ACTION MEMORANDUM

COMO BASIN/GLENGARRY ADIT/FISHER CREEK
RESPONSE ACTION
NEW WORLD MINING DISTRICT
RESPONSE AND RESTORATION PROJECT

Gallatin National Forest - Gardiner Ranger District
Park County, Montana

December 2002

ACTION MEMORANDUM

Date: December 25, 2002

Subject: Request for Removal Action
New World Mining District Response and Restoration Project
Gallatin and Custer National Forests

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To: Regional Forester

Through: Ken Britton, District Ranger, Gardiner Ranger District
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I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of the proposed non-time-critical Response Action described herein for the Como Basin, Glengarry Adit, and remaining mine dumps in the Fisher Creek drainage, which are historic mining disturbances included in the New World Mining District Response and Restoration Project. The project sites are located in Park County, Montana. The Como Basin, Glengarry Adit, and remaining dumps in Fisher Creek are sources of metals contaminants that degrade water quality in the headwaters of Fisher Creek, which drains into the Clarks Fork of the Yellowstone River. The discussion provided in this memorandum will substantiate the need for a Response Action at the three sites, identify the proposed action, and explain the rationale for the proposed action.

The scope of this Response Action is directed at eliminating or reducing uncontrolled releases of metals from these three remaining mining-related sources in Fisher Creek. Mine waste at the Fisher Creek dump sites, including the largest dumps at the Glengarry and Gold Dust adits, consists of about 16,840 cubic meters of waste rock over an area of 2.9 hectares (7.1 acres). Disturbed soils in the Como Basin encompass about 2.2 hectares (5.5 acres) that were primarily disturbed for the construction of exploration drilling roads. The Glengarry Adit discharges an average of 140 liters per minute (37 gallons per minute) of metals-tainted water directly into Fisher Creek.

The Como Basin/Glengarry Adit/Fisher Creek Response Action will be executed by following the non-time-critical removal action process as defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; 42 USC 9604) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR Part 300). Response actions -- as explained in the U.S. Environmental Protection Agency's (EPA) *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* -- are implemented to respond to "the cleanup or removal of released hazardous substances from the environment … as may be

necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment…" (EPA, 1993).

This is the third Response Action proposed for this multi-year project. An Overall Project Work Plan prepared for the project (Maxim, 1999a), and work plans prepared annually (Maxim, 2002a; 2001; 2000; 1999b) describe in detail the process for prioritizing sites and the overall schedule for cleanup of historic mining wastes present in the District. A Draft Engineering Evaluation/Cost Analysis (EE/CA) was prepared to develop various alternatives that address impacts associated with hazardous substances present in the headwaters of Fisher Creek (Maxim, 2002b). The EE/CA provides the details and basis for the proposed Response Action. The Final EE/CA, which is an abbreviated summary of the engineering analysis and contains responses to comments received on the Draft EE/CA, is attached to this memorandum as a supporting document. The more complete Draft EE/CA is available at three document repositories in Cooke City, Bozeman, and Gardiner, and on the project website at **http://www.fs.fed.us/r1/gallatin.**

II: SITE CONDITIONS AND BACKGROUND

A. Site Description

The primary environmental issues within the New World Mining District (District) are associated with impacts from historic and recent gold, silver, copper, and lead mining activities that were initiated with minerals prospecting in the area in about 1869. Mining disturbances are primarily situated on National Forest System lands. Human health and environmental issues are related to elevated levels of heavy metal contaminants present in mine waste dumps, metals-rich soils, acid mine discharges, and in-stream sediments. Mine waste has been subject to erosion and leaching of contaminants, and perennial acid mine discharges directly impact water quality in the District.

A Consent Decree negotiated with the former owner of the mining interests in the District provides the terms and funding for cleanup efforts. For cleanup purposes, there are two categories of properties in the District: District Property and non-District Property. District Property is defined as including all property or interests in property that Crown Butte Mining, Inc. (CBMI) relinquished to the United States under the terms and conditions of a Settlement Agreement and Consent Decree entered by the United States District Court for the District of Montana in 1998. Non-District Property includes private land and other federal lands within the project boundary. Mining wastes present on District Property must first be addressed before cleanup of mining wastes on non-District Property can proceed. The three source areas included in the proposed Response Action are located on District Property.

1. Removal Site Evaluation

In 1996, the EPA began a site investigation of mining impacts in the District, which was performed by URS Operating Systems (UOS). The EPA investigation involved installing monitoring wells, surface water sampling, groundwater monitoring, and completing a groundwater tracer study. The results of these studies were published in a technical report (UOS, 1998) that included the following: a review of all previous surface water and groundwater data

collected by the Montana Department of Natural Resources and Conservation, USDA Forest Service, CBMI, EPA, and UOS; an evaluation of the data collected during the 1996, 1997, and 1998 field seasons; and an overall evaluation of the complete data set with respect to restoration and reclamation of the historic abandoned mining operations. Site investigation data adequately document impacts to human health and the environment associated with historic mining.

2. Physical Location

The New World Mining District falls within the boundaries of the Gallatin and the Custer National Forests and abuts Yellowstone National Park's northeast corner. The Absaroka-Beartooth Wilderness Area bounds the District to the north and east. To the south of the District is the Montana-Wyoming state line. The District lies entirely within Park County, Montana.

The communities of Cooke City and Silver Gate, Montana are the only population centers near the District. The neighboring communities of Mammoth, Wyoming and Gardiner, Montana are located about 80 kilometers (50 miles) to the west. Red Lodge, Montana is about 105 kilometers (65 miles) to the northeast, via the Beartooth Highway, and Cody, Wyoming is located 100 kilometers (60 miles) to the southeast. Only two routes of travel are open on a year-round basis to the District: the Chief Joseph Highway, which allows access to within a few miles of the District in the wintertime, and the highway between Mammoth and Cooke City. The Beartooth Highway is closed during the winter.

The District is situated at the headwaters of three river systems, which all eventually flow into the Yellowstone River. The three tributary rivers are the Clarks Fork of the Yellowstone, the Stillwater, and the Lamar. The Lamar River flows through Yellowstone Park. The major tributary streams in the District include Daisy, Miller, Fisher, Goose, Sheep, Lady of the Lake, Republic, Woody, and Soda Butte creeks.

3. Site Characteristics

The District is located at an elevation that ranges from 2,400 meters (7,900 feet) to over 3,200 meters (10,400 feet) above sea level and covers an area of about 100 square kilometers (40 square miles). The topography of the District is mountainous, with the dominant topographic features created by glaciation. The stream valleys are U-shaped and broad while the ridges are steep, rock-covered, and narrow. Much of the District is located at or near tree line, especially where the major mining disturbances are located. The site is snow-covered for much of the year.

The three project sites included in the proposed Response Action are considered source areas for metals contaminants and are referred to as the Como Basin Source Area, Fisher Creek Source Area, and Glengarry Adit Source Area. The Como Basin and Fisher Creek source areas are similar in that they both contain metal-rich soils and/or waste rock deposits as a principal source of sulfide-bearing material that is oxidized to form an acidic, metal-laden leachate, which in turn is mobilized and impacts the quality of surface water and groundwater. The Glengarry Adit Source Area includes underground mine workings that collect contaminated water flows from four principal areas that combine and flow through the mine, discharging contaminated surface water into the upper Fisher Creek watershed.

The Como Basin and Fisher Creek source areas differ in scale in that the Como Basin Source Area is a large area (2.23 hectares) that contains disturbed and metal-rich soils (as much as 190,174 cubic meters) in contact with an underlying massive sulfide mineral deposit. The Como Basin Source Area also includes portions of the Lulu Pass Road as it climbs northward from the Glengarry Adit through the Como Basin and a side road that accesses a former waste rock dump from this road. This portion of the road exhibits severe erosion problems that expose mineralized soil and rock. The Fisher Creek Source Area contains numerous small, scattered waste rock piles in the Fisher Creek drainage and other small, but locally severe erosional problems. Total volume of waste rock in the Fisher Creek Source Area is estimated to be 16,840 cubic meters scattered over a combined area of about 2.9 hectares (7.1 acres).

Metals loading investigations by Kimball and others (1999) and Amacher (1998) indicate that four distinct surface water flows in the upper 500 meters of Fisher Creek supply the majority of the contaminant load to Fisher Creek. The four surface water sources are:

- Outflow from the Glengarry Adit
- A tributary draining the northeastern flank of Fisher Mountain
- A tributary draining the Como Basin
- Seepage from the Glengarry Adit waste rock dump

There is considerable temporal variation in the relative contribution of these four major surface water flows from snowmelt to base-flow conditions. In late April and early May, under base-flow conditions, the Glengarry Adit accounts for most of the dissolved copper load to upper Fisher Creek. As snowmelt begins in May and proceeds into July, runoff from Fisher Mountain and Como Basin account for most of the dissolved copper load. In the fall, the Glengarry Adit again accounts for majority of the copper load. On an annual basis, these four sources of flow contribute about 65 to 70% of the total copper load in Fisher Creek when measured at a point just downstream of the Glengarry Adit.

As water flows down Fisher Creek, less acidic surface and groundwater with more alkalinity enters Fisher Creek and changes the chemistry of the water, raising the pH and diluting metal concentrations. As a result, settling of colloidal metals and co-precipitation of dissolved metals with ferric-hydroxides produce an overall improvement of water quality so that water quality impacts at surface water station CFY-2, which is located near the confluence of Fisher Creek with the Clarks Fork River, are very minor for most of the year. Since the cleanup project began in 1999, no temporary standards have been exceeded at this downstream surface water station. Since 1999, copper concentrations have fallen below chronic aquatic standards during winter base flow conditions at surface water station CFY-2 and zinc concentrations are below both the chronic and acute aquatic standards. During base flow conditions in the fall, only copper has exceeded acute or chronic aquatic standards at this station.

Current conditions in the Fisher Creek drainage show impacts to soil, sediment, and water resources from both mining impacts and natural sources of metals and acidity. Surface water in Fisher Creek is impacted by runoff from mine waste dumps and other disturbances, as well as discharges from adits, seeps, and natural groundwater that carry high metal loads. Several

parameters, including total recoverable aluminum, copper, iron, lead, and zinc exceed Montana's water quality standards (MDEQ, 1998). The Glengarry Adit discharge, with an average flow of 140 liters per minute (37 gpm) exceeds water quality standards for aluminum, copper, iron, lead, manganese, and zinc. Stream sediment data indicate that arsenic, chromium, copper, and zinc concentrations are more than three times higher than background levels for these elements in soil.

