF	$31.50	$94,500.00
Site Preparation and Storm Water Control	8	AC	$3,000.00	$24,000.00
Site Blasting for Headwall Removal	110,000	CY	$12.25	$1,347,500.00
Pushing Ripped Material	110,000	CY	$2.04	$224,400.00
Site Grading	3	100,000 SF	$4,950.00	$14,850.00
Waste Excavation, Hauling and Placement	569,000	CY	$15.00	$8,535,000.00
Repository Cap (HDPE/GDF/base course)	34,000	SY	$13.50	$459,000.00
Load,Haul, and Spread Cover Soil	39,600	CY	$8.50	$336,600.00
Fertilize, Seed, and Mulch	7	AC	$2,000.00	$14,000.00
Install Lined Perimeter Drainage Ditch	2,500	LF	$8.00	$20,000.00
Fence Repository Area	2,500	LF	$10.00	$25,000.00
Monitoring Well Installation	4	EA	$5,000.00	$20,000.00
Subtotal Construction Costs				**$11,114,850.00**
Project Management		5% Construction Cost		$555,742.50
Remedial Design		8% Construction Cost		$889,188.00
Construction Management		6% Construction Cost		$666,891.00
Construction Contingencies		20 % of Construction Cost		$2,222,970.00
Total Capital Costs				**$15,449,641.50**
Yearly Operation and Maintenance (O&M) Costs				
Site Inspections	2	EA	$1,000.00	$2,000.00
Site Maintenance		1 % of Construction Cost		$111,148.50
Subtotal O&M Costs				**$113,148.50**
O&M Contingencies		15%		$16,972.28
Total Yearly O&M Cost				**$130,120.78**
Present Worth of O&M Costs Based on 30 Year Life @ 7.00%		PF Factor = 12.41		**$1,614,798.82**
Total Present Worth				**$17,064,440.32**

Notes:

@	At
%	Percent
AC	Acre
CY	Cubic Yard
EA	Each
LF	Linear Feet
PF	Present Worth Factor
SF	Square Feet
SY	Square Yard
O&M	Operation and Maintenance

ATTACHMENT 1

IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THIS ACTION

IDENTIFICATION AND DESCRIPTION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR FEASIBILITY STUDY ANALYSIS OF ALTERNATIVES

Carpenter Snow Creek Mining District
Focused Feasibility Study for Site-Wide Secure Waste Disposal Area
July 2014

INTRODUCTION

Section 121(d) of the Comprehensive Environmental Response, Compensation and Liability Act as amended (CERCLA), 42 U.S.C. § 9621(d), certain provisions of the current National Contingency Plan (the NCP), 40 CFR Part 300, and CERCLA guidance and policy issued by the Environmental Protection Agency (EPA) require that remedial actions taken pursuant to Superfund authority shall require or achieve compliance with substantive provisions of applicable or relevant and appropriate standards, requirements, criteria, or limitations from state environmental and facility siting laws, and from federal environmental laws, during implementation of the remedial action or at the completion of the remedial action, or both, depending on the nature of the requirements, unless a waiver is granted[1]. If contaminant or location specific ARARs are not being met before the commencement of a remedial action, it is not necessary to invoke a waiver to justify their non-attainment during the action; although they must be obtained (or appropriately waived) for remedial action to be complete and the remedy to be successful[2]. These requirements are threshold standards that any selected remedy must meet, unless adequate basis for a waiver is present. See Section 121 (d) (4) of CERCLA, 42 U.S.C. § 9621(d)(4); 40 CFR § 300.430(f)(1). EPA describes standards, requirements, criteria, or limitations identified pursuant to section 121 (d) "ARARs," or applicable or relevant and appropriate requirements.

ARARs are either applicable or relevant and appropriate. Applicable requirements are those standards, requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance found at a CERCLA site. 40 CFR § 300.5. Relevant and appropriate requirements are those standards, requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to hazardous substances, pollutants, contaminants, remedial actions, locations, or other circumstances found at a CERCLA site, address problems or situations sufficiently similar to those encountered at

[1] See 55 Fed.Reg. 8666, 8755 (March 8, 1990)

[2] EPA CERCLA Compliance with Other Laws Manual 1-8 (OSWER 9234.1-01, August 1988)

the CERCLA site such that their use is well suited to the particular site. Id. Factors which may be considered in making this determination are presented in 40 CFR § 300.400(g)(2). Compliance with both applicable and relevant and appropriate requirements is mandatory, unless the ARAR is waived. 42 U.S.C. § 121(d)(4); 40 CFR 300.430(f)(1)(C).

Each ARAR or group of related ARARs identified here is followed by a specific statutory or regulatory citation, a classification describing whether the ARAR is applicable or relevant and appropriate, and a description which summarizes the requirements, and addresses how and when compliance with the ARAR will be measured (some ARARs will govern the conduct of the remedial action, some will define the measure of success of the remedial action, and some will do both)[3]. The descriptions given here are provided to allow the user a reasonable understanding of the requirements without having to refer constantly to the statute or regulation itself. However in the event of any inconsistency between the law and the summary provided in this document, the applicable or relevant and appropriate requirement is ultimately the requirement as set out in the law, rather than any paraphrase of the law provided here.

Also contained in this list are policies, guidance or other sources of information which are to be considered in the selection of the remedy and implementation of the record of decision (ROD) for this action. Although not enforceable requirements, these documents are important sources of information which EPA and the State of Montana Department of Environmental Quality (DEQ) may consider during selection of the remedy, especially in regard to the evaluation of public health and environmental risks; or which will be referred to, as appropriate, in selecting and developing cleanup actions.

Finally, this list contains a non-exhaustive list of other legal provisions or requirements which should be complied with during the implementation of the ROD[4].

ARARs are divided into contaminant specific, location specific, and action specific requirements, as described in the NCP and EPA guidance. For contaminant specific ARARs, ARARs are listed according to the appropriate media.

Contaminant specific ARARs include those laws and regulations governing the release to the environment of materials possessing certain chemical or physical characteristics or containing specific chemical compounds. Contaminant specific ARARs generally set health or risk based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that my be found in, or discharged to, the ambient environment. Location specific ARARs are restrictions placed on the

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[3] 40 CFR § 300.435(b)(2); Preamble to the Proposed NCP, 53 Fed.Reg. 51440 (December 21, 1988); Preamble to the Final NCP, 55 Fed.Reg. 8755-8757 (March 8, 1990)

[4] 40 CFR § 300.400(g)(3); 40 CFR § 300.515(h)(2); Preamble to the Final NCP, 55 Fed.Reg. 8744-8746 (March 8, 1990)

concentration of hazardous substances or the conduct of cleanup activities because they are in specific locations. Location specific ARARs related to the geographic or physical position of the site, rather than to the nature of site contaminants. Action specific ARARs are usually technology or activity based requirements or limitations on actions taken with respect to hazardous substances.

Only the substantive portions of the requirements are ARARs[5]. Administrative requirements are not ARARs and thus do not apply to actions conducted entirely on-site. Administrative requirements are those which involve consultation, issuance of permits, documentation, reporting, record keeping, and enforcement. The CERCLA program has its own set of administrative procedures which assure proper implementation of CERCLA. The application of additional or conflicting administrative requirements could result in delay or confusion[6]. Provision of statutes or regulations which contain general goals that merely express legislative intent about desired outcomes or conditions but are non-binding are not ARARs.[7]

Many requirements listed here are promulgated as identical or nearly identical requirements in both federal and state law, usually pursuant to delegated environmental programs administered by both EPA and the states, such as many of the requirements of the federal Clean Water Act and the Montana Water Quality Act. The Preamble to the final NCP states that such a situation results in citation to the state provision as the appropriate standard, but treatment of the provisions as a federal requirement. ARARs and other laws which are unique to state law are identified separately by the State of Montana.

