EARLY ACTION - INTERIM RECORD OF DECISION

OPERABLE UNIT 2 WATER TREATMENT OPERATIONS

GILT EDGE MINE NPL SITE LAWRENCE COUNTY, SOUTH DAKOTA

April 2001

U.S. Environmental Protection Agency
999 18th Street, Suite 500
Denver, Colorado 80202

EARLY ACTION - INTERIM RECORD OF DECISION

OU 2 - WATER TREATMENT OPERATIONS
GILT EDGE MINE NPL SITE
LAWRENCE COUNTY, SOUTH DAKOTA

The U.S. Environmental Protection Agency (EPA), with the concurrence of the South Dakota Department of Environment and Natural Resources (SDDENR), presents this Early Action - Interim Record of Decision (ROD) for the operation of the Water Treatment Plant Operable Unit (OU) 2 of the Gilt Edge Mine Superfund Site, Lawrence County, South Dakota. The Early Action Interim ROD is based on the Administrative Record for Water Treatment Plant (OU2), including the Hazard Ranking Scoring package, EPA/Bureau of Reclamation (BOR) Conceptual Closure Plan, the Proposed Plan, the public comments received, and responses by EPA and SDDENR. The ROD presents a brief summary of current site conditions, potential risks to human health and the environment, and the Selected Remedy. EPA followed the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, the National Contingency Plan (NCP), and EPA guidance (EPA, 1999) in preparation of the ROD. The three purposes of the ROD are to:

1. Certify that the remedy selection process was carried out in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9601 *et seq.*, as amended by the Superfund Amendments and Reauthorization Act (collectively, CERCLA), and, to the extent practicable, the NCP;

2. Outline the engineering components and remediation requirements of the Selected Remedy; and

3. Provide the public with a consolidated source of information about the history, characteristics, and risk posed by the present operation of the Water Treatment Plant (OU2), as well as a summary of the modifications to water treatment operations that were considered, their evaluation, the rationale behind the Selected Remedy, and the agencies consideration of, and responses to, the comments received.

The ROD is organized into three distinct sections:

1. The **Declaration** section functions as an abstract and data certification sheet for the key information contained in the ROD and is the section of the ROD signed by the EPA Regional Administrator.

2. The **Decision Summary** section provides an overview of the OU2 characteristics, the alternatives evaluated, and the analysis of those options. The Decision Summary also identifies the Selected Remedy and explains how the remedy fulfills statutory and regulatory requirements; and

3. The **Responsiveness Summary** section addresses public comments received on the Proposed Plan and other information in the Administrative Record.

Part 1

The Declaration

1.1 Site Name and Location

The Gilt Edge Mine (EPA ID No. SDD987673985) is located southeast of the town of Lead in the northern Black Hills in Lawrence County, South Dakota. Specifically, the site is in parts of Sections 4, 5, 6, 7, 8 and 9, T. 4 N., R. 4 E. of the Deadwood South Quadrangle, Lawrence County, South Dakota (U. S. Geological Survey 1971). (Figure 1-1).

1.2 Statement of Basis and Purpose

This decision document presents the Selected Remedy for an early interim action at the Gilt Edge Mine Operable Unit (OU) 2, Water Treatment, in South Dakota, which was chosen in accordance with CERCLA, as amended by SARA, and to the extent practicable, the NCP. South Dakota concurs with the Selected Remedy.

1.3 Assessment of the Site

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 Description of the Selected Remedy

The selected remedy for this action is to: (1) maintain site control and operational infrastructures; (2) collect metal-laden toxic waters and acid rock drainage (ARD) for treatment in the existing Water Treatment Plant; (3) upgrade the Water Treatment Plant with ferric iron addition; and, (4) to implement optimized onsite sludge management using on-site storage basins or sludge filtering. Treated water will be discharged to Strawberry Creek. Needed repairs to the administrative building will also be performed.

1.5 Statutory Determinations

This interim action (1) is protective of human health and the environment in the short term and is intended to provide adequate protection until a subsequent Record of Decision can be signed, (2) complies with those federal and state requirements that are applicable or relevant and appropriate for this limited-scope action, and (3) is cost effective. Although this interim action is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does use treatment and thus supports that statutory mandate. Because this action does not constitute the final remedy for the

operable unit, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element although partially addressed in this remedy, will be addressed by subsequent response actions. Subsequent actions are planned to address fully the threats posed by conditions at the health-based levels at this operable unit. Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an interim action ROD, review of this operable unit and remedy will be ongoing as EPA continues to develop remedial alternatives for the operable unit.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administration Record file for this site.