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

a. Hazardous Substances

The hazardous substances as defined in section 101(14) of CERCLA found at the site include aluminum, arsenic, cadmium, copper, iron, lead, and zinc. Concentrations of hazardous substances in solid wastes and surface water are documented in the Como Basin/Glengarry Adit/Fisher Creek Response Action EE/CA (Maxim, 2002b).

b. Sampling and Analytical Data

The sampling methods used to collect the chemical data are described in the Como Basin/Glengarry Adit/Fisher Creek Response Action EE/CA prepared by Maxim Technologies under contract to the USDA Forest Service (Maxim, 2002b). Surface water, mine waste, and groundwater samples were collected in 1996 by CBMI, in 1997 and 1998 by the EPA, and in 1999, 2000, and 2001 by the USDA Forest Service. Laboratory analytical results from waste dump samples indicate that mine waste contains elevated levels of arsenic, copper, lead, and zinc as compared to background concentrations. Long-term monitoring of surface water in Fisher Creek shows that water quality standards for aquatic life are particularly exceeded for aluminum, copper, lead, and zinc as well as other parameters including pH, suspended solids, and iron.

c. Mechanism for Past, Present, or Future Release

The waste dumps present in the headwaters of Fisher Creek and the disturbed soils of the Como Basin are largely unvegetated and unconfined. Runoff erodes material into Fisher Creek and potentially leaches metals from these metals-enriched wastes and soils into groundwater. Several of the waste dumps located in the Fisher Creek drainage are in direct contact with surface water at certain times of the year.

The Glengarry Adit discharges acidic, metals-contaminated water year-round. Concentrations of aluminum, copper, iron, lead, manganese, and zinc greatly exceed water quality standards. Under base flow conditions, the Glengarry Adit accounts for most of the dissolved copper load in the headwaters of Fisher Creek.

d. Events or Features that could Spread or Accelerate Releases

Large runoff events, particularly during the spring when twelve to twenty feet of snowpack melts off the sites, presents potential conditions for increasing erosion of the dumps and disturbed soils into surface water drainages. Other physical processes that can spread or accelerate the release

of metals into the environment include avalanches that cross the path of waste dumps (including the Glengarry dump), severe summer thunderstorms, and use of recreational vehicles on unvegetated dumps.

e. Properties that Influence the Rate of Releases

The conceptual model presented in the Como Basin/Glengarry Adit/Fisher Creek EE/CA (Maxim, 2002b) illustrates that the principal mechanisms of transport of contaminants within Fisher Creek include the following:

- Physical erosion, transport and deposition of materials by runoff and surface water.
- Dissolution of contaminants into surface runoff, from primary mineralization or secondary sedimentary deposits.
- Infiltration of runoff containing dissolved metals into soil and groundwater.
- Movement of contaminated water through open underground mine workings and improperly abandoned exploratory borings.
- Contaminated groundwater discharge into surface water.
- Contaminated surface water inflow to groundwater.
- Precipitation of iron and aluminum mineral phases with adsorption of trace metals in Fisher Creek along its flow path.
- Scouring of secondary minerals and remobilization metals.

Physical erosion of materials occurs where waste rock, metal-rich soils, or roadbed material is exposed at the surface, such as at mine dumps at the mouth of the Glengarry and Gold Dust adits or disturbed soils in the Como Basin. Surface runoff carries metal-laden sediments to stream channels, where sediments are entrained in the bed load of the stream. Mobility of metals in the streambed is dependent on the chemistry of water in the stream.

5. National Priority List (NPL) Status

CERCLA, sometimes referred to as the "Superfund" statute, was enacted in 1980 to address sites where releases of hazardous substances pose a threat to public health or the environment. Under CERCLA, the nation's most contaminated sites are placed on the National Priorities List (NPL) by the EPA. No mine sites in the District are listed or have been proposed for listing on the NPL by the EPA or the Montana Department of Environmental Quality (MDEQ) because, to date, hazard ranking evaluations of the worst sites in the District do not result in a hazard score warranting listing.

6. Maps, Pictures, and other Graphic Representations

A location map and map of site features are displayed in the attached Final EE/CA (Maxim, 2002c).

B. Other Actions to Date

1. Previous Actions

On August 12, 1996, the United States signed a Settlement Agreement with CBMI to purchase CBMI's holdings in the District. The resulting transfer of property to the U.S. government effectively ended CBMI's proposed mine development plans and provided $22.5 million to cleanup historic mining impacts to specific properties in the District. In June 1998, a Consent Decree, which was signed by all interested parties and CBMI and approved by the United States District Court, finalized the terms of the Settlement Agreement and formalized the process by which funds would be made available for mine cleanup.

Mitigation of historic mining wastes has been an on-going interest of numerous parties since the 1970s. One of the first to investigate revegetation in the District was the USDA Forest Service Intermountain Research Station (Brown, 1994; 1995). This research has focused on reclamation of high elevation mine disturbances, with the bulk of the research focused on the wastes present in the McLaren Pit and the Como Basin. Larger scale reclamation efforts were conducted by CBMI as part of exploration and proposed mine development work. In 1993, CBMI began surface restoration work to reclaim the Como Basin. Reclamation activities at the Como Basin included recontouring, construction of runon control ditches, treating acid soils with a lime amendment, and fertilizing and seeding with native grasses. From 1993 to 1996, CBMI also reclaimed a number of exploration roads and drill pads, and recontoured the Glengarry Dump.

In March 1999, the USDA Forest Service initiated the planning process for overall project cleanup. Planning documents were in place in June 1999, and work was begun on the project with the monitoring of surface water and groundwater quality at selected monitoring points. Activities conducted in 1999 included the following:

- Establishing a database management system for the project.
- Cataloging existing information available for the site.
- Completing a technical evaluation of existing information and data.
- Improving portions of Daisy Pass and Lulu Pass roads to accommodate construction traffic.
- Improving a previously constructed surface water diversion around the Como Shaft.
- Developing a suitable map base of District Property to support engineering design.
- Evaluating areas of erosion contributing excessive sediment to area drainages.
- Completing a repository siting evaluation report and collecting hydrogeologic data on two prospective repository sites.
- Completion by the U.S. Geological Survey of a surface water tracer study on Fisher Creek to determine surface water inputs.
- Obtaining data to fill identified data gaps for proposed Response Actions at the site.
- Identifying unrecorded mine waste dumps, adits, and boreholes, and developing a database of site characteristics.
- Ranking mine waste sources according to a modified Hazard Ranking System to aid in the prioritization of sites slated for cleanup.
- Identifying unrecorded cultural features.
- Determining the feasibility of reopening the Glengarry Adit.
- Evaluating water quality treatment alternatives for acid mine discharges.
- Preparing the Selective Source Response Action EE/CA.

Cleanup and Response Actions were continued in 2000 and 2001, with construction of the first Response Action (Selective Source Response Action) initiated in 2001. This cleanup work involved removing mine waste from nine sites in the Fisher Creek and Soda Butte Creek drainages, and disposing of these mine wastes in a constructed, central, on-site mine waste repository. Other cleanup activities conducted during 2000 and 2001 included the following:

- Maintaining community relations.
- Maintaining the project database and the project Web site.
- Preparing annual work plans.
- Continuing long-term monitoring of surface water, groundwater, and revegetated areas in the District.
- Completing the repository siting evaluation.
- Evaluating mass loading of metals from specific source areas to assist in the overall evaluation of potential response actions.
- Completing the hydrologic and geologic evaluation of the McLaren Pit, Como Basin, and Glengarry Adit source areas. This work involved reviewing historic mine maps, analyzing groundwater and surface water samples, measuring infiltration, analyzing pore water samples, and evaluating geochemical and hydrologic models that used the data to describe interactions between surface water and groundwater resources and mine wastes.
- Reopening the Glengarry Adit to assess the feasibility of potential response actions directed at reducing the input of acid mine drainage emanating from the adit.
- Reopening the Spalding and McLaren adits to determine the source and nature of water flows produced in the underground workings.
- Evaluating erosion control measures in the Como Basin.
- Completion by the U.S. Geological Survey of a surface water tracer study on Daisy Creek and Miller Creek.
- Identifying mine waste dumps, adits, and boreholes within the District.
- Completing road improvements initiated in 1999 and installing a bridge across Fisher Creek and Polar Star Creek
- Preparing the McLaren Adit Response Action EE/CA and construction package.
- Preparing the Como Basin/Glengarry Adit/Fisher Creek Response Action EE/CA.
- Reopening and rehabilitating the Como raises from the Glengarry Mine.
- Obtaining data to fill identified data gaps for proposed Response Actions at the site.

2. Current Actions

The USDA Forest Service completed a draft version of an EE/CA for the Como Basin/Glengarry Adit/Fisher Creek Response Action on June 17, 2002. A copy of the draft version of the EE/CA was placed in the information repositories in Cooke City (Chamber of Commerce), Gardiner (Gardiner Ranger District Office), and Bozeman (Gallatin National Forest Supervisor's Office). A public notice appeared in the Bozeman Chronicle, Livingston Enterprise, Cody Enterprise, and Powell Tribune announcing that the draft EE/CA was available, setting the time for the comment period, and listing the location of the information repositories. A comment period was established, allowing comments to be made over a 75 day period, and the comment period closed on August 31, 2002. Four written comments were received from the public, with three of the four supporting the selection of the preferred alternative. The fourth commenter made no

mention of the preferred alternative. A response to comments received is included in the Final EE/CA, which is attached to this Action Memorandum.

Other cleanup and investigative work continued in 2002, including the completion of assessment work in the Glengarry Adit, the Como raise, and the McLaren Adit. Reclamation construction work was begun in the McLaren Pit, with the consolidation of mine waste in the pit, reduction of slopes, and construction of runon and runoff controls. A summary of other response and restoration activities includes the following:

- Maintaining community relations.
- Maintaining the project database and the project Web site.
- Preparing the 2002/2003 annual work plan.
- Continuing long-term monitoring of surface water and groundwater.
- Completing construction of the Selective Source Response Action mine waste repository.
- Reopening the McLaren Adit.
- Conducting a study of ferricrete deposits in Fisher Creek.
- Obtaining data to fill identified data gaps for proposed Response Actions at the site.

C. State and Local Authorities' Role

1. State and Local Actions to Date

The USDA Forest Service has been cooperating throughout the project with the states of Montana and Wyoming, the United States Environmental Protection Agency, the United States Department of Interior, and the local county commissioners. The cooperating agencies have reviewed the various project documents and have provided comments to the USDA Forest Service.

2. Potential for Continued State/Local Response

Neither the State nor local authorities have the resources to conduct a Response Action at this time. State and local constituents will continue to be involved in site activities and will be kept apprised of all activities of this Response Action.

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

The EE/CA indicates there is a threat to public health or welfare, or to the environment as set forth in the National Contingency Plan (NCP) at 40 CFR 300.415(b)(2). Briefly, this threat is the risk of continued and future metals contamination of surrounding lands, surface water, and groundwater in Fisher Creek.

Due to the concentrations of metals in mine waste sources (Maxim, 2002b), conditions at these sources meet the criteria for initiating a Response Action under 40 CFR 300.415(b)(2) of the NCP. The following factors from 40 CFR 300.415(b)(2) of the NCP form the basis for USDA Forest Service's determination of the threat present and the appropriate action to be taken:

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

(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;

(iii) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate;

(iv) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;

(v) The unavailability of other appropriate federal or state response mechanisms to respond to the release.

A. Threats to Public Health or Welfare

Heavy metals associated with the Fisher Creek headwater waste rock sources can affect human health through inhalation or ingestion. The total hazard quotient for copper and zinc present in the Fisher Creek mine dumps and the Como Basin exceed 1.0, indicating that these contaminants pose a human health risk. The total hazard quotient for copper and zinc is attributed to the risk posed by ingestion of fish taken from the stream by recreationists. Because there are no fish in Fisher Creek at the present time, this risk of exposure to copper and zinc in surface water is currently not a pathway at this site. Therefore, based on these data, contaminants do not present a risk to human health.