This list constitutes EPA's and DEQ's detailed description of potential ARARs for use in the feasibility study for the Carpenter Snow Creek Mining District focused feasibility study for repository siting and construction, and resulting remedial action decisions. It is important to note the narrow scope of this focused feasibility study and ROD decision – it is limited to repository siting and construction and does not address certain other ARARs that will be identified for the geographic operable unit feasibility studies. This list will be used in evaluating the compliance of the various remedial alternatives with ARARs. However, the final determination of ARARs that will ultimately apply to the repository siting and construction and the final determination of compliance with ARARs or applicability of ARAR waivers will be presented in the ROD.

The ARAR analysis is based on section 121(d) of CERCLA, 42 U.S.C. § 9621 (d); CERCLA Compliance with Other Laws Manual, Volumes I and II; OSWER Directives 9234.1-01 and -02 (August 1988 and August 1989 respectively); various CERCLA ARARs Fact Sheets issued as OSWER

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[5] 40 CFR § 300.5. See also Preamble to the Final NCP, 55 Fed.Reg. 8756-8757 (March 8, 1990)

[6] Preamble to the Final NCP, 55 Fed.Reg. 8756-8757 (March 8, 1990); Compliance with Other Laws Manual, Vol.1, pp. 1-11 - 1-12

[7] Preamble to the Final NCP, 55 Fed.Reg. 8746 (March 8, 1990)

Directives; the Preamble to the Proposed NCP, 53 Fed.Reg. 51394 et seq. (December 21, 1988); the Preamble to the Final NCP, 55 Fed.Reg. 8666-8813 (March 8, 1990); and the final NCP, 40 CFR Part 300; other applicable guidances; and the substantive provisions of law discussed in this document.

FEDERAL ARARS

I. FEDERAL CONTAMINANT SPECIFIC REQUIREMENTS

A. Groundwater Standards - Safe Drinking Water Act (Relevant and Appropriate) [8]

The National Primary Drinking Water Standards (40 CFR Part 141), better known as maximum contaminant levels and maximum contaminant level goals (MCLs and MCLGs), are not applicable to the ground water aquifers within the Carpenter Snow Creek Mining District because the aquifer underlying the area is not a current public water system, as defined in the Safe Drinking Water Act, 42 U.S.C. § 300f(4). These standards are relevant and appropriate standards, however, because the groundwater in the alluvial aquifer is a potential source of drinking water, and is classified by the State of Montana as such.

Use of these standards for this action is fully supported by EPA regulations and guidance. The Preamble to the NCP clearly states that MCLs are relevant and appropriate for groundwater that is a current or potential source of drinking water (55 Fed.Reg. 8750, March 8, 1990), and this determination is further supported by requirements in the regulations governing conduct of the RI/FS studies found at 40 CFR § 300.430(e)(2)(i)(B). EPA's guidance on Remedial Action for Contaminated Groundwater at Superfund Sites states that "MCLs developed under the Safe Drinking Water Act generally are ARARs for current or potential drinking water sources." MCLGs which are above zero are relevant and appropriate under the same conditions (55 Fed.Reg. 8750-8752, March 8, 1990). See also, State of Ohio v. EPA, 997 F.2d 1520 (D.C. Cir. 1993), which upholds EPA's application of MCLs and non-zero MCLGs as ARAR standards for groundwater which is a potential drinking water source.

As noted earlier, standards such as the MCL and MCLG standards are promulgated pursuant to both federal and state law. Under the Safe Drinking Water Act, EPA has granted the State of Montana primacy in implementation of the Safe Drinking Water Act. The State has promulgated its own public water supply ground water standards through the Public Water Safety Act for most contaminants of concern, primarily through incorporation by reference of the federal standard. These standards are also identified here.

This document identifies MCL and MCLG-related ARARs for contaminants of concern that are known to exist at the Carpenter Snow Creek Mining District Site. As the site-wide remedial investigation and operable unit specific feasibility studies are developed and other contaminants

[8] 42 U.S.C. §§ 300f et seq.

of concern are added, similar ARARs for those contaminants will be identified.

Chemical	MCLG	MCL
Arsenic	NA	10 ug/l[9]
Cadmium	5 ug/l[10]	5 ug/l[11]
Copper	1300 ug/l[12]	1300 ug/l[13]
Lead	NA [14]	15 ug/l[15]
Mercury	2 ug/l16	2 ug/l17

These standards incorporate potentially relevant and appropriate Resource Conversation Act (RCRA) standards for groundwater found at 40 CFR Part 264, Subpart F, which is incorporated pursuant to state law at ARM17.53.801. The RCRA standards are the same or less stringent than the MCLs or MCLGs identified above.

If any repository is selected in the resulting ROD, it must be designed to ensure compliance with these standards at points of compliance established at or outside of the boundary of the repository.

B. Surface Water - Ambient and Point Source Discharges - Clean Water Act. (Applicable or Relevant and Appropriate)

Repository siting and construction, if that option is selected, will not directly impact surface water at the Carpenter Snow Creek Mining District Site, so contaminant specific ARARs in this category are not identified for this action. As noted earlier, contaminant specific surface water ARARs will be identified for the operable unit specific feasibility studies and RODs that will be produced later.

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[9] See 66 FR 6976 (January 22, 2001) and 66 FR 28341 - 28350 (May 22, 2001); 40 CFR § 141.11 and 40 CFR § 141.62.

[10] 40 CFR § 141.51

[11] 40 CFR § 141.62

[12] 40 CFR § 141.51

[13] 40 CFR § 141.80(c) The requirement is an action level rather than a simple numerical standard.

[14] The MCLG for lead is zero, which is not an appropriate standard for Superfund site cleanups.

[15] 40 CFR § 141.80(c). The requirement is an action level rather than a simple numerical standard.

16 40 CFR § 141.51

17 40 CFR § 141.62

C. Air Standards - Clean Air Act (Applicable)

If a repository location is selected in the resulting ROD, limitations on air emissions resulting from repository construction activities or emissions resulting from wind erosion of exposed hazardous substances as they are being placed in the repositories are set forth-in the action specific requirements, below.

II. FEDERAL LOCATION SPECIFIC REQUIREMENTS

A. Fish and Wildlife Coordination Act (Applicable)

These standards are found at 16 U.S.C. §§ 661 et seq. They require that federally funded or authorized projects ensure that any modification of any stream or other water body affected by a federally funded or authorized action provide for adequate protection of fish and wildlife resources. Because the repository(ies) will not affect streams or water bodies, this ARAR is not applicable to the repository siting and construction decision, if that action is selected.

B. Floodplain Management Order (Applicable)

This requirement (40 CFR Part 6,[18] Appendix A, Executive Order No. 11,988) mandates that federally funded or authorized actions within the 100 year floodplain avoid, to the maximum extent possible, adverse impacts associated with development of a floodplain. Compliance with this requirement is detailed in EPA's August 6, 1985 "Policy on Floodplains and Wetlands Assessments for CERCLA Actions." No repository location is located within a 100 year floodplain, so this ARAR will not implicated in this action, if a repository location is selected.