- Chemicals of concern and their respective concentrations.
- Baseline risk represented by the chemicals of concern.
- Cleanup levels established for chemicals of concern and the basis for these levels.
- How contaminated waters constituting principal threats are addressed.
- Estimated capital and operation and maintenance (O&M) costs are presented.
- Key factor(s) that led to selecting the remedy (i.e. describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision).

Max H. Dodson
Assistant Regional Administrator
Ecosystems Protection and Remediation
U.S. Environmental Protection Agency, Region VIII

4/23/01
Date

Concurrence:

Tim Tollefsrud, Director
Division of Environmental Services
South Dakota Department of Environment and Natural Resources

4/5/01
Date

Part 2

Decision Summary

2.1 Site Name, Location, and Description

The Gilt Edge Mine (EPA ID No. SDD987673985) is located southeast of the town of Lead in the northern Black Hills in Lawrence County, South Dakota. Specifically, the site is in parts of Sections 4, 5, 6, 7, 8 and 9, T. 4 N., R. 4 E. of the Deadwood South Quadrangle, Lawrence County, South Dakota (U. S. Geological Survey 1971). The lead agency for the site is the Environment Protection Agency (EPA) with support from the South Dakota Department of Environment and Natural Resources (SDDENR). The source of response funds for this site are expected to be the Superfund trust fund, with South Dakota providing ten percent of the cleanup costs as required by CERCLA.

The Gilt Edge Mine is an abandoned 258-acre open pit, former cyanide heap leach gold mine, developed in highly sulfidic rock. The area has been mined intermittently by several owners from the late 1800s to the present. Cyanide leaching, mercury amalgamation, and zinc precipitation among other methods were used to recover gold. Placement of the Gilt Edge Mine site on the National Priorities List (NPL) is based on releases of cadmium, cobalt, copper, manganese, lead and zinc that have been documented in Strawberry Creek, a tributary to Bear Butte Creek, and Bear Butte Creek. Strawberry Creek and Bear Butte Creek are classified by the State of South Dakota as

- cold water marginal fish life propagation waters;
- limited-contact recreation waters,
- fish and wildlife propagation, recreation, and stock watering waters, and
- irrigation waters .

2.2 Site History and Enforcement Activities

2.2.1 Site History

Mining activities began at the site in 1876 when the Gilt Edge and Dakota Maid claims were located. Historical underground mining operations extracted sulfide-bearing gold ores from irregular deposits in veins and fracture zones in the igneous rocks.

The property of the Gilt Edge Mines, Inc. is a consolidation of claims including the Sunday, Rattlesnake Jack, Gilt Edge, Dakota Maid, Oro Fino groups, and others. The property has had a number of owners and operators over the past century (BOR 2000). The Oro Fino Mine was the first mine in the area, and it began and ended operations in 1893. No mining was conducted again until 1900. The Hoodoo-Union Hill group of mines was located adjacent to the Gilt Edge group. The Hoodoo-Union Hill group was active around 1900. The Anchor Mountain mine was also historically active in 1900. The original Gilt Edge Mining Company operated from 1900 to 1902. No mining was conducted between 1902 and 1905. The Gilt Edge-Maid Gold Mining Company operated from 1905 to 1916. Production of gold and silver, and small amounts of copper, lead, and zinc are reported from the properties at Gilt Edge. Mining continued sporadically until 1916. No mining occurred at the Gilt Edge Mine between 1916 and 1935.

The Gilt Edge Mining Company was incorporated in South Dakota in 1935; the mine reopened in 1937 and operated until 1941 (EPA 2000). In 1938, the Gilt Edge Mine milling operation used a cyanidization gold extraction process that was capable of processing 125 tons of ore per day. Mercury amalgamation was used on the jig concentrate, while zinc precipitation was used on the flotation solids (URS Operating Systems [UOS] 1999).

Production of gold and silver, along with small amounts of copper, lead, and zinc were reported from the properties at Gilt Edge. Copper caused losses in the cyanide circuit in 1940 which prompted management to install flotation cells; the copper concentrates were sold to Montana smelters. The mines also produced a small amount of tungsten in 1941. Underground mines include the Gilt Edge, Pyrite, Rattlesnake Jack, Hoodoo, Union Hill, and Anchor. The underground mining operations broke through to the surface leaving gloryhole openings and some limited surface mining at the site (UOS 1999).