B. Threats to the Environment

Two groups of ecological receptors have been identified as potentially being affected by contamination associated with historic mining present in the District. The first group includes aquatic life and wetlands associated with Fisher Creek located downgradient of the source areas. The second group of receptors is native terrestrial plants at the site whose ability to grow in soil or mine waste is limited by relatively high concentrations of certain metals.

The pathways by which ecological receptors could become exposed to contaminants at the site are through direct contact with soils, ingestion of contaminated soils, direct contact with water and sediments, ingestion of water and sediments, and ingestion of contaminated food. Fisher Creek has been impacted by elevated heavy metals concentrations (principally copper, iron, and zinc). A comparison of metals levels measured in mine waste samples collected from selected dumps to literature guidelines and state aquatic water quality standards indicate that aluminum, copper, iron, lead, and zinc pose a risk to organisms in the aquatic environment. In addition, arsenic, cadmium, copper, and lead appear at phytotoxic levels in waste dumps, although no site-specific studies of metals concentrations in vegetation growing on reclaimed or abandoned mine wastes in the District have been done to determine if grazing animals would be at risk by consumption of plants that become established on mining wastes.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed Action Description

Our loading analysis suggests that metals loading from the Glengarry Adit is most significant (more than 90% of the total load as measured in Fisher Creek immediately below the mine site) during low flow conditions from September to late June. Metals loading from the Como Basin is most significant (about 20% of the total load in Fisher Creek immediately below the Glengarry mine) during high flow conditions in late June through August. Loading for many constituents during low flow is about a factor of 10 lower than that during high flow. Metals loading from the tributary draining undisturbed ground on the northeast flank of Fisher Mountain contributes about 14% of the copper load to Fisher Creek during high flow conditions. This metals load is thought to be the result of natural acid rock drainage. Based on this analysis, it would seem appropriate to complete the most desirable response action on both the Como Basin and Glengarry Adit Source Areas in order to minimize contaminant migration into Fisher Creek on a year-round basis. The combination of both should significantly and positively impact water quality, particularly with respect to metals and acidity loading, in the upper reaches of Fisher Creek, and will likely have some positive impacts on groundwater.

A response action targeting the smaller waste rock dumps that remain in the Fisher Creek Source Area is of lower importance in terms of metals loading to Fisher Creek. Only the Glengarry waste rock dump appears from metals loading analysis to have a significant impact on water quality in Fisher Creek. Some water quality degradation may occur at other dump sites in the drainage, although this impact is relatively minor compared to the other identified sources of contaminants and the pathways of contaminant movement in the drainage. There are no unacceptable residual risks to human health at these sites.

The preferred alternative for the Como Basin/Glengarry Adit/Fisher Creek Response Action is a combination of alternatives that has been selected for the three source areas. Only by combining the alternatives discussed will substantial improvements in water quality be realized in Fisher Creek. The preferred alternative for each of the three source areas is discussed below.

Como Basin Source Area

The preferred alternative for the Como Basin Source Area is Alternative CB-3B. Alternative CB-3B involves in-situ regrading of metal-rich disturbed and unconsolidated soils that overlie the massive sulfide deposit present in the basin and covering these materials with an impermeable capping system composed of a synthetic liner, a drainage layer, and amended soil.

The synthetic liner in the capping system, a 60 mil high density polyethylene (HDPE) geomembrane, will be used as a barrier layer over the regraded metal-rich soils. A drainage layer will be placed on top of the liner and the drainage layer covered with soil salvaged from the upper one meter of the existing disturbed-area surface. Salvaged soil used in the cover will be amended with about 2,100 metric tons of lime to reduce available acidity, reduce metals availability, and make the soil more suitable for revegetation. Runon and runoff drainage systems will be constructed above, on, and below the capped area, and the entire site will be fertilized, seeded, and mulched.

Also included in this alternative is reclamation of road segments that cutoff the switchbacks along the Lulu Pass Road, as well as one side road that accesses a monitoring well near from the Lulu Pass Road to the former Upper Spalding Dump. The road segments that would be reclaimed are switchback cutoffs used by wheeled vehicle travel during the late spring and early summer when snowdrifts block the main track of the road along the steep, east-facing slope. Closure will be accomplished by closing off and revegetating the cutoff road segments, improving drainage, and reclaiming steep, raveling cut-slopes on this switchback portion of the road. The side road that accesses the monitoring well will be reclaimed by recontouring and revegetating.

For material needs, off-site sources of rock and gravel will be required for the drainage systems, runon/runoff systems, and channel reconstruction. Road surfacing materials may also be needed for the Lulu Pass road. These materials may be available from a rock quarry operated by the Federal Highways Administration for reconstruction of the Beartooth Highway, or from a commercial source.

Given what is known about the source of metals impacts in Fisher Creek and the fact that natural sources contribute a considerable metals load to the creek via groundwater and surface water pathways, eliminating all metals impacts in the Como Basin is not feasible. However, capping the disturbed soils that overly the massive sulfide deposit in the Como Basin with an impermeable liner will effectively reduce mining-related metals impacts, especially copper, from the Como Basin by preventing the infiltration of snowmelt and rainwater through these materials. This in turn will lead to a significant reduction in metals loading to Fisher Creek.

Fisher Creek Source Area

Except for the Glengarry and Gold Dust dumps, there appears to be little major impact from the remaining waste rock dumps located in Fisher Creek. There are no identified human health risks, and environmental risks appear to be associated with waste rock that is in contact with surface water and/or groundwater. This is the case at the Glengarry Dump, where loading of contaminants was determined to make up nearly 15% of the load delivered to Fisher Creek during low flow conditions. Part of the reason for this is the location of the dump at the mouth of the Glengarry Adit, where flows discharging from the adit eventually infiltrate through part of the waste dump. Another reason is the location of the dump in the Fisher Creek floodplain, where it is prone to nearly constant contact with Fisher Creek The Glengarry Dump accounts for about 59% of the remaining waste rock in Fisher Creek.

The Gold Dust site is somewhat similar to the Glengarry Dump in that the Gold Dust waste rock sits at the mouth of the adit, and discharge from the adit and a tributary stream to Fisher Creek flow through the dump before entering another tributary to Fisher Creek. Impacts to surface water from the Gold Dust waste rock appear to be only slightly decreased pH values. The dump is also one of the larger remaining dumps, constituting 26% of the waste rock remaining in Fisher Creek.

Other waste rock dumps and their associated mine sites lie topographically above the valley bottom, in relatively dry locations, and present little threat to surface or groundwater quality, except for brief periods during active precipitation or snowmelt. Some of the sites, in addition to being relatively high and dry, are also considered to be cultural or historic resources or prime sites for mineral collecting. Excluding the Glengarry and Gold Dust dumps, four of the remaining dumps are eroding directly into surface water streams. Table 1 summarizes the work that is proposed for the remaining dumps in Fisher Creek.

Because of the nominal nature of recognized impacts from remaining dumps in Fisher Creek, and because the Glengarry and Gold Dust waste dumps constitute 85% of the waste rock, the preferred alternative for the Fisher Creek Source Area is a combination of alternatives analyzed in the EE/CA. Alternative FC-4, total removal to the SB-4B(B) repository, is selected for the Glengarry and Gold Dust dumps. These dumps would be disposed in the Selective Source repository site, an on-site, lined facility located at the southern end of the Lulu Pass road near its junction with Highway 212. The first cell of this repository was constructed in 2001/2002.

Alternative FC-3 (surface controls) is the preferred alternative for the four dump sites that are in contact with surface water or that exhibit erosion. Surface controls principally involve moving wastes away from streambanks, reshaping and/or regrading dumps to improve and reroute drainage, and repairing erosion problems. For the remaining dumps that lie on steep, inaccessible slopes located well away from surface water drainages, No Action is selected.

Table 1
Proposed Reclamation Activities for the Fisher Creek Source Area

Site No.	Site Name	Waste Volume (cubic meters)	Area (hectares)	Mine Drainage	Flow (gpm)	Access	Alternative Selected	Work Type	Rank
FCSI-96-2A	Glengarry Dump	9880	0.43	Adit, toe seep	20	Road	FC-4	Waste removal, regrade	15
FCSI-99-1	Sheep Mountain Dump One	140	0.05	Adit, toe seep	10	Road	FC-3	Move waste, divert flow	21
FCSI-96-4	Glengarry Adit and Mill Site	380	0.23	Adit, toe seep	5	Road	FC-4	Waste removal, regrade	22
FCSI-96-1A	Gold Dust Mine and Dump	4330	0.22	Adit, toe seep	15	Road	FC-4	Partial waste removal, regrade, portal closure	24
FCSI-99-11	Como Basin	22,040	3.43	None	0	Road	Como Source Area	Regrade, geomembrane	27
FCSI-99-70	Henderson Mountain Dump Nine	150	0.17	None	0	Road	FC-3	Regrade	31
FCSI-99-53	Henderson Mountain Dump Four	60	0.11	None	0	Road	FC-3	Regrade	40
FCSI-99-68	Henderson Mountain Dump Seven	210	0.04	Adit	2	Tracked but flat	FC-3	Move waste, divert flow	51
FCSI-99-73	Henderson Mountain Dump Thirteen	40	0.03	Adit	6	Tracked but flat	FC-3	Move waste, divert flow	66
FCSI-96-17	Homestake Adit and Dump	320	0.11	Open Portal	0	Road	FC-3	Portal Closure	73
FCSI-99-35	Fisher Mt Dump Three	regraded	0.49	none	0	Road and Tracked (steep)	FC-3	Regrade, construct drainage channel	100
FCSI-99-36	Fisher Mt. Dump Four	regraded	0.67	none	0	Road and Tracked (steep)	FC-3	Construct drainage channel	100

Note: All disturbed areas will be amended as necessary and seeded provided site conditions allow appropriate access for vehicles and equipment.

Glengarry Source Area

The preferred Response Action for the Glengarry Source Area addresses the discharge from the Glengarry Adit from a source control approach. The source control approach is considered a first step in attempting to reduce contaminant loading from point sources. Source control is preferred to water treatment as a first step in mitigating impacts to water quality in Fisher Creek, as water treatment options evaluated in a separate study by the USDA Forest Service indicates that construction and operation of passive and active water treatment systems would be difficult and expensive (Unifield, 2000). Passive treatment systems are less expensive than active treatment systems, but large flow variations and low water temperatures raise uncertainties relative to effectiveness and maintenance requirements.

The most effective means of closure for the Glengarry Mine involves a combination of alternatives that attempt to minimize mobility of contaminants as inflow and outflow from the mine. The following alternatives comprise the preferred alternative for the Glengarry Source Area:

- GA-2, a surface grout curtain around the Como raise collar with a concrete plug in the raise below the Meagher limestone and backfilling a portion of the raise.

- GA-4, a grout curtain around the 1050 roof leak.

- GA-5A, backfilling of the drift with cemented backfill in the Fisher Mountain Porphyry portion of the drift.