C. Protection of Wetlands Order (Applicable)

This requirement (40 CFR Part 6, Appendix A, Executive Order No. 11,990) mandates that federal agencies and potentially responsible parties (PRPs) avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists. Section 404(b)(1), 33 U.S.C. § 1344(b)(1), also prohibits the discharge of dredged or fill material into waters of the United States. Together, these requirements create a "no net loss" of wetlands standard.

If a repository selection is selected, the implementing party for any repository will document appropriately any existing wetland at a selected repository location, and will avoid, mitigate or replace any affected wetland accordingly.

D. The Endangered Species Act (Applicable)

This statute and implementing regulations (16 U.S.C. §§ 1531 - 1544, 50 CFR Part 402, and 40 CFR § 6.302(h)) require that any federal

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18 40 CFR Part 6 was revised and replaced at 72 Fed. Reg. 53652 (September 19, 2007), but the notice provides that Appendix A remains in full force and effect.

activity or federally authorized activity may not jeopardize the continued existence of any threatened or endangered species known to live or to have lived in the affected environment or destroy or adversely modify a critical habitat. There are listed species present at the Carpenter Snow Creek Mining District site, but, at this time, repository siting and construction are not likely to affect these species, if a repository location is selected in the resulting ROD. This ARAR will be more fully analyzed in future, operable unit-specific feasibility studies and ROD selections.

E. The National Historic Preservation Act (Applicable)

This statute and implementing regulations (16 U.S.C. § 470 et seq, 36 CFR Part 800) require federal agencies or federal projects to take into account the effect of any federally assisted undertaking or licensing on any district, site building, structure, or object that is included in, or eligible for, the Register of Historic Places. If effects cannot be avoided reasonably, measures should be implemented to minimize or mitigate the potential effect. In addition, Indian cultural and historical resources must be evaluated, and effects avoided, minimized, or mitigated.

EPA and the US Forest Service have documented listed or eligible historical resources in the Carpenter Snow Creek Mining District site. If a repository location is selected in the resulting ROD, and the construction of any selected repository effects listed or eligible historical resources, EPA will consult with the State Historical Preservation Officer and avoid, minimize or mitigate any effects.

F. Archaeological and Historic Preservation Act (Applicable)

The statute and implementing regulations (16 U.S.C. § 469 et seq.,) establish requirements for evaluation and preservation of historical and archaeological data, including Indian cultural and historic data, which may be destroyed through alteration of terrain as a result of federal construction projects or a federally licensed activity or program. If eligible scientific, prehistorical, or archaeological data are discovered during site activities, they must be preserved in accordance with these requirements. Such resources are not expected at the proposed repository locations for this action, if the resulting ROD selects a repository location.

G. Historic Sites, Buildings, and Antiquities Act (Applicable)

This statute and implementing regulations (16 U.S.C. § 461 et seq.) state that federal project officials shall consider the existence and location of natural landmarks using information provided by the National Park Service pursuant to 36 CFR § 62.6(d) to avoid undesirable impacts upon such landmarks. EPA will consult this information before proceeding with any on-site construction activities under the resulting ROD.

H. Migratory Bird Treaty (Applicable)

This requirement (16 U.S.C. §§ 703 et seq.) establishes a federal responsibility for the protection of the international migratory bird resource and requires continued consultation by EPA with the USFWS during remedial design and remedial construction to ensure that the cleanup of the site does not unnecessarily impact migratory birds. Specific mitigative measures may be identified by EPA for compliance with this requirement as appropriate for performance by the persons who implement the remedy.

I. Bald Eagle Protection Act (Applicable)

This requirement (16 U.S.C. §§ 668 et seq.) establishes a federal responsibility for protection of bald and golden eagles, and requires continued consultation by EPA with the USFWS during remedial design and remedial construction to ensure that any cleanup of the site does not unnecessarily adversely affect the bald and golden eagle. Specific mitigative measures may be identified by EPA for compliance with this requirement as appropriate, and will be done by the persons who implement any selected remedy.

J. Resource Conservation and Recovery Act (Relevant and Appropriate)

Any repository sites must comply with the siting restrictions and conditions at 40 CFR § 264.18 (a) and (b). These sections require management units to be designed, constructed, operated, and maintained to avoid washout, if they are within or near the current 100 year flood plain. If a repository location is selected in the resulting ROD, any repository design will consider and comply with these standards.

K. Native American Grave Protection and Repatriation Act, 25 U.S.C. § 3001; 43 CFR §§ 10.1 - 10.17 (Applicable or Relevant and Appropriate)

NAGPRA and its implementing regulations provide for the disposition of Native American remains and objects inadvertently discovered on federal or tribal lands after November, 1990. No federal or tribal lands are involved in the repository locations.

III. FEDERAL ACTION SPECIFIC REQUIREMENTS

A. Solid Waste (Applicable), Surface Mining Control and Reclamation (Relevant and Appropriate), and RCRA (Relevant and Appropriate) Requirements

The contamination at the Carpenter Snow Creek Mining District site is primarily mining waste from mines, mining mills or smelters. This waste is not RCRA hazardous waste unless it does not pass a TCLIP test, but certain RCRA requirements are relevant and appropriate. For any on-site active management (i.e., treatment, storage, disposal, grading, or in-situ treatment) or removal of tailings or mixed

tailings and soils contamination, the following requirements are ARARs.

1. Requirements described at 40 CFR §§ 257.3-1(a), 257.3-3, and 257.3-4, governing waste handling, storage, and disposal, including retention of the waste, in general[19].

2. For any selected repository, reclamation and closure regulations found at 30 CFR Parts 816 and 784, governing coal waste units and to a lesser extent, non-coal mining, are relevant and appropriate requirements[20].

3. RCRA regulations found at 40 CFR §§ 264.116 and .119 (governing notice and deed restrictions), 264.228(a)(2)(ii (addressing de-watering of wastes prior to disposal), and 264.228(a)(2)(iii)(B), (C), and (D) and .251(c), (d), and (f) (regarding run-on and run-off controls), are relevant and appropriate requirements for any repository selected in this action[21].

B. Air Standards - Clean Air Act (Applicable)

These standards, promulgated pursuant to section 109 of the Clean Air Act[22], are applicable to releases into the air from any transfer into or storage of waste at a selected repository prior to closure, if a repository location is selected in the resulting ROD.

1. Lead: No person shall cause or contribute to concentrations of lead in the ambient air which exceed 1.5 micrograms per cubic meter (ug/m) of air, measured over a 90-day average. These standards are promulgated at ARM § 17.8.222 as part of a federally approved State Implementation Plan (SIP), pursuant to the Clean Air Act of Montana, §§ 75-2-101 et seq. MCA. Corresponding federal regulations are found at 40 CFR § 50.12[23].

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[19] Solid waste regulations are promulgated pursuant to the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901 et seq. They are applicable regulations, although the State of Montana has the lead role in regulating solid waste disposal in the State of Montana, through incorporation in State regulations.

[20] The Surface Mining Control and Reclamation Act is promulgated at 30 U.S.C. §§1201 - 1326.

[21] As noted earlier, federal RCRA regulations are incorporated by reference into applicable State Hazardous Waste Management Act regulations. See ARM 17.53.801. Use of select RCRA regulations for mining waste cleanups is appropriate when discrete units are addressed by a cleanup and site conditions are distinguishable from EPA generic determination of low toxicity/high volume status for mining waste. See Preamble to the Final NCP, 55 Fed.Reg. 8763 - 8764 (March 8, 1990), CERCLA Compliance with Other Laws Manual, Volume II (August 1989 OSWER Directive #9234.1-02) p. 6-4; Preamble to the Proposed NCP, 53 Fed.Reg. 51447 (Dec. 21, 1988); and guidance entitled Consideration of RCRA Requirements in Performing CERCLA Responses at Mining Wastes Sites, August 19, 1986 (OSWER).