- GA-6, placement of watertight plugs and a portal plug in the Glengarry drift.

Alternative GA-2 effectively reduces the influx of metal-laden water into the Glengarry Mine and Fisher Creek by providing multiple barriers to contaminated water entering and flowing down the Como raise. The grout curtain encircling the raise collar will provide a barrier to keep shallow subsurface water flowing along the colluvial/bedrock contact from entering the raise, and cement and bentonite plugs will provide a very tight seal within the raise and below the massive sulfide-bearing portion of the Meagher Limestone. Backfilling the raise will also act as a barrier to water movement, and will eliminate the chance of future collapse of rock around the grout curtain and plug areas that could result in leakage past the plugs or failure of the grout curtain.

Other significant sources of inflow are the flow from the top of the first raise (38 to 64 liters per minute) and flow from the 1050 fracture system (10 to 50 liters per minute). These two inflow sources contribute two orders of magnitude less metals concentrations than the Como raise, but contribute a considerable iron and zinc load that exceeds water quality standards. Grouting of the 1050 roof leak will considerably reduce water inflows to the mine. Grouting of flows from the first raise is unnecessary because Alternative GA-6 seals the underground workings with a series of plugs. Water draining down the raises and entering the Glengarry drift will be stopped in the very dry and low permeability rock of the Precambrian granite. A third plug located near

the portal will block Fisher Mountain Porphyry water that drains into the drift between the portal and the porphyry contact.

Implementing Alternative GA-5A (backfilling various portions of the underground workings) ensures no further ground movement will occur in the rock surrounding the Glengarry workings. This alternative provides structural stability and support to areas grouted and plugged under Alternatives GA-4 and GA-6. The relative impermeability of backfill will also significantly reduce flow through the backfilled portions of the workings.

a. Address Identified Human Health and Environmental Threats

Upper Fisher Creek is characterized by highly variable flow with rapidly increasing flow rates and short periods of sustained flow during snowmelt. As much as 90% of Fisher Creek's discharge volume occurs between mid May and early August. Discharge rates near the upper reaches of Fisher Creek range from less than 0.3 cubic meters per second (m^3/s) or 1.0 cubic feet per second (cfs) in late winter to over 1.4 m^3/s (150 cfs) during peak runoff.

Metals loading investigations by Amacher (1998) and Kimball and others (1999) indicate that a few distinct surface water sources in the upper 500 meters of Fisher Creek supply the majority of the contaminant load to the creek. In general, the loading studies agree about the major inflow sources that contribute metals to Fisher Creek. Roughly half of the sources contributing metal loading into the creek have been identified as surface sources, with estimates ranging from 40 to 60%; the remainder are groundwater or subsurface flows. Subsurface flows will prove difficult to remediate, as these flows do not seem to be associated with any particular mining-related activity, and could very well represent natural acidic drainage.

Amacher (1998) and Kimball and others (1999) noted that the relative contribution of the four major sources varied considerably from spring runoff to base flow conditions. The majority of contaminant loading to Fisher Creek occurs under peak flow conditions (by a factor of 10). A comparison of loadings indicates that while the Glengarry Adit dominates water chemistry during low flow conditions, the tributaries from the Como Basin and the tributary from the un-mined area of Fisher Mountain contribute the majority of the annual load during high flow conditions. In May, under base flow conditions, the Glengarry Adit discharge accounts for most of the dissolved copper load to upper Fisher Creek. As snowmelt begins in June and proceeds into July, runoff from Fisher Mountain and Como Basin accounts for most of dissolved copper load. In the fall, the Glengarry Adit again accounts for the majority of copper load.

Using copper and iron as examples, based on the combined predicted affect for the preferred alternative for each of three source areas (composite cover on Como Basin soils, closure of the Glengarry adit and removal of the Glengarry and Gold Dust waste rock dumps), copper loading to Fisher Creek could be reduced by as much as 90% during low flow at a point in the stream immediately below the Glengarry Adit (surface water station SW-3). This is true because there is no or very little flow in the tributaries from Fisher Mountain or the Como Basin under base-flow conditions, and approximately 90% of the load then comes from the Glengarry adit and seepage through the waste rock dump. The remaining load is from groundwater sources that report to surface water flow measured at surface water station SW-3. During these flow

conditions, both Kimball and Amacher's studies indicate that groundwater inflow to Fisher Creek between the Glengarry Adit and SW-3 contributes at least 35 to 45% of the total load at surface water station SW-3.

The total estimated load reduction for the preferred alternative, using three estimates of adit closure efficiency of 100, 50 and 20%, show that copper removal will likely range from 8 to 40%, depending upon the amount of load rerouted by the adit closure into preexisting fractures that in turn report to Fisher Creek. Using the total annual load data for copper (2,132 pounds per year (lbs/year) under high flow conditions or 149.4 lbs/year under low flow conditions), and assuming annual flow of 3 months per year at high flow and 9 months per year at low flow, the preferred alternative could remove as few as 18 pounds (20% efficiency) or as much as 146 pounds (100% efficiency) of copper per year. Similarly for iron loading, the calculated estimates show that iron removal will likely range from 8 to 49%, depending upon adit closure efficiency. Using the total annual load data for iron (8,876 lbs/year under high flow conditions or 1,255 lbs/year under low flow conditions), and assuming annual flow at 3 months per year at high flow and 9 months per year at low flow, the preferred alternative could remove as few as 94 pounds (20% efficiency) or as much as 1,462 pounds (100% efficiency) of copper per year.

Following the implementation of the preferred alternative, the reduction in loading to Fisher Creek may not bring surface water in Fisher Creek into compliance with established surface water standards. Any failure to meet Montana surface water standards will be due principally to natural sources of metals-enriched water that report to Fisher Creek. The Como Basin/Glengarry Adit/Fisher Creek EE/CA summarizes pertinent literature publications that demonstrate the effects of naturally occurring sulfide minerals in bedrock. These natural sources are believed to be a major source of metals and acid rock drainage. There are also other sources present in the headwaters of Fisher Creek, including contaminated groundwater that is migrating from the headwaters area to Fisher Creek, and metals-enriched sediment that has been transported from mining-related disturbances in the Como Basin, waste rock dumps present in the headwaters of Fisher Creek, and the Glengarry Adit. Metals-enriched sediment from these sources has deposited in the streambed along most of the length of Fisher Creek. Cleaning up the three source areas under the preferred alternative does not address these other sources of metals contaminants in the Fisher Creek drainage.

By addressing releases from metals-enriched mine wastes and disturbed soils, some reduction in contaminant concentrations are expected in surface water, groundwater, and new stream sediment accumulation as a result of removing or controlling these primary sources of mining-related metals contamination in Fisher Creek. Contaminated sediments that have been historically deposited in and along Fisher Creek are considered second order contaminate sources that may need to be addressed in future response actions. Sediments are not being addressed at this time under this proposed response action because sources of sediments must first be cleaned up sufficiently to eliminate the possibility for recontamination of sediments. When all discharge sources are controlled in the headwaters of Fisher Creek, alternatives for cleanup of sediment can be considered.

b. Justification for Proposed Alternative

The USDA Forest Service has selected capping of the Como Basin, removal of the Glengarry and Gold Dust waste rock dumps, surface controls at specific dumps in the headwaters of Fisher Creek, and grouting and backfilling of the Glengarry Adit because this combined alternative provides the best combination of effectiveness, implementability, and cost effectiveness of the alternatives evaluated. Capping of the unconsolidated and disturbed soils in the Como Basin will be effective in significantly reducing metals loading to Fisher Creek because the impermeable liner will place a barrier between infiltrating precipitation and soils enriched with metals. Backfilling and grouting of the Glengarry Adit will remove a point source of metals contamination to Fisher Creek. Removal of the Glengarry and Gold Dust waste rock dumps will eliminate 85% of the waste rock present in the Fisher Creek headwaters.

These response actions are an appropriate response because contaminated materials and the adit discharge directly impact water quality in Fisher Creek, and because such an action is in accord with the Consent Decree, Settlement Agreement, and overall project objectives. None of the alternatives considered in the EE/CA are expected to meet Montana's B-1 standards for surface water quality in Fisher Creek. Nevertheless, the combined preferred alternative will provide substantial mitigation of man-caused mining impacts. Unfortunately, natural sources contribute a considerable metals load to the creek via groundwater and surface water pathways, and, given the difficult environmental conditions, eliminating metals impacts from mining related activities may not allow achievement of water quality standards. The proposed combined alternative will meet most project applicable or relevant and appropriate requirements (ARARs) with the exception of surface water and groundwater standards. Although Montana B-1 water quality standards may not be met if this action is selected, this action will mitigate, in part, impacts to the environment that result from historic metal mining.

Once this Response Action is implemented and evaluated, further cost effective response actions to achieve further water quality improvements can be considered. In any case, the preferred combined alternative will not inhibit the implementation of additional response actions. Additional efforts that may be linked to improving the isolation of mining-related impacts could involve constructing groundwater cutoff walls upgradient of the Como Basin, as well as other potential alternatives that target reducing metal contaminants present in surface water and groundwater that result from man-induced impacts.

c. Technical Feasibility and Probable Effectiveness

The recommended actions at all three source areas are both technically and administratively feasible. Key project components such as equipment, materials, and construction expertise, although distant from the site, are available and would allow the implementation and successful execution of the alternative.

The proposed combined alternative for the headwaters of Fisher Creek is expected to substantially reduce contaminant mobility in the headwaters of Fisher Creek, especially during low flow conditions. As previously mentioned, 90% of the metals loading during low flow is contributed to Fisher Creek by the Glengarry Adit. The preferred alternative for the Glengarry Adit is expected to eliminate or substantially reduce any water discharge. Removal of the Glengarry and Gold Dust dumps will eliminate any loading from these materials into Fisher

Creek. Capping the mineral rich soils in the Como Basin below an impermeable liner is expected to substantially reduce the quantity of contaminated groundwater and surface water to Fisher Creek from this source area.

Removing the Glengarry and Gold Dust waste rock dumps, and grouting and backfilling the Glengarry Adit are expected to be permanent solutions requiring little maintenance. Capping of metals-rich soils in the Como Basin is expected to be a permanent solution with some required maintenance to ensure that revegetation of the soil cover protects the cap from erosion.

d. Further Information

No further information is needed to select the proposed action.

e. Verify Extent of Contamination

Assessment work in the Glengarry Adit has confirmed the locations of water inflow to the workings, and the preferred Response Action has been selected to provide additional levels of protection that will ensure elimination or substantial reduction of the discharge from the adit. For the Como raise, these levels of protection include grouting the near-surface bedrock interface to eliminate seepage down the raise, backfilling and placing a cement plug in the raise, and covering the Como raise at the surface with the impermeable capping system. In the Glengarry workings at the adit level, additional levels of protection include grouting the 1050 roof leak, placing cement plugs at several locations in the workings, and backfilling the workings to provide stability for the plugs and grout.

Assessment work in the Como Basin has identified the horizontal extent of metals-rich soil. With this area delineated, the capping system will be designed to cover the entire disturbed area containing metals-rich soils.