[22] 42 U.S.C. §§ 7401 et seq.

[23] Ambient air standards established as part of Montana=s approved State Implementation Plan in many cases provide more stringent or additional standards. The federal standards by themselves apply only to major sources, while the State standards are fully applicable throughout the state and are not limited to major sources. See ARM 17.8.205 and 17.8.212-.223. As part of an EPA approved State Implementation Plan, the state standards are also federally enforceable. Thus, the state standards which are equivalent to the federal standards are identified in this

2. Particulate matter that is 10 microns in diameter or smaller (PM-10): No person shall cause or contribute to concentrations of PM-10 in the ambient air which exceed:

- 150 ug/m3 of air, 24 hour average, no more than one expected exceedence per calendar year;
- 50 ug/m3 of air, annual average.

These regulations are promulgated at ARM 17.8.223 as part of a federally approved SIP, pursuant to the Clean Air Act of Montana, §§ 75-2-101 et seq. MCA. Corresponding federal regulations are found at 40 CFR § 50.6.

C. Point Source Controls - Clean Water Act (Applicable)

If a repository location is selected in the resulting ROD, there will be no point sources of pollutants to water bodies created at the repositories considered in this action.

D. Dredge and Fill Requirements (Applicable)

Regulations found at 40 CFR Part 230 address conditions or prohibitions against depositing dredge and fill material into water of the United States. If remediation activities would result in an activity subject to these regulations, they would be applicable. No water bodies or dredge and fill activities will occur at the repositories, if a repository location is selected in this action.

E. Underground Injection Control (Applicable)

If a repository location is selected in the resulting ROD, no underground injection control actions will occur in the siting or construction of the repositories in this action.

F. Transportation of Hazardous or Contaminated Waste (Relevant and Appropriate)

40 CFR Part 263 establishes regulations for the transportation of hazardous waste. These regulations would govern any on-site transportation of contaminated material. Any off-site transportation would be fully subject to applicable regulations and permitting. The implementing party will follow these regulations during transport of any materials on-site.

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section. A more detailed list of State standards, which include standards which are not duplicated in federal regulations, is contained in the State ARAR identification section.

STATE OF MONTANA ARARS

As provided by Section 121 of CERCLA, 42 U.S.C. § 9621, only those state standards that are more stringent than any federal standard and that have been identified by the state in a timely manner are appropriately included as ARARs. DEQ has identified some state standards that are potentially duplicative of federal standards to ensure their timely identification and consideration in the event that they are not identified or retained in the federal ARARs. Duplicative or less stringent standards will be deleted as appropriate when the final determination of ARARs is presented.

IV. MONTANA CONTAMINANT SPECIFIC REQUIREMENTS

A. Water Quality

2. Surface Water Quality Standards (Applicable)

Under the Montana Water Quality Act, §§ 75-5-101 et seq., MCA, the state has promulgated water quality standards to protect, maintain, and improve the quality and potability of the state's surface water for water supplies, wildlife, fish and aquatic life, agricultural, industry, recreation, and other beneficial uses. Tributaries to the Missouri River, such as Carpenter, Snow and Belt Creeks, are classified as B-1 streams pursuant to ARM 17.30.610.

As noted above, repositories which may be selected in this action will not impact surface water, so these ARARs do not apply to this specific action. Surface water ARARs will be considered fully in the operable unit specific feasibility studies and remedy selection processes for this site, including but not limited to ARM 17.30.623, 17.30.637, 17.30.705, and 17.38.203.

Applicable for both surface water and ground water, § 75-5-605, MCA, provides that it is unlawful to cause pollution as defined in 75-5-103 of any state waters or to place or cause to be placed any wastes where they will cause pollution of any state waters. Applicable for both surface water and ground water, § 75-5-303, MCA, states that existing uses of state waters and the level of water quality necessary to protect the uses must be maintained and protected. See also ARM 17.50.1110 for similar requirements regarding solid waste facilities. If a repository location is selected in the resulting ROD, any repository site selection and design under this action will ensure compliance with these ARARs.

Section 75-5-308, MCA, allows DEQ to grant short-term exemptions from the water quality standards or short-term use that exceeds the water quality standards for the purpose of allowing certain emergency environmental remediation activities. Such exemptions typically extend for a period of 30-60 days. However, any exemption must include conditions that minimize to the extent

possible the magnitude of the violation and the length of time the violation occurs. In addition, the conditions must maximize the protection of state waters by ensuring the maintenance of beneficial uses immediately after termination of the exemption. Water quality and quantity monitoring and reporting may also be included as conditions.

Montana Pollutant Discharge Elimination System (MPDES) - stormwater and other point sources.

As noted above, if repositories are selected in this action, their construction will not impact surface water, so these ARARs do not apply to this action as contaminant specific ARARs. Stormwater and point source water related ARARs will be considered fully in the operable unit specific feasibility studies and remedy selection processes for this site. Specific ARARs in this category are referenced in State action specific ARARs below.

2. Groundwater Water Standards

In addition to the standards set forth below, relevant and appropriate MCLs and MCLGs are included in the federal ARARs identified above.

a. Montana Maximum Contaminant Levels (relevant and appropriate)

Pursuant to the Public Water Supplies, Distribution and Treatment Act, §§ 75-6-101 et seq. MCA and ARM 17.38.203, the MCLs specified in 40 CFR Part 141 (Primary Drinking Water Standards) are incorporated by reference into State law. If a repository location is selected in the resulting ROD, any repository selected will be designed to meet these standards, for contaminants of concern that are disposed of in the repository, for points of compliance at or outside of the repository unit boundary. See also ARM 17.50.1204 which requires solid waste facilities to be designed to meet MCL standards.

b. Groundwater Quality Standards (Applicable)

State regulations found at ARM 17.30.1005 and 17.30.1006 classifies groundwater into Classes I through IV based upon its specific conductance, and establishes the groundwater quality standards applicable with respect to each groundwater classification. Based upon its specific conductance, the majority

of the groundwater in the aquifers at the Carpenter Snow Creek Mining District site is considered Class I.[24]

Concentrations of substances in Class I and Class II groundwater may not exceed the human health standards for groundwater listed in department Circular DEQ-7. For the primary chemicals of concern these levels are listed below.

For concentrations of parameters for which human health standards are not listed in Circular DEQ-7, ARM 17.30.1006 allows no increase of a parameter to a level that renders the waters harmful, detrimental or injurious to listed beneficial uses.

ARM 17.30.1006 (Applicable) establishes the groundwater quality standards applicable with respect to each groundwater classification. Concentrations of dissolved substances in Class I or II groundwater (or Class III groundwater which is used as a drinking water source) may not exceed the human health standards listed in department Circular DEQ-7. For the primary contaminants of concern these levels are listed below. Ground water is measured in dissolved form, according to WQB-7.

Chemical WQB-7 Human Health Standards for Groundwater

Arsenic	10 ug/1
Cadmium	5 ug/1
Copper	1300 ug/1
Lead	15 ug/1
Mercury	2 ug/l
Zinc	2000 ug/1

ARM 17.30.1011 provides that groundwater whose existing quality is higher than the standard for its classification must be maintained at that high quality unless degradation may be allowed under the principles established in § 75-5-303, MCA, and the nondegradation rules at ARM 17.30.701 et seq.