For the removal of the Glengarry and Gold Dust waste dumps, final contours and visual observations will be used to determine when to stop excavating waste rock. Overexcavation of native material underlying the dumps will be done to ensure any leaching of metals into native soil is removed. Samples from the bottom of excavated areas will be collected and analyzed to verify that contaminant levels in native material below the waste are at acceptable concentrations. Based on these data, additional material may be excavated, if necessary.

f. Sensitive Environments

The headwaters area of Fisher Creek, including the Como Basin and Glengarry Adit and dump are severely disturbed by mining and mining exploration activities, as well as disturbances from roads and all terrain vehicle travel along the Lulu Pass road. These disturbances have resulted in land that has little vegetation, numerous erosion features, and visually distinct iron staining in strembeds and gullies below the disturbances. The severity of metals impacts within the headwaters of Fisher Creek and downstream for several miles greatly reduce any likelihood of the presence of sensitive environments.

g. Uncertainties

Uncertainties associated with implementing this alternative include the uncertainty involved in predicting the effectiveness of the alternative on water quality improvement. Current models that estimate the loading of contaminants from the headwaters wastes to Fisher Creek show that copper removal will likely range from 8% to 40% by implementing this response action.

The models used to estimate impacts from mining wastes present at the headwaters of Fisher Creek are based on several derived and/or calculated values. These analyses required calculation of several significant climatic variables, including precipitation and mean daily temperature, and estimation of several other parameters using limited data sets. Although both professional judgment and experience were used in deriving these relationships, results of the modeling should be viewed as general results only.

h. Institutional Controls

No institutional controls are expected to be needed following the implementation of this Response Action. Temporary closure of portions of the Lulu Pass Road may be required during construction. Closure of the cutoff portions of the Lulu Pass Road and closure of the side road that dead ends at the monitoring well would be permanent, but these closures do not restrict existing road access to Lulu Pass.

i. Off-Site Disposal

Because contaminated material is being handled on-site, off-site disposal is not required.

j. Post-Removal Site Controls

Post-removal site control will be required at the Como Basin and the Glengarry and Gold Dust dumps. Post-removal site control will involve monitoring to identify any problems with revegetation or erosion. Monitoring the capped area will involve monitoring vegetation on the cap and monitoring surface water quality at stations in Fisher Creek. Water quality sampling will be conducted periodically at established stations. Monitoring and maintenance of the cover system will involve visually checking the condition of the cap several times during the snow-free season to insure that the vegetative cover is performing adequately and that no erosion or stability problems are occurring. If monitoring shows that environmental conditions have degraded because of capping, corrective action will be taken.

k. Changes Resulting from Public Comments

Written comments on an internal review draft of the Como Basin/Glengarry Adit/Fisher Creek EE/CA were received from the EPA, Montana DEQ, and Department of Interior National Park Service. These comments were considered, modifications were made to the internal review draft based on these comments, and a public Draft EE/CA was prepared.

The Draft EE/CA was released to the public on June 22, 2002, and comments on it were received from the Greater Yellowstone Coalition, the Beartooth Alliance, the Center for Science in Public Participation, and one private citizen. Comments received from the three organizations supported the selection of the preferred alternative. Comments received from the private citizen were concerned with disposal of drill cuttings in the Como Basin by the mining exploration company. Other concerns expressed by the parties in their comments included the following: a concern for the use of salvaged soil from the Como Basin as the soil cover because of elevated metals concentrations present in the salvaged soil; a concern for the consideration of a near-perennial snow bank and its effect on the capped area; a concern for cutting off runon so that runon does not infiltrate below the cap; a concern for establishing adequate runoff channel capacity after installing the cap; a concern for the undisturbed vegetation lying below the area in the Como Basin that will be capped; and, a concern for creation of wetland areas following removal of the Glengarry Dump. Other comments were also received on various aspects of the project. These comments do not affect the analysis of alternatives or selection of the preferred alternative.

The Draft EE/CA that was released to the public did not require any substantive changes because the comments received did not affect the evaluations presented in the EE/CA or the selection of the preferred alternative. The Final EE/CA (attached) presents the comments received on the internal review draft and the public draft, and provides a response to each comment.

2. Short-Term Impacts

The major short-term impact to the surrounding community, residents, and wildlife involves increased vehicle traffic and temporary closures of access to some forest roads. An increase in traffic will occur during mobilization and demobilization of construction equipment. Short-term road closures in the project area may also be necessary, limiting access to the forest. Increased traffic may impact wildlife by either changing their daily migration patterns or exposing them to a higher potential for injury or death due to collisions with vehicles.

3. Contribution to Remedial Performance

The Como Basin/Glengarry Adit/Fisher Creek Response Action is one of several response actions that will be completed in the District for the New World Mining District Response and Restoration Project. The Como Basin/Glengarry Adit/Fisher Creek Response Action will address the majority of mining-related impacts in Fisher Creek. In so doing, this proposed Response Action would make a substantial contribution toward improving water quality in Fisher Creek. Selection and construction of the preferred alternative will not prevent or inhibit any further response actions that may need to be taken in Fisher Creek to meet the terms and intent of the Settlement Agreement and Consent Decree.

4. Description of Alternative Technologies

Removal technologies and process options potentially capable of achieving response action objectives and goals in the headwaters of Fisher Creek were screened in the Como Basin/Glengarry Adit/Fisher Creek Response Action EE/CA (Maxim, 2002b). These

technologies included no action, institutional controls, engineering controls, excavation and treatment, and in-situ treatment.

a. Institutional Controls

Institutional controls include land use and access restrictions. Institutional controls by themselves will not prevent migration of the contaminants off-site through groundwater, surface water, or air. Therefore, institutional controls as a separate alternative were not considered. However, institutional controls as components of other alternatives were considered.

b. Engineering Controls

Engineering controls limit the release or threat of release of hazardous substances generally by limiting mobility through isolation, and/or by limiting physical processes necessary for mobility. These measures included removal, in-situ containment, surface controls, and chemical fixation. In addition, underground flow controls were considered for the Glengarry Adit. These measures were incorporated into the alternatives considered for the three source areas included in the EE/CA.

c. Waste Disposal

Waste disposal options were considered for the metals-rich soils in the Como Basin and the waste rock dumps in Fisher Creek. Waste disposal is used as a source control measure by placing contaminated media in an engineered, controlled environment. Waste control measures evaluated for the remaining Fisher Creek waste dumps and the Como Basin metals-rich soils included in-situ amendment and removal to an on-site, engineered repository.

d. Miscellaneous Alternatives

Technology types and process options were screened to eliminate those technologies that are obviously unfeasible, while retaining potentially effective options. General response actions and process options were applied to the mitigation of contaminants in the three source areas in Fisher Creek. An evaluation of surface water and groundwater treatment was not conducted because source control technologies are considered the first step in cleaning up mining-related impacts. Water treatment technologies may be considered at a future time depending on the results of the source controls implemented as part of this Response Action. Capping metals-rich soils, eliminating the Glengarry Adit discharge, and removal or waste rock at the Glengarry and Gold Dust presumes that some reduction in contaminant concentrations will occur in surface water, groundwater, and streambed sediments as a result of removing or controlling the primary sources of contamination.

Various response actions and technology types were evaluated but rejected due to a variety of reasons including uncertainties in effectiveness and high cost. These response actions included: physical/chemical treatments to separate contaminants from soil, thermal treatments to either vaporize or immobilize contaminants, reprocessing metals-rich materials to recover a portion of the metals present, and off-site disposal.

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

An EE/CA that details site characteristics and identifies and develops alternatives was prepared. The USDA Forest Service interdisciplinary team and specialists from the cooperating agencies analyzed the effects of the alternatives identified in the EE/CA, and considered public comments. The Forest Service then selected a preferred alternative. A copy of the Final EE/CA is attached (Maxim, 2002b).

6. Applicable or Relevant and Appropriate Requirements (ARARs)

Section 300.415(i) of the National Contingency Plan (NCP) and guidance issued by the EPA require that removal actions attain Applicable or Relevant and Appropriate Requirements (ARARs) under federal or state environmental laws or facility siting laws, to the extent practicable considering the urgency of the situation and the scope of the removal (EPA, 1993). In addition to ARARs, the lead Agency may identify other federal or state advisories, criteria, or guidance to be considered for a particular release. ARARs were identified in the Como Basin/Glengarry Adit/Fisher Creek Response Action EE/CA.

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 found at a site and would apply in the absence of a CERCLA cleanup. Relevant and appropriate requirements are those standards, requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that are not applicable to a particular situation but apply to similar problems or situations, and therefore may be well suited requirements for a response action to address.

ARARs are divided into contaminant specific, location specific, and action specific requirements. Contaminant specific ARARs are listed according to specific media and govern the release to the environment of specific chemical compounds or materials possessing certain chemical or physical characteristics. 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 may be found in, or discharged to, the ambient environment.
Location specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of cleanup activities because they are in specific locations. Location specific ARARs generally relate to the geographic location or physical characteristics or setting of the site, rather than to the nature of the 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. Administrative requirements are not ARARs and do not apply to actions conducted entirely on-site. Provisions of statutes or regulations that contain general goals expressing legislative intent but are non-binding are not ARARs. In addition, in instances like the present case where the cleanup is proceeding in stages,

a particular phase of the remedy may not comply with all ARARs, so long as the overall remedy does meet ARARs.

Under Section 121 of CERCLA, 42 U.S.C. §9621, only those state standards that are more stringent than any federal standard are considered to be an ARAR provided that these standards are identified by the state in a timely manner. To be an ARAR, a state standard must be "promulgated," which means that the standards are of general applicability and are legally enforceable. The State of Montana ARARs set forth below have been identified in cooperation with, and with assistance from, the State of Montana Department of Environmental Quality.

a. Federal Contaminant Specific Requirements

Groundwater Standards - Safe Drinking Water Act (Relevant and Appropriate)

The National Primary Drinking Water Standards (40 CFR Part 141), are not applicable to the Como Basin/Glengarry Adit/Fisher Creek Response Action 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 groundwater in the area is a potential source of drinking water. In addition, because groundwater discharges to District tributaries that may be a source of drinking water, these standards are relevant and appropriate. Maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) are standards promulgated pursuant to both federal and state law. No State water quality standard is more stringent than the corresponding federal MCL.

Groundwater quality in the Fisher Creek drainage varies considerably. With the exception of iron and manganese concentrations, groundwater in the Fisher Creek valley bottom complies with groundwater quality standards in both shallow alluvium and Precambrian granite water-bearing units. Iron and manganese are ubiquitous in the District, and concentrations of these two metals are believed to be partially controlled by natural sources in bedrock. Groundwater on the east flank of Fisher Mountain (sampled from well Tracer 5, which is completed in the Fisher Mountain Porphyry) exceeds groundwater contaminant-specific standards for copper, iron, and manganese and has an acidic pH. Capping of the Como Basin soils and removal of the Glengarry and Gold Dust dumps will likely have a positive effect on groundwater quality. Grouting, plugging, and backfilling the Glengarry Adit will eliminate a source of oxygen to groundwater, thereby reducing the production of acidity and solution of metals in groundwater that currently occurs in the underground workings.

Surface Water - Ambient Standards and Point Source Discharges.

While CERCLA and the NCP provide that federal water pollution criteria are the usual surface water standards to be used as relevant and appropriate standards for removal action cleanups, the State of Montana has promulgated surface water quality standards pursuant to the State of Montana Water Quality Act that are as or more stringent than the federal standards. The State of Montana has designated uses for District tributaries as B-1 and has promulgated specific standards accordingly. Discussions of these standards are included in the State of Montana ARARs discussion.

Air Standards - Clean Air Act (Applicable)

Limitations on air emissions resulting from cleanup activities or emissions resulting from wind erosion of exposed hazardous substances are described in the federal action specific requirements.

b. Federal Location Specific Requirements

The National Historic Preservation Act (Applicable)

This statute and implementing regulations (16 U.S.C. § 470, 40 CFR § 6.310(b), 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 National Register of Historic Places.

Compliance with this ARAR is being met through identifying cultural and historic sites and consultation with the State Historic Preservation Office (SHPO). Cultural and historic data collected during the mining company permit application were mapped and reviewed in detail by USDA Forest Service archaeologists. The USDA Forest Service has drafted a Memorandum of Agreement (Agreement) with SHPO that outlines the steps involved with historic resource delineation and protection.

Impacts to historic features associated with the Como Basin/Glengarry Adit/Fisher Creek Response Action are limited to removing and covering mine dumps. Where proposed cleanup actions impact historic or cultural resources, mitigation measures will be taken in accordance with the Agreement. These mitigating measures will be considered for the District as a whole as response actions are initiated. If unknown or undocumented historic properties are discovered during the response action, construction will be halted in the immediate area of the discovery and a USDA Forest Service archeologist will be notified.

Archaeological and Historic Preservation Act (Applicable)

This statute and implementing regulations (16 U.S.C. § 469, 40 CFR § 6.301(c)) establish requirements for evaluation and preservation of historical and archaeological data, including Indian cultural and historical resources, 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, these resources will be preserved in accordance with these requirements. The procedure for addressing such discoveries is described under the previous National Historic Preservation Act discussion.

Historic Sites, Buildings, and Antiquities Act (Applicable)

This requirement states that "in conducting an environmental review of a proposed EPA action, the responsible official 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. Those activities described for the National Historic Preservation Act provide procedures to comply with this ARAR.

Fish and Wildlife Coordination Act (Applicable)

These standards (16 U.S.C. §§ 661 et seq. and 40 CFR § 6.302(g)) require that federally funded or authorized projects ensure that any modification of any stream or other water body affected by a funded or authorized action provide for adequate protection of fish and wildlife resources. The USDA Forest Service is involved with discussions with the U.S. Fish and Wildlife Service (USFWS) and the State of Montana Department of Fish, Wildlife, and Parks (FWP) to comply with this ARAR.

Floodplain Management Order (Relevant and Appropriate)

This requirement (40 CFR Part 6, Appendix A, Executive Order No. 11,988) mandates that federally funded or authorized actions within the 100 year flood plain 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." The Floodplain and Floodway Management Act does not directly apply because the Como Basin, Glengarry Adit, and remaining waste dumps in Fisher Creek because these sites are not in a designated 100-year floodplain. However, as some wastes will be removed from the Fisher Creek floodplain, removals will comply with the substantive portions of this order.

Protection of Wetlands Order (Applicable)

This requirement (40 CFR Part 6, Appendix A, Executive Order No. 11,990) mandates that federal agencies avoid, to the extent possible, adverse impacts associated with the destruction or loss of wetlands. The order also provides that activities avoid construction in wetlands if a practicable alternative exists. Section 404(b)(1), 33 U.S.C. § 1344(b)(1) prohibits discharge of dredged or fill material into waters of the United States. The only wetlands that may be impacted by the proposed Response Action are small seep areas at the toes of the Glengarry and Gold Dust dumps and a vegetated area in the Como Basin that is adjacent to the area that will be capped. These areas will be avoided to the extent possible during construction and by reclaiming the excavated waste dump areas with suitable materials that do not adversely impact adjacent wetlands.

The Endangered Species Act (Applicable)

This statute and implementing regulations (16 U.S.C. §§ 1531 - 1543, 50 CFR Part 402, and 40 CFR § 6.302(h)) require that any federal activity or federally authorized activity may not jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify a critical habitat.

Threatened and endangered species are present in or near the District. The U.S. Fish and Wildlife Service has identified the grizzly bear, bald eagle, Canada lynx, and gray wolf as threatened and endangered species that may be present in the project area. No critical habitat was designated or proposed in the project area, although the New World Mining District lies within the Grizzly Bear Recovery Zone for the Yellowstone area. Long-term impacts to threatened and endangered species from the proposed action are not expected, although risk to grizzly bear mortality may be higher due to the increased use of the area. Also, displacement of wildlife species such as the grizzly bear may be increased by reclamation activities in the short-term.

Although construction and implementation of the preferred alternative will require an increased level of activity, long-term maintenance will not require a level of activity that is greater than that existing under current conditions. In the long term, mitigation of mining-related water quality impacts in the District should serve to enhance wildlife habitat by removing contaminants from the environment. The overall impact of response and restoration activities is neutral to beneficial to wildlife, although road improvements that are being done over the life of the project could have long-term impacts on wildlife due to increased traffic, increased traffic speeds, and increased use of the area.

Migratory Bird Treaty Act (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 with the USFWS during design and construction to ensure that cleanup does not unnecessarily impact migratory birds. The USDA Forest Service is involved with discussions with the USFWS to comply with this requirement, and measures will be taken to mitigate removal activities if adverse impacts are identified. The reclamation process will attempt to restore habitat and should have a long-term neutral to beneficial effect on migratory bird species, while reclamation activities may have a short-term disturbance or displacement effect on migratory bird species.

Bald and Golden 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 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. The USDA Forest Service is involved with discussions with USFWS to comply with this requirement, and measures would be taken to mitigate removal activities if adverse affects are identified. Bald eagles do not nest in the area,

although golden eagles may nest in the project area. Both species may pass through the area to forage or during migration. The project is unlikely to have adverse effects on these species. Overall, impact of mining reclamation should be neutral to beneficial for most wildlife species, while disturbance associated with reclamation will be short-term for most bird species.

c. Federal Action Specific Requirements

RCRA Requirements (Relevant and Appropriate)

RCRA hazardous waste requirements are not applicable to District Property wastes in accordance with 40 CFR § 261.4(b)(7) (the Bevill exemption). In addition, many RCRA regulations are not applicable because this removal action consolidates mining wastes from two waste dumps and places these wastes into an existing on-site repository. Nevertheless, certain RCRA hazardous waste regulations (which are identical to state hazardous waste regulations) concerning covering waste piles and runon/runoff controls have been determined to be relevant and appropriate in the handling of these wastes. The following regulations are relevant and appropriate:

- RCRA regulations found at 40 CFR §§ 264.310(a), and (b)(1), and (5) (regarding final cover, run-on and run-off controls), which are identical to state solid waste regulations, are relevant and appropriate requirements for the consolidation site to be used for waste management and disposal, although the 40 CFR Part 258 standards for solid wastes provide more specific guidance.

For work in the Como Basin, capping the metals-enriched soils includes elements typical of designs for Class II and RCRA waste disposal facilities. In particular, a composite cover system will utilize (from top to bottom) a vegetated cover consisting of salvaged and amended soil, a drainage layer to capture infiltrating precipitation, and a synthetic cover liner consisting of a geomembrane. Consolidated materials will be compacted as it is placed to prevent settling and damage to the soil cover system, and run-on will be diverted around the capped area. All run-on and runoff controls will be engineered to handle water flows that arise during spring runoff.

No point discharge of contaminants will be released from the capped Como Basin area. Engineering analysis of the performance of the cover liner predicts that essentially no leachate will migrate through the bottom of the capped waste.

Solid Waste Requirements (Relevant and Appropriate)

The Federal solid waste regulations (40 CFR Part 258) are not applicable because, under 40 CFR § 258.1(c), these criteria are only for new disposal units. This removal action will only consolidate metals-rich soils in the Como Basin and remove the Glengarry and Gold Dust waste dumps to an existing on-site facility. Siting and location regulations are not relevant and appropriate because no siting of a new unit is taking place. Nevertheless, certain solid waste regulations concerning covering waste piles and runon/runoff controls have been determined to be relevant and appropriate in the handling of these wastes. The following regulations are relevant and appropriate:

- Requirements described at 40 CFR §§ 258.60(a) and 258.61(a)(1), governing cover requirements and runon/runoff controls.

Surface Mining Control and Reclamation (Relevant and Appropriate),

Regulations promulgated under the Surface Mining Control and Reclamation Act (30 CFR, Part 816 and 784) cover reclamation requirements for coal and certain non-coal mining operations. Reclamation of the removed dump sites, capped metals-rich soils, and other disturbed areas will generally conform to these requirements. Revegetation requirements will follow prescriptions developed by the USDA Forest Service Rocky Mountain Research Station. These prescriptions are based on 23 years of site specific research involving reclamation of mine wastes at high altitudes and restoration of native plant communities. Revegetation prescriptions have been designed to regenerate under the natural conditions prevailing at the site. Site specific research indicates that revegetation will be permanent, diverse, predominantly native, and of the same seasonality and utility found in similar pre-disturbance areas. Cover, planting, and stocking specifications are based on local and regional conditions.

Erosion control will be accomplished using best management practices to prevent deterioration of water quality or quantity and prevent erosion resulting from roads. Following removal, revegetated areas will be capable of supporting designated land uses, will blend with the surrounding topography, and meet slope restrictions.

Air Standards - Clean Air Act (Applicable)

The state standards, promulgated in accordance with Section 109 of the Clean Air Act, are applicable to releases into the air from removal action activities, but the national ambient air standards are not. Ambient air standards for lead are promulgated at Administrative Rules of Montana (ARM) 17.8.222 as part of a federally approved State Implementation Plan (SIP), in accordance with the Clean Air Act of Montana, §§ 75-2-101 et seq., Montana Codes Annotated (MCA). Corresponding federal regulations are 40 CFR § 50.12. The lead standard provides that no person shall cause or contribute to concentrations of lead in the ambient air that exceed 1.5 micrograms per cubic meter ($\mu g/m^3$) of air, measured over a 90-day average.

Regulations promulgated at ARM 17.8.223 as part of the SIP (§§ 75-2-101 et seq., MCA) apply to particulate matter that is 10 microns in diameter or smaller (PM-10). Corresponding federal regulations are 40 CFR § 50.6. According to this standard, no person shall cause or contribute to

concentrations of PM-10 in the ambient air which exceed 150 $\mu g/m^3$ of air for a 24 hour average with no more than one expected exceedance per calendar year or 50 $\mu g/m^3$ of air on an annual average.

For the Como Basin/Glengarry Adit/Fisher Creek Response Action, sampling data indicated that lead concentrations are not at levels that are high enough to be of concern to human health. Furthermore, based on field investigation, dump materials are primarily of a grain size that is not susceptible to wind transport. Therefore, based on these characteristics, removal operations that involve excavation, loading, hauling, and placing wastes are not expected to exceed these two air quality standards. However, to ensure blowing dust is controlled, best management practices will be incorporated into the removal action as site conditions require mitigating actions.