If a repository location is selected in the resulting ROD, any repository will be designed to meet these standards at points of compliance at or outside any repository boundary.

B. Air Quality

In addition to the standards identified in the federal action specific ARARs above, the State of Montana has identified certain

[24] ARM 17.30.1006 provides that Class I groundwaters are those with specific conductance of less than 1000 microSiemens per centimeter at 25_ C; Class II groundwaters: 1000 to 2500; Class III groundwaters: 2500 to 15,000; and Class IV groundwaters: over 15,000.

air quality standards in the action-specific section of the State ARARs below.

V. MONTANA LOCATION SPECIFIC REQUIREMENTS

A. Floodplain and Floodway Management Act and Regulations (Applicable)

The Floodplain and Floodway Management Act, §§ 76-5-401 et seq., and implanting regulations specify types of uses and structures that are allowed or prohibited in the designated 100-year floodway[25] and floodplain[26].

Because the repository locations for this action are not within or near 100-year floodplains, these standards are not applicable to this specific action, if a repository location is selected in this action.

B. Solid Waste Management Regulations (Applicable)

Regulations promulgated under the Solid Waste Management Act, §§ 75-10-201 et seq. MCA, specify requirements that apply to the location of any solid waste management facility. Under implementing regulations, a facility for the treatment, storage or disposal of solid wastes:

> (a) must be located where a sufficient acreage of suitable land is available for solid waste management; must have adequate separation from underlying groundwater or adjacent surface water; must be located so as to prevent pollution of ground, surface and private water supply systems; and must allow for reclamation of the land. (ARM 17.50.1009);
>
> (b) may not be located in a 100 year floodplain unless its location will not restrict flow of the 110-year flood and reduce the temporary water storage capacity of the floodplain or result in washout of solid waste that poses a threat; and may not be located in a wetland unless there is no demonstrable practicable alternative (ARM 17.50.1004 and 17.50.1005);

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[25] The floodway is the channel of a watercourse or drainway and those portions of the floodplain adjoining the channel which are reasonably required to carry and discharge the floodwater of the water course or drainway. ARM 36.15.101(13)

[26] The floodplain is the area adjoining the water course or drainway which would be covered by the floodwater of a base (110 year) flood except for sheet flood areas that receive less than one foot of water per occurrence. The floodplain consists of the floodway and flood fringe. ARM 36.15.101(11)

(c) must not be: located within 200 feet of a fault that has had displacement in Holocene time unless an alternative setback can be demonstrated to be protective; or located in a seismic impact zone unless demonstrated to be designed to resist the maximum horizontal acceleration in lithfield earth material for the site; or located in an unstable area unless demonstrated that the facility is designed to ensure that the integrity of the structural components will be not be disrupted (ARM 17.50.1006, 17.50.1007, and 17.50.1008).

Solid Waste landfills, including Class III landfills, must be located and constructed in a manner that does not allow the discharge of pollutants in excess of state standards for the protection of state waters, public water supply systems, or private water supply systems. Additional conditions may be necessary, to protect human health or the environment, for a facility in or near sensitive hydrogeological environments including, but not limited to, sole-source aquifers, wellhead protection areas, or gravel pits ARM 17.50.1009(c)).
In addition, § 75-10-212 prohibits dumping or leaving any debris or refuse upon or within 200 yards of any highway, road, street, or alley of the State or other public property, or on privately owned property where hunting, fishing, or other recreation is permitted. However, the restriction relating to privately owned property does not apply to the owner, his agents, or those disposing of debris or refuse with the owner's consent.

Any repository selected in this action can be designed to meet these standards.

C. Natural Streambed and Land Preservation Standards (Applicable)

Sections 87-5-502 and 504, MCA, (substantive provisions only) provide that a state agency or subdivision shall not construct, modify, operate, maintain or fail to maintain any construction project or hydraulic project which may or will obstruct, damage, diminish, destroy, change, modify, or alter the natural existing shape and form of any stream or its banks or tributaries in a manner that will adversely affect any fish or game habitat. Section 75-7-101 et seq. MCA and ARM 36.2.401 et seq. describe minimum standards for actions which effect streambeds. ARM 17.24.651 addresses similar requirements.

Because any repository selected in this action is not near a stream bank, this ARAR is not applicable to this action.

D. Montana Antiquities Act (Applicable on State-owned lands; Relevant and Appropriate elsewhere)

Section 22-3-421 et seq. MCA (substantive provisions only). Describes certain actions which must be taken if historic or prehistoric sites are found during excavation activities.

If these sites are discovered during construction of any repository, appropriate avoidance or documentation activities will be undertaken.

E. Montana Human Skeletal Remains and Burial Site Protection Act

Section 22-3-801 addresses requirements if graves are discovered. Graves are not anticipated at the on-site repository locations, but if a repository location is selected in the resulting ROD, and any graves are encountered, appropriate notification actions will be taken.

F. Montana Endangered Species and Wildlife Act (Applicable)

Sections 87-5-106, 107 and 111 MCA list endangered species and certain acts which are prohibited in areas where such species are found. Section 87-5-201 and ARM 12.5.201 describe prohibited activities around certain wild bird, nests, and eggs.

EPA and/or the implementing party will continue to coordinate with the State Fish, Wildlife and Parks Department regarding compliance with substantive provisions of this act.

VI. MONTANA ACTION SPECIFIC REQUIREMENTS

A. Water Quality Statute and Regulations (Applicable):

Causing of pollution: Section 75-5-605 of the Montana Water Quality Act prohibits the causing of pollution of any state waters. Pollution is defined as contamination or other alteration of physical, chemical, or biological properties of state waters which exceeds that permitted by the water quality standards.

Placement of Wastes: Section 75-5-605, MCA states that it is unlawful to place or caused to be placed any wastes where they will cause pollution of any state waters. Placement of waste is not prohibited if the authorization for placement contains provisions for review of the placement of materials to ensure it will not cause pollution to state waters.

Any on-site repository selected in this action will be located and designed in a manner to comply with this ARAR.

If a repository location is selected in this action, other action specific ARARs under these statute and regulations are not implicated in this action, since the repository locations will not be near surface water. These provisions will be analyzed more fully in operable unit specific feasibility studies.

B. Montana Pollutant Discharge Elimination System (MPDES)-stormwater and other point sources.

ARM 17.30.1342 - 1344 set forth the substantive requirements applicable to all MPDES permits. The substantive requirements, including the requirement to properly operate and maintain all facilities and systems of treatment and control are applicable requirements.

Under ARM 17.30.601 et seq., and ARM 17.30.1301 et seq., including ARM 17.30.1341, the Water Quality Division has issued general stormwater permits for certain activities. Generally, the permits require the permittee to implement Best Management Practices (BMP) and to take all reasonable steps to minimize or prevent any discharge which has a reasonable likelihood of adversely affecting human health or the environment. However, if there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with the activity, an individual Montana Pollutant Discharge Elimination System (MPDES) permit or alternative general permit may be required.

The substantive requirements of the following permits are applicable for the following activities:

For construction activities: General Permit for Storm Water Discharge Associated with Construction Activity, Permit No. MTR 100000 (April 16, 2007);

For mining activities: General Discharge Permit for Storm Water Associated with Mining and with Oil and Gas Activities, Permit No. MTR300000 (November 17, 2002)[27];

For industrial activities: General Permit for Storm Water Discharge Associated with Industrial Activity, Permit No. MTR000000 (October 1, 2006).

Generally, the permits require the permittee to implement Best Management Practices (BMP) and to take all reasonable steps to minimize or prevent any discharge which has a reasonable likelihood of adversely affecting human health or the

[27] This permit covers point source discharges of storm water from mining and milling activities (including active, inactive, and abandoned mine and mill sites) including activities with Standard Industrial Code 14 (metal mining).

environment. However, if there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with the activity, an individual MPDES permit or alternative general permit may be required. On-site CERCLA activities are not required to obtain permits however.

A related mine reclamation requirement is set out in ARM 17.24.633 (relevant and appropriate), which requires that all surface drainage from disturbed areas that have been graded, seeded or planted must be treated by the best technology currently available (BTCA) before discharge. Sediment control through BTCA practices must be maintained until the disturbed area has been reclaimed, the revegetation requirements have been met, and the area meets state and federal requirements for the receiving stream.

If a repository location is selected in this action, repository construction will be implemented with appropriate stormwater runoff BMPs employed, in compliance with this ARAR.

C. Air Quality

Air Quality Regulations (Applicable)

Dust suppression and control of certain substances likely to be released into the air as a result of earth moving, transportation and similar actions related to response activities which move material into the selected repository or as the repository is constructed at the Carpenter Snow Creek Mining District may be necessary to meet air quality requirements. Certain ambient air standards for specific contaminants and particulates are set forth in the federal action specific section above. Additional air quality regulations under the state Clean Air Act, §§ 75-2-101 et seq., MCA, are discussed below.

ARM 17.8.220 Settled particulate matter shall not exceed a thirty (30) day average of 10 grams per square meter.

ARM 17.8.304(2) (Applicable) requires that actions not cause emissions into the outdoor atmosphere of 20% or greater averaged over 6 consecutive minutes.

ARM 17.8.604 (Applicable) lists certain wastes that may not be disposed of by open burning, including oil or petroleum products, RCRA hazardous wastes, chemicals, and treated lumber and timbers. Any waste which is moved from the premises where it was generated and any trade waste (material resulting from construction or operation of any business, trade, industry or demolition project) may be open burned only in accordance with the substantive requirements of 17.8.611 or 612. Waste removed and placed in the

repositories will not be burned. If grubbing debris is burned, this ARAR will be complied with.

ARM 17.8.308 (Applicable) provides that no person shall cause or authorize the production, handling, transportation or storage of any material; or cause or authorize the use of any street, road, or parking lot; or operate a construction site or demolition project, unless reasonable precautions to control emissions of airborne particulate matter are taken. Normally, emissions of airborne particulate matter must be controlled so that they do not "exhibit an opacity of twenty percent (20%) or greater averaged over six consecutive minutes." (Applicable).

In addition, state law provides an ambient air quality standard for settled particulate matter. Particulate matter concentrations in the ambient air shall not exceed the annual average scattering coefficient of particulate matter of 3 x 10-5 per square meter. ARM 17.8.221 (Applicable). Whenever this standard is exceeded, the activity resulting in such exceedance shall be suspended until such time as conditions improve.

ARM 17.24.761 (Relevant and Appropriate) specifies a range of measures for controlling fugitive dust emissions during mining and reclamation activities. Some of these measures could be considered relevant and appropriate to control fugitive dust emissions in connection with excavation, earth moving and transportation activities conducted as part of the remedy at the site. Such measures include, for example, paving, watering, chemically stabilizing, or frequently compacting and scraping roads, promptly removing rock, soil or other dust-forming debris from roads, restricting vehicle speeds, revegetating, mulching, or otherwise stabilizing the surface of areas adjoining roads, restricting unauthorized vehicle travel, minimizing the area of disturbed land, and promptly revegetating regraded lands.

Monitoring protocols for air data are set forth in ARM 17.8.206. Any air quality monitoring during excavation and placement activities will be done in general accordance with these provisions.

D. Solid Waste Management Regulations (Applicable)

As noted above, the Solid Waste Management Regulations are applicable to the disposal or active management of the tailings and similar wastes within the Carpenter Snow Creek Mining District. Certain of these regulations are identified in the state location specific ARARs above. Action specific solid waste regulations are discussed below:

ARM 17.50.501 et seq. provides uniform standards governing the storage, treatment, recycling, recovery, and disposal of solid waste, including the requirements that:

1. Class II[28] landfills must confine solid waste and leachate to the disposal facility. If there is the potential for leachate[29] migration, it must be demonstrated that leachate will only migrate to underlying formations which have no hydraulic continuity with any state waters;

2. adequate separation of group II wastes from underlying or adjacent water must be provided[30]; and

3. no new disposal units or lateral expansions may be located in wetlands.

ARM 17.50.1204 specifies design requirements for landfills[31]. Landfills must either be designed to ensure that MCLs are not exceeded or the landfill must contain a composite liner and leachate collection system which comply with specified criteria.

ARM 17.50.1101 et seq. sets forth general operational and maintenance and design requirements for solid waste management systems. ARM 17.50.1108 requires that the owner or operator of a Class II landfill to use barriers to control public access. ARM 17.50.1109 requires a run-on control system to prevent flow onto the active portion of the Class II landfill during the peak discharge from a 25-year storm and a run-off control system from the active portion of the Class II landfill to collect and control at least the water volume result from a 24-hour, 25-year storm.

ARM 17.50.1111 prohibits the placement of bulk or noncontainerized liquid waste into a Class II landfill, unless the waste is household waste other than septic waste or the waste is leachate or gas condensate derived from the Class II landfill

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[28] Generally Class II landfills are licensed to receive Group II, Group III, and Group IV waste, but not regulated hazardous waste. Class III landfills may only receive Group III waste. ARM 17.50.504.

[29] Leachate is defined as a liquid which has contacted passed through, or emerged from solid waste and contains soluble, suspended, or miscible materials removed from the waste. ARM 17.50.502(19).

[30] The extent of separation shall be established on a case-by-case basis, considering terrain and the type of underlying soil formations, and facility design. The Waste Management Section of DEQ has generally construed this to require a 10 to 20 foot separation from groundwater.

[31] Landfills are defined as an area of land or an excavation where wastes are placed for permanent disposal, and is not a land application unit, surface impoundment, injection well, or waste pile. ARM 17.50.502(27).

unit, and the Class II landfill unit is designed with a composite liner and leachate collection and removal system as described in ARM 17.30.1204(1)(b).

Specific operational and maintenance requirements specified in ARM 17.50.1116 that are relevant and appropriate are requirements for run-on and runoff control systems, requirements that sites be fenced to prevent unauthorized access, prohibitions of point source and nonpoint source discharges which would violate Clean Water Act requirements.

ARM 17.50.523 specifies that solid waste must be transported in such a manner as to prevent its discharge, dumping, spilling or leaking from the transport vehicle.

ARM 17.50.1403 sets forth the closure[32] requirements for landfills. Class II landfills must meet the following criteria:

1. install a cover that is designed to minimize infiltration and erosion;

2. design and construct the final cover system to minimize infiltration through the closed unit by the use of an infiltration layer that contains a minimum 18 inches of earthen material and has a permeability less than or equal to the permeability of any bottom liner, barrier layer, or natural subsoils or a permeability no greater than 1 X 10-5 cm/sec, whichever is less;

3. minimize erosion of the final cover by the use of a seed bed layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth and protecting the infiltration layer from frost effects and rooting damage; and

4. revegetate the final cover with native plant growth within one year of placement of the final cover.

ARM 17.50.1403 allows an alternative final cover design if the infiltration layer achieves reduction in infiltration at least equivalent to the stated criteria and the erosion layer provides protection equivalent to the stated criteria.