Ambient air standards under Section 109 of the Clean Air Act are also promulgated for carbon monoxide, hydrogen sulfide, nitrogen dioxide, sulfur dioxide, and ozone. If emissions of these compounds were to occur at the site in connection with any cleanup action, these standards would also be applicable (40 CFR Part 50). Carbon monoxide, hydrogen sulfide, nitrogen dioxide, sulfur dioxide, or ozone are not expected to be generated during the removal action beyond those levels normally associated with internal combustion engines. Therefore, no measures will be needed to accommodate these standards.

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 material. No off-site transportation of wastes will occur in the Como Basin/Glengarry Adit/Fisher Creek Response Action. Transportation of waste materials will be done in such a manner as to eliminate the spread of waste along haul roads and to immediately cleanup any spills that may occur during haul operations.

Occupational Safety and Health Act (Applicable)

Occupational Safety and Health Administration requirements will be met by requiring appropriate safety training for all on-site workers during construction phase. Site activities will be conducted under the guidance of a Health and Safety Plan for the site per OSHA 29 CFR § 1910.120. Site personnel will have completed 40-hour hazardous waste operations and emergency response training and will be current with the 8-hour annual refresher training as required by OSHA 29 CFR § 1910.120.

d. Montana Contaminant Specific Requirements

Surface Water Quality Standards (Relevant and Appropriate)

Under the State of Montana Water Quality Act, §§ 75-5-101 et seq., MCA, the state has promulgated regulations to protect, maintain, and improve the quality of surface waters in the state. Although the point source discharge requirements of the Act are not applicable because the Como Basin/Glengarry Adit/Fisher Creek Response Action will not create any point source

discharge of contaminated water, the requirements listed below are relevant and appropriate water quality standards for the Como Basin/Glengarry Adit/Fisher Creek Response Action.

The State of Montana has classified the streams in the District as B-1. The definition of B-1 waters are waters that are suitable for drinking, culinary and food processing (after conventional treatment), bathing, swimming and recreation, growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers, and agricultural and industrial water supply. The B-1 stream classification also sets forth standards for coliform bacteria, dissolved oxygen content, pH, turbidity, temperature, sediment or floating solids, color, and concentrations of toxic or harmful parameters as specified in Circular WQB-7. The state is also in the process of developing total maximum daily loads (TMDLs) for the Cooke City Planning Area. A TMDL is a pollutant budget developed at a level where water quality standards will not be exceeded. The TMDL accounts for loads from point and non-point sources in addition to natural background loads. A final Water Quality Restoration Plan for the Cooke City Planning Area was released by the DEQ on September 23, 2002.

On June 4, 1999, the Montana Board of Environmental Review adopted a rule for temporary water quality standards on portions of Fisher Creek, Daisy Creek, and the Stillwater River. Temporary standards will be in effect for 15 years, at which time the water quality issues in the District will be reevaluated by the USDA Forest Service and the Montana Department of Environmental Quality.

For the Como Basin/Glengarry Adit/Fisher Creek Response Action, metals-rich soils and waste rock dumps that will be capped or removed are all located in the Fisher Creek watershed. The applicable temporary water quality standards for Fisher Creek apply at surface water station CFY-2, which is located about three miles below the Glengarry Adit discharge at the confluence of Fisher Creek with the Clarks Fork of the Yellowstone. Narrative standards apply at any point on Fisher Creek, upstream of CFY-2. Narrative standards are based on plus or minus two (2) standard deviations from the mean for the sampling period of record. Numeric temporary standards for CFY-2 are listed below in micrograms per liter:

Parameter	CFY-2 (µg/L)
Aluminum	470
Cadmium	NA
Copper	110
Iron	750
Lead	2
Manganese	82
Zinc	44
pH	> 5.7 s.u.

Additional restrictions on any discharge to surface waters are included in ARM 17.30.637 (Applicable), which prohibits discharges containing substances that will:

(a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;

(b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;

(c) produce odors, colors, or other conditions that create a nuisance, or render undesirable tastes to fish flesh or make fish inedible;

(d) create concentrations or combinations of materials that are toxic or harmful to human, animal, plant, or aquatic life;

(e) create conditions that produce undesirable aquatic life.

ARM 17.30.1203 (Applicable) adopts and incorporates the provisions of 40 C.F.R. Part 125 for criteria and standards for the imposition of technology-based treatment requirements in MPDES permits. The permit requirement would not apply to on-site discharges because it is not substantive, and the substantive requirements of Part 125 would not be applicable because there will be no point source discharge at the site.

One relevant and appropriate provision of the Act 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. In this instance, the selected Response Action is in compliance because it prevents future pollution of state waters, and does not cause additional pollution.

Temporary water quality standards are currently being met in Fisher Creek under existing conditions. However, contaminant-specific standards associated with the Montana Water Quality Act, with the exception of chromium (which is already in compliance), will not be achieved under the preferred alternative without further remediation as part of a subsequent cleanup phase. The reasons for this are several, including the presence of a large body of near-surface sulfide mineralization present in the Como Basin and headwaters of Fisher Creek that contributes metal and pH impacts to groundwater and surface water. This natural source of impacted drainage may be at levels that preclude aquatic life in Fisher Creek, regardless of mining impacts present in the headwaters area.

Surface water quality at Station SW-3 will improve as a direct result of implementing the preferred alternative. Copper and iron loading from the Como Basin will be considerably reduced by implementing the preferred capping alternative if Alternative CB-3B or CB-3C is implemented because percolation of water through metal-rich soils would be reduced by over 85% from existing conditions. Removal of the Glengarry and Gold Dust dumps will eliminate approximately 85% of the remaining waste rock in the Fisher Creek headwaters.

With the implementation of the preferred alternative for the Glengarry Adit, copper, iron, and zinc loading will be reduced considerably, especially during low flow periods. Loading from the Glengarry Mine is significant during both high and low flow conditions. During low flow conditions from early August through late May the adit contributes almost 90% of the metal

loading to upper Fisher Creek. During high flow conditions the Glengarry Mine contributes about 20% of the copper, 65% of the iron, 40% of the manganese, and 10% of the sulfate. Reduction of the flow from the Glengarry Mine will lead to a very significant reduction in loading during low flow and a more modest but still significant reduction in loading at high flow.

Water chemistry in the reaches below Station SW-3 appears to be controlled by mineral precipitates and sorption of metals, and by downgradient groundwater contributions rather than by upstream loading, so the impact to water quality in Fisher Creek below Station SW-3 are somewhat uncertain.

Groundwater Pollution Control System (Applicable)

ARM 17.30.1006 (Applicable) classifies groundwater into Classes I through IV based on the present and future most beneficial uses of the groundwater, and states that groundwater is to be classified according to actual quality or actual use, whichever places the groundwater in a higher class. Class I is the highest quality class; Class IV the lowest. Based upon its specific conductance, the great majority of the groundwater in the District should be considered Class I groundwater.

Groundwater quality in the Fisher Creek drainage varies considerably. With the exception of iron and manganese concentrations, groundwater in the Fisher Creek valley bottom complies with groundwater quality standards in both shallow alluvium and Precambrian granite water-bearing units. Iron and manganese are ubiquitous in the District, and concentrations of these two metals are believed to be partially controlled by natural sources in bedrock. Groundwater on the east flank of Fisher Mountain (sampled from well Tracer 5, which is completed in the Fisher Mountain Porphyry) exceeds groundwater contaminant-specific standards for copper, iron, and manganese and has an acidic pH.

ARM 17.30.1011 (Applicable) generally prohibits the degradation of groundwater, and the Response Action will comply with this ARAR because capping of the mine wastes and removal of the Glengarry and Gold Dust dumps should result in improvements in groundwater quality and prevent further degradation. Grouting, plugging, and backfilling the Glengarry Adit will eliminate a source of oxygen to groundwater, thereby reducing the production of acidity and solution of metals in groundwater that currently occurs in the underground workings.

Air Quality

In addition to the standards identified in the federal action specific ARARs above, the State of Montana has identified certain air quality standards in the action specific section of the State action specific ARARs below.

e. Montana Location Specific Requirements

Floodplain and Floodway Management Act and Regulations (Applicable)

The Floodplain and Floodway Management Act (§§ 76-5-401 et seq., MCA) and regulations specify types of uses and structures that are allowed or prohibited in the designated 100-year floodway and floodplain. While no designated 100-year floodplain will be affected by the Como Basin/Glengarry Adit/Fisher Creek Response Action, the Act and certain floodplain management regulations (ARM 36.15.602, .603, .604, .605) have been designated as applicable because excavation of the Glengarry Dump will be conducted in the Fisher Creek floodplain. Compliance with the substantive portions of the these regulations will be achieved because the Glengarry dump will be removed from the floodplain, the stream channel reconstructed through the former dump area, and no permanent structures or obstructions will be placed in the floodplain.

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 a previous response action in the District (Selective Source Response Action), a lined and capped on-site facility was constructed, and the wastes disposed under this Response Action will be placed at this facility. These regulations do not apply to the response actions proposed for the Como Basin or the Glengarry Adit.

Natural Streambed and Land Preservation Standards (Applicable)

Sections 87-5-502 and 504, MCA, (Applicable -- 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 vary 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. The requirement that any such project must eliminate or diminish any adverse effect on fish or game habitat is applicable to the state in approving removal actions to be conducted. The Natural Streambed and Land Preservation Act of 1975, §§ 75-7-101 et seq., MCA, (Applicable -- substantive provisions only) includes similar requirements and is applicable to private parties as well as government agencies.

ARM 36.2.410 (Applicable) establishes minimum standards which would be applicable if a removal action alters or affects a streambed, including any channel change, new diversion, riprap or other streambank protection project, jetty, new dam or reservoir or other commercial, industrial or residential development. No such project may be approved unless reasonable efforts will be made consistent with the purpose of the project to minimize the amount of stream channel alteration, insure that the project will be as permanent a solution as possible and will create a reasonably permanent and stable situation, insure that the project will pass anticipated water flows without creating harmful erosion upstream or downstream, minimize turbidity, effects on fish and aquatic habitat, and adverse effects on the natural beauty of the area and

insure that streambed gravels will not be used in the project unless there is no reasonable alternative. Soils erosion and sedimentation must be kept to a minimum. Such projects must also protect the use of water for any useful or beneficial purpose. See §75-7-102, MCA.

The Natural Streambed and Land Preservation Act will be complied with by using earth and natural materials to construct diversion channels and to armor existing channels below the Como Basin that are currently exposed to severe erosion. The natural streambed and land preservation act will be complied with at the Glengarry and Gold Dust dumps in a similar manner by reconstructing stream portions with earth and natural materials and sufficiently protecting those locations with erosion control techniques so that the bed and banks are protected from flood erosion. Reconstructed stream segments will be designed to provide hydraulic stability. All disturbed areas will be managed during construction to minimize erosion.

f. Montana Action Specific Requirements

In the following action-specific ARARs, the nature of the action triggering applicability of the requirement is stated in parentheses as part of the heading for each requirement.

Groundwater Act (Applicable) (Construction and maintenance of groundwater wells)

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 to prevent waste, contamination, or pollution of groundwater.