ARM 17.50.1404 sets forth post closure care requirements for Class II landfills. Post closure care must be conducted for a period sufficient to protect human health and the environment. Post closure care requires maintenance of the integrity and effectiveness of any final cover, including making repairs to the

[32] Closure means the process by which the operator closes all or part of the facility. ARM 17.50.502.

cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the cover and comply with the groundwater monitoring requirements found at ARM Title 17, chapter 50, subchapter 13.

Section 75-10-206, MCA, allows variances to be granted from solid waste regulations if failure to comply with the rules does not result in a danger to public health or safety or compliance with specific rules would produce hardship without producing benefits to the health and safety of the public that outweigh the hardship. In certain circumstances relating to waste nature and volume and the provisions of the Superfund law regarding ongoing maintenance and review, certain of the Solid Waste regulations regarding design of landfills, operational and maintenance requirements, and landfill closure and post-closure care may appropriately be subject to variance for the Carpenter Snow Creek Mining District. For example, the barrier layer and leachate collection and removal system requirements of ARM 17.50.1111 and ARM 17.50.1204(1)(b) for a Class II landfill may be subject to variance as long as the design ensures that concentration values listed in Table 1, ARM 17.50.1204, will not be exceeded in the uppermost aquifer at the relevant point of compliance. Similarly, the ground water monitoring requirements of ARM 17.50.1301 et seq. can be considered and coordinated with any other monitoring requirements under CERCLA.

E. Reclamation Requirements

The Strip and Underground Mine Reclamation Act, §§ 82-4-201 through 254, MCA, technically applies to coal and uranium mining, but that statute and the regulations promulgated under that statue and discussed in this section set out the standards that mine reclamation should attain. Those requirements identified here have been determined to be relevant and appropriate requirements for this action, in terms of how a repository would be closed after waste placement in it is complete. Section 82-4-231 (Relevant and Appropriate) requires the reclamation and revegetation of the land as rapidly, completely, and effectively as the most modern technology and the most advanced state of the art will allow. In developing a method of operation and plans of backfilling, water control, grading, topsoiling and reclamation, all measures shall be taken to eliminate damages to landowners and members of the public, their real and personal property, public roads, streams, and all other public property from soil erosion, subsidence, landslides, water pollution, and hazards dangerous to life and property. Sections 82-4-231(10)(j) and (10)(k)(i) and ARM 17.24.751 (Relevant and Appropriate) provide that reclamation of mine waste materials shall, to the extent possible using the best technology currently available, minimize disturbances and adverse impacts of the operation on fish,

wildlife, and related environmental values and achieve enhancement of such resources where practicable, and shall avoid acid or other toxic mine drainage by such measures as preventing or removing water from contact with toxic producing deposits. ARM 17.24.641 (Relevant and Appropriate) also provides that drainage from acid forming or toxic-forming spoil into ground and surface water must be avoided by preventing water from coming into contact with such spoil. ARM 17.24.505 (Relevant and Appropriate) similarly provides that acid, acid forming, toxic, toxic-forming or other deleterious materials must not be buried or stored in proximity to a drainage course so as to cause or pose a threat of water pollution.

Section 82-4-336 requires disturbed areas reclaimed to stability and utility comparable to adjacent areas.
Reclamation Activities - Hydrology Regulations (Relevant and Appropriate)

The hydrology regulations promulgated under the Strip and Underground Mine Reclamation Act, §§82-4-201 et seq., MCA, provide detailed guidelines for addressing the hydrologic impacts of mine reclamation activities and earth-moving projects and are relevant and appropriate for addressing these impacts in any repository selected in this action. Specific ARAR requirements in this category are described below.

ARM 17.24.631 (Relevant and Appropriate) provides that long-term adverse changes in the hydrologic balance from mining and reclamation activities, such as changes in water quality and quantity, and location of surface water drainage channels shall be minimized. Water pollution must be minimized and, where necessary, treatment methods utilized. Diversions of drainage to avoid contamination must be used in preference to the use of water treatment facilities. Other pollution minimization devices must be used if appropriate, including stabilizing disturbed areas through land shaping, diverting runoff, planting quickly germinating and growing stands of temporary vegetation, regulating channel velocity of water, lining drainage channels with rock or vegetation, mulching, and control of acid-forming, and toxic-forming waste materials.

ARM 17.24.633 (Relevant and Appropriate) provides water quality performance standards that may be invoked in the event that runoff from the treated areas threatens water quality or sediments in the stream, including the requirement that all surface drainage from a disturbed area must be treated by the best technology currently available (BTCA). Treatment must continue until the area is stabilized.

ARM 17.24.634 (Relevant and Appropriate) provides that, in reclamation of drainage, drainage design must emphasize channel

and floodplain dimensions that approximate the postmining topography map and approximate original contour, and that will blend with the undisturbed drainage above and below the area to be reclaimed. The average stream gradient must be maintained with a concave longitudinal profile. This regulation provides specific requirements for designing the reclaimed drainage to:

1. approximate an appropriate geomorphic habit or characteristic pattern;
2. remain in dynamic equilibrium with the system without the use of artificial structural controls;
3. improve unstable premining conditions;
4. provide for floods and for the long-term stability of the landscape; and
5. Establish or restore a diversity of habitats that are consistent with the approved postmining land use, and restore, enhance where practicable, or maintain natural riparian vegetation as necessary to comply with ARM subchapter 7.

ARM 17.24.635 through 26.4.637 (Relevant and Appropriate) set forth requirements for temporary and permanent diversions.

ARM 17.24.638 (Relevant and Appropriate) specifies sediment control measures to be implemented during operations.

ARM 17.24.639 (Relevant and Appropriate) sets forth requirements for temporary and permanent sedimentation ponds.

ARM 17.24.640 (Relevant and Appropriate) provides that discharge from sedimentation ponds, permanent and temporary impoundments, and diversions shall be controlled by energy dissipaters, riprap channels, and other devices, where necessary, to reduce erosion, prevent deepening or enlargement of stream channels, and to minimize disturbance of the hydrologic balance.

ARM 17.24.643 (Relevant and Appropriate) requires protection of groundwater resources.

ARM 17.24.645 (Relevant and Appropriate) sets forth requirements for groundwater monitoring. Any monitoring requirements would be done as part of a final operation and maintenance plan for a selected repository.

ARM 17.24.646 (Relevant and Appropriate) sets forth requirements for surface water monitoring. Any monitoring requirements would be done as part of a final operation and maintenance plan for a selected repository.

ARM 17.24.650 addresses the need to reclaim and renovate all permanent sedimentation, ponds, diversions, impoundments and treatment facilities created during cleanup activities.

Reclamation and Revegetation Requirements (Relevant and Appropriate)

ARM 17.24.501 (Relevant and Appropriate) gives general backfilling and final grading requirements. Backfill must be placed so as to minimize sedimentation, erosion, and leaching of acid or toxic materials into waters, unless otherwise approved. Final grading must be to the approximate original contour of the land and final slopes must be graded to prevent slope failure, may not exceed the angle of repose, and must achieve a minimum long term static safety factor of 1:3. The disturbed area must be blended with surrounding and undisturbed ground to provide a smooth transition in topography.

ARM 17.24.504 provides that permanent impoundments may be retained under certain circumstances.

ARM 17.24.519 (Relevant and Appropriate) provides that an operator may be required to monitor settling of regraded areas.

ARM 17.24.520 allows spoil materials to be disposed of on-site with certain siting, surface runoff, underdrain and revegetation requirements.

ARM 17.24.702(4), (5), (6), and (7) (Relevant and Appropriate) requires that during the redistributing and stockpiling of soil (for reclamation):

1. regraded areas must be deep-tilled, subsoiled, or otherwise treated to eliminate any possible slippage potential, to relieve compaction, and to promote root penetration and permeability of the underlying layer; this preparation must be done on the contour whenever possible and to a minimum depth of 12 inches;

2. redistribution must be done in a manner that achieves approximate uniform thicknesses consistent with soil resource availability and appropriate for the postmining vegetation., land uses, contours, and surface water drainage systems; and

3. redistributed soil must be reconditioned by subsoiling or other appropriate methods.

ARM 17.24.703 (Relevant and Appropriate) requires that when using materials other than, or along with, soil for final surfacing in reclamation, the operator must demonstrate that the material (1) is at least as capable as the soil of supporting the approved vegetation and subsequent land use, and (2) the medium must be the best available in the area to support vegetation. Such substitutes must be used in a manner consistent with the requirements for redistribution of soil in ARM 17.24.701 and 702.

ARM 17.24.711 (Relevant and Appropriate) requires that a diverse, effective, and permanent vegetative cover of the same seasonal variety native to the area of land to be affected shall be established except on road surfaces and below the low-water line of permanent impoundments. See also § 82-4-233, MCA (Relevant and Appropriate). Vegetative cover is considered of the same seasonal variety if it consists of a mixture of species of equal or superior utility when compared with the natural vegetation during each season of the year (See also ARM 17.24.716 and 719 below regarding substitution of introduced species for native-species). This requirement may not be appropriate where other cover is more suitable for the particular land use or another cover is requested by the landowner.

ARM 17.24.713 (Relevant and Appropriate) provides that seeding and planting of disturbed areas must be conducted during the first appropriate period for favorable planting after final seedbed preparation.

ARM 17.24.714 (Relevant and Appropriate) requires use of a mulch or cover crop or both until an adequate permanent cover can be established. Use of mulching and temporary cover may be suspended under certain conditions.

ARM 17.24.716 (Relevant and Appropriate) establishes the required method of revegetation, and provides that introduced species may be substituted for native species as part of an approved plan.

ARM 17.24.717 (Relevant and Appropriate) relates to the planting of trees and other woody species if necessary, as provided in § 82-4-233, MCA, to establish a diverse, effective, and permanent vegetative cover of the same seasonal variety native to the affected area and capable of self-regeneration and plant succession at least equal to the natural vegetation of the area, except that introduced species may be used in the revegetation process where desirable and necessary to achieve the approved land use plan.

ARM 17.24.718 (Relevant and Appropriate) requires the use of soil amendments and other means such as irrigation, management, fencing, or other measures, if necessary to establish a diverse and permanent vegetative cover.

ARM 17.24.721 (Relevant and Appropriate) specifies that rills or gullies in reclaimed areas must be filled, graded or otherwise stabilized and the area reseeded or replanted if the rills and gullies are disrupting the reestablishment of the vegetative cover or causing or contributing to a violation of water quality standards for a receiving stream.

ARM 17.24.723 (Relevant and Appropriate) sets forth requirements for vegetation, soils, wildlife, and other monitoring.

ARM 17.24.724 (Relevant and Appropriate) specifies that revegetation success must be measured against approved unmined reference areas or by comparison with technical standards from historic data. More than one reference area or historic record must be established for vegetation types with significant variation due to a number of factors.

ARM 17.24.726 (Relevant and Appropriate) sets forth vegetation production, cover, diversity, density, and utility requirements.

Noxious Weeds

Section 7-22-2101(8)(a) and ARM 4.5.201 *et seq.* require the control and/or avoidance of certain plants classified as noxious weeds during revegetation and monitoring activities.

TO BE CONSIDERED DOCUMENTS (TBCS)

The use of documents identified as TBCs is addressed in the Introduction, above. A list of TBC documents is included in the Preamble to the NCP, 55 Fed. Reg. 8765 (March 8, 1990). Those documents, plus any additional similar or related documents issued since that time, will be considered by EPA and DEQ during the conduct of the Carpenter Snow Creek Mining District repository RI/FS, during remedy selection, and during remedy implementation.

OTHER LAWS (NON-EXCLUSIVE LIST)

CERCLA defines as ARARs only federal environmental and state environmental and siting laws. Remedial design, implementation, and operation and maintenance must nevertheless comply with all other applicable laws, both state and federal, if the remediation work is done by parties other than the federal government or its contractors.

The following "other laws" are included here to provide a reminder of other legally applicable requirements for actions being conducted at the Carpenter Snow Creek Mining District. They

do not purport to be an exhaustive list of such legal requirements, but are included because they set out related concerns that must be addressed and, in some cases, may require some advance planning. They are not included as ARARs because they are not "environmental or facility siting laws." As applicable laws other than ARARs, they are not subject to ARAR waiver provisions.

Section 121(e) of CERCLA exempts removal or remedial actions conducted entirely on-site from federal, state, or local permits. This exemption is not limited to environmental or facility siting laws, but applies to other permit requirements as well.

Other Federal Laws

Occupational Safety and Health Regulations

The federal Occupational Safety and Health Act regulations found at 29 CFR § 1910 are applicable to worker protection during conduct of RI/FS or remedial activities.

Other Montana Laws

1. Groundwater Act

Section 85-2-505, MCA, (Applicable) precludes the wasting of groundwater. Any well producing waters that contaminate other waters must be plugged or capped, and wells must be constructed and maintained so as to prevent waste, contamination, or pollution of groundwater.

Section 85-2-516, MCA, states that within 60 days after any well is completed a well log report must be filed by the driller with the DNRC and the appropriate county clerk and recorder.

2. Public Water Supply Regulations

If remedial action at the site requires any reconstruction or modification of any public water supply line or sewer line, the construction standards specified in ARM 17.38.101 (Applicable) must be observed. This is not expected at the repository locations in question.

3. Water Rights

Sections 85-2-101 et seq. addresses water rights possession. The location and construction of a repository under this action is not expected to have any effect on water rights as defined by State law.

4. Occupational Health Act, §§ 50-70-101 et seq., MCA.

ARM § 17.74.101 addresses occupational noise. In accordance with this section, no worker shall be exposed to noise levels in excess of the levels specified in this regulation. This regulation is applicable only to limited categories of workers and for most workers the similar federal standard in 29 CFR 1910.95 applies.

ARM § 17.74.102 addresses occupational air contaminants. The purpose of this rule is to establish maximum threshold limit values for air contaminants under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. In accordance with this rule, no worker shall be exposed to air contaminant levels in excess of the threshold limit values listed in the regulation. This regulation is applicable only to limited categories of workers and for most workers the similar federal standard in 29 CFR § 1910.1000 applies.

6. Montana Safety Act

Sections 50-71-201, 202 and 203, MCA, state that every employer must provide and maintain a safe place of employment, provide and require use of safety devices and safeguards, and ensure that operations and processes are reasonably adequate to render the place of employment safe. The employer must also do every other thing reasonably necessary to protect the life and safety of its employees. Employees are prohibited from refusing to use or interfering with the use of safety devices.

7. Employee and Community Hazardous Chemical Information

Sections 50-78-201, 202, and 204, MCA, state that each employer must post notice of employee rights, maintain at the work place a list of chemical names of each chemical in the work place, and indicate the work area where the chemical is stored or used. Employees must be informed of the chemicals at the work place and trained in the proper handling of the chemicals.