Monitoring wells have been constructed in the headwaters of Fisher Creek to monitor groundwater levels and water quality following capping of the Como Basin. Any additional monitoring wells will be constructed in accordance with state monitoring well regulations to assure that pollution will not be spread between aquifers. Since monitoring wells are not producing wells, no groundwater will be wasted.

Air Quality Regulations (Applicable) (Excavation/earth-moving; transportation)

Dust suppression and control of certain substances likely to be released into the air as a result of earth moving, transportation and similar actions 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 17.8.604 (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 17.8.612 or 611.

No burning of waste will be conducted to complete this project.

ARM 17.8.308(1) and (2) (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. 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." ARM 17.8.308(1) and (2) (Applicable) and ARM 17.8.304 (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 following 30-day average: 10 grams per square meter. ARM 17.8.220 (Applicable).

ARM 17.8.308(4) (Applicable) requires that any new source of airborne particulate matter that has the potential to emit less than 100 tons per year of particulates shall apply best available control technology (BACT); any new source of airborne particulate matter that has the potential to emit more than 100 tons per year of particulates shall apply lowest achievable emission rate (LAER). The BACT and LAER standards are defined in ARM 17.8.301. Precautions will be taken during construction to limit dust emissions from removal activities.

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 removal. Such measures include watering 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.

Fugitive dust will be generated with earth moving activities and transportation of materials on unpaved roads. Road dust will be suppressed by the contractor through watering.

Solid Waste Regulations (Applicable)

The State regulations concerning final cover requirements, runon/runoff controls, and monitoring that are more specific than the Federal regulations are applicable to the Response Action. To some extent these regulations are superceded by State mine reclamation regulations, which are more specific. Implementing the preferred alternative for this Response Action will comply with the requirements for final cover, runon/runoff controls, and monitoring. Compliance with these requirements is explained in the discussion on Reclamation Requirements (below) and the Federal Action Specific Requirements section (above).

Reclamation Requirements (Relevant and Appropriate)

The Strip and Underground Mine Reclamation Act, §§ 82-4-201 et seq., MCA, technically applies to coal and uranium mining, but that statute and the regulations promulgated under that

statute and discussed in this section set out the standards that mine reclamation should attain. To the extent they are more stringent than the federal regulatory scheme contained in the Surface Mining Control and Reclamation Act (see 30 CFR Parts 789, 816), the State requirements identified here have been determined to be relevant and appropriate requirements for this action.

Section 82-4-231 (Relevant and Appropriate) requires the reclamation and revegetation of the land. 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 (k) 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.

Revegetation will be an integral part of the Como Basin/Glengarry Adit/Fisher Creek Response Action design and construction package. Utilizing nearly 25 years of site specific revegetation trials, the USDA Forest Service has developed revegetation prescriptions that substantially comply with all requirements of the Strip and Underground Mine Reclamation Act. Revegetation is an integral part of the removal action because vegetation protects the removal sites and the Como Basin cap from erosion. Disturbed areas will be revegetated in accordance with the revegetation prescriptions such that revegetation is rapid and effective.

Reclamation Activities - Hydrology Regulations (Relevant and Appropriate)

The hydrology regulations provide guidelines for addressing the hydrologic impacts of mine reclamation activities and earth moving projects and are relevant and appropriate for addressing these impacts associated with the Como Basin/Glengarry Adit/Fisher Creek Response Action.

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 drainages to avoid contamination should 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.

During construction of the Como Basin/Glengarry Adit/Fisher Creek Response Action, storm water controls will be in place and vegetation will be established following construction to minimize erosion. Temporary diversion channels needed to direct stormwater runoff from the construction area will be constructed to minimize erosion. Acid-forming metals-rich soils will be consolidated and capped beneath an engineered cover in the Como Basin. The capping system will minimize any contact of waste with surface water. The Glengarry and Gold Dust dump removals will remove 85% of the remaining waste rock from the Fisher Creek headwaters.

ARM 17.24.635 through 17.24.637 (Relevant and Appropriate) set forth requirements for temporary and permanent diversions. Temporary diversion channels will be designed in consideration of the drainage basin contributing flow to the channels. Erosion will be avoided by using rock lining.

ARM 17.24.638 (Relevant and Appropriate) specifies sediment control measures to be implemented during operations. An erosion control plan will be required that sets forth methods to control sediment during construction.

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. Sediment basins will be designed with overflow pipes that discharge to existing drainages. Drainages will be rock lined at the discharge points.

Reclamation and Revegetation Requirements (Relevant and Appropriate)

ARM 17.24.501 (Relevant and Appropriate) set forth general backfilling and final grading requirements. Excavated areas will be backfilled to blend with the surrounding undisturbed topography. Backfill will be suitable for establishment of vegetative cover.

ARM 17.24.519 (Relevant and Appropriate) provides that an operator may be required to monitor settling of regraded areas. Long-term monitoring of revegetated areas has been established as a project objective; planning documents provide guidance for long-term monitoring.

ARM 17.24.702 (Relevant and Appropriate) requires that during the redistributing and stockpiling of soil (for reclamation):

- Regraded areas must be prepared 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;

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

- Redistributed soil must be reconditioned by subsoiling or other appropriate methods.

These criteria will be addressed through the design of the Como Basin/Glengarry Adit/Fisher Creek Response Action. Regraded materials will have slopes that match the surrounding topography and will generally be constructed to be no steeper than 3H:1V. Thickness of topsoil or growth medium will be specified in the contract documents. Regraded soil surfaces will be chiseled using standard farming techniques to promote plant establishment.

ARM 17.24.703 (Relevant and Appropriate). 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 and utility as the vegetation 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. The vegetative cover must also be capable of meeting the criteria set forth in ?82-4-233, MCA. 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 below regarding substitution of introduced species for native species.)

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.
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.

All revegetation requirements included in the above ARMs will be complied with using site specific revegetation research results. Nearly 25 years of research was conducted by the USDA Forest Service at the site, primarily through the guidance of Dr. Ray Brown, an eminent scientist

stationed at the Rocky Mountain Research Station in Logan, Utah. Through his work, the USDA Forest Service has developed revegetation prescriptions that substantially comply with revegetation requirements. All disturbed areas will be revegetated in accordance with the revegetation prescriptions such that revegetation is effective, permanent, self-sustaining, and native. Soil amendments and revegetation treatments such as lime, fertilizer, mulch, erosion control blankets, and organic amendments are all included in the revegetation prescriptions.

g. Non-Compliance with ARARs

The preferred Response Action selected for the cleanup of mining-related impacts in the headwaters of Fisher Creek will move compliance with ARARs in a positive direction. Surface water and groundwater quality is expected to improve to some extent by implementing the preferred alternative. Additional cleanup efforts will be evaluated as necessary, depending on results achieved. Implementing the preferred Response Action will not hinder further Response Actions that may be required at the site

7. Project Schedule

The Como Basin/Glengarry Adit/Fisher Creek Response Action should require three to four construction seasons to complete. The Glengarry Adit closure will be conducted over a period of two years beginning in 2003. An engineering design will be prepared during the winter of 2002 and a construction package will be advertised for bid in 2003. Construction in 2003 will consist of grouting the Como raise at the surface in the Como Basin, grouting the 1050 roof leak, and preparing the Glengarry tunnel for closure by removing mud from the underground workings. In 2004, closure work will involve backfilling and constructing a plug in the Como raise, constructing plugs in the tunnel, and backfilling the tunnel.

Work in the Como Basin is planned to begin in 2005. Earthwork, capping, and reclamation activities should be completed during the 2005 construction season. Removal of the Glengarry and Gold Dust waste dumps, and constructing surface controls at specific remaining dumps in Fisher Creek may also be done in 2005.

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B. Estimated Costs

The total cost to implement the preferred Response Action alternative for the Como Basin/Glengarry Adit/Fisher Creek Response Action is $6.5 million. A breakdown of costs for each source area is shown in Table 2.

TABLE 2
SUMMARY OF ESTIMATED COSTS FOR THE PREFERRED ALTERNATIVE
New World Mining District Response and Restoration Project
Como Basin/Glengarry Adit/Fisher Creek Response Action

Preferred Alternative	Cost
Como Basin Source Area – CB-3B	$ 1,918,000
Fisher Creek Source Area – FC-3 (Modified for removal of the Glengarry and Gold Dust Waste Rock Dumps)	$ 2,010,000
Glengarry Adit Source Area (Combination of GA-2, GA-4, GA-5A, and GA-6)	$ 2,666,000
TOTAL ESTIMATED RESPONSE ACTION COST	**$ 6,594,000**

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

If no action is taken to stabilize wastes and isolate wastes from surface water and groundwater, the site will continue to be degraded and present a risk to ecological receptors.

VII. OUTSTANDING POLICY ISSUES

None

VIII. ENFORCEMENT

Although the USDA Forest Service specifically denies any liability in this situation, it will be the "lead agency" for all response actions occurring on National Forest System Lands, as defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR part 300, and all response actions will be undertaken in a manner not inconsistent with the NCP. A Consent Decree and Settlement Agreement between the United States, several signature parties, and CBMI is the legal mechanism that outlines responsibilities of the parties to the agreement, the process, and the funds that will be used for cleanup.

IX. RECOMMENDATION

This decision document represents the Como Basin/Glengarry Adit/Fisher Creek Response Action for the capping of metals-rich soils in the Como Basin, removal and disposal of the Glengarry and Gold Dust waste dumps, implementing surface controls at selected dumps in the Fisher Creek drainage, and closure of the Glengarry Adit by a combination of grouting, plugging, and backfilling. The project is situated in the Gardiner Ranger District of the Gallatin National Forest. This document was developed in accordance with CERCLA, as amended, and is not inconsistent with the NCP. This decision is based on the administrative record for the site. Conditions at the site meet the NCP section 300.415(b)(2) criteria for a removal and I recommend your approval of the proposed removal action.

_____ _____

Mary Beth Marks Date
On-Scene Coordinator (OSC)

I concur with the recommendation to implement the proposed alternatives as described in this Action Memorandum and attached Engineering Evaluation/Cost Analysis for the Como Basin/Glengarry Adit/Fisher Creek Response Action, New World Mining District Response and Restoration Project.

_____ _____

Ken Britton Date
District Ranger
Gardiner Ranger District

I concur with the recommendation to implement the proposed alternatives as described in this Action Memorandum and attached Engineering Evaluation/Cost Analysis for the Como Basin/Glengarry Adit/Fisher Creek Response Action, New World Mining District Response and Restoration Project.

_____ _____

Rebecca Heath Date
Forest Supervisor
Gallatin National Forest

I concur with the recommendation to implement the proposed alternatives as described in this Action Memorandum and attached Engineering Evaluation/Cost Analysis for the Como

Basin/Glengarry Adit/Fisher Creek Response Action, New World Mining District Response and Restoration Project.

_____ _____

Bob Kirkpatrick Date
USDA Project Coordinator
Northern Region

I approve of the proposed removal action as outlined in the Action Memorandum and attached Engineering Evaluation/Cost Analysis for the Como Basin/Glengarry Adit/Fisher Creek Response Action, New World Mining District Response and Restoration Project.

_____ _____

Bradley E. Powell Date
Regional Forester
Northern Region