Mill tailings were deposited in Strawberry Creek and Bear Butte Creek by Gilt Edge Mines, Inc. at the request of the residents of Galena and Sturgis in an effort to have the tailings plug up sink holes in Bear Butte Creek to preserve stream flow through the towns (EPA 2000). Mill tailings were discharged to Strawberry Creek until the mine closed in 1941. Piles of acidic tailings were left along Strawberry Creek. These tailings continually discharged acid and metals into Strawberry Creek, and contributed to sediment loads as the piles eroded. During the early 1980s, the SDDENR observed several tens of thousands of tons of acid-generating tailings in upper Strawberry Creek (UOS 1999). A spring at the base of these tailings was discharging water with a pH of 1.9. Underground mine entrances and shafts were also discharging acidic water and metals (EPA 2000). No aquatic life was observed in Strawberry Creek at that time.

In 1984, Gilt Edge, Inc. applied for a permit to begin a heap leach operation. By that time, Gilt Edge, Inc. had acquired the claims of the Hoodoo-Union Hill and Anchor Hill Mining

companies. Gilt Edge, Inc. was acquired by Brohm Mining Corporation (BMC) before a permit was issued (UOS 1999).

In 1986, the SD Board of Minerals and Environment issued South Dakota Mining Permit No. 439 to Brohm Mining Corporation (BMC) for the open pit/heap leach operations (UOS 1999). The permit contained several conditions that addressed the tailings and the potential for ARD. Over 150,000 tons of relic tailings were removed from the upper Strawberry Creek drainage by BMC beginning in 1993. The permit contained a condition that did allow the use of some of the tailings for the construction of the heap leach pad liner. Other tailings were mixed with fly ash from a local coal-fired power plant; these amended tailings were placed on upper portions of the pit benches and were topsoiled in 1994 (UOS 1999). Another condition of the permit required Brohm to install a pumpback system designed to prevent acid discharges from the mine workings from entering Strawberry and Bear Butte Creeks. Construction of the open-pit mine and cyanide heap leaching facilities was initiated in August 1987. Mining of the Dakota Maid and Sunday open pits was completed in 1992, which resulted in the removal of old glory hole openings.

In 1991, cyanide leaked from the cyanide heap leach pad into Strawberry Creek and Bear Butte Creek. Unpermitted discharges of acid water, aluminum, cadmium, copper, lead, and zinc from two areas were identified by EPA during an inspection in 1992 under the National Pollutant Discharge Elimination System (NPDES). In 1993, EPA issued an NPDES surface water discharge permit to BMC to address metals and cyanide discharges. Three NPDES compliance points were designated including one in Strawberry Creek, and two in Ruby Gulch, an intermittent tributary to Bear Butte Creek (see Section 2.5.8). NPDES permit violations based on low pH and levels in excess of permitted concentrations of aluminum, cadmium, copper, iron, manganese and zinc have occurred on several occasions since the permit was issued.

Previous work done by BMC's consultant, OEA Research, Inc., documents the impact to benthic macro invertebrate communities along the foot of Strawberry Creek as well as upstream and downstream of the confluence of Strawberry Creek with Bear Butte Creek (UOS 1999). ARD from the Ruby Waste Dump was first detected in 1993.

Subsequent operations by BMC developed the North and Southeast Langley Pits and the Anchor Hill pit areas. A large-scale mining permit for the Anchor Hill deposit was issued by the State of South Dakota on January 19, 1996. The Anchor Hill project was split into Phase I located on private land and Phase II on USDA Forest Service land. Mining of the Phase I deposit was initiated in May of 1996 and completed by August of 1997. The Langley area was mined at the same time (1996-1997) as Anchor Hill Phase I.

Phase II of the Anchor Hill project was delayed because of the need for completion of an Environmental Impact Statement by the USDA Forest Service. A favorable Forest Service decision was issued for Phase II of Anchor Hill in November 1997. However, in response to appeals, the USDA Forest Service withdrew its approval on February 18, 1998. On May 21, 1998, BMC reported that it would abandon the site by May 29, 1998. The state filed for a Temporary Restraining Order to prevent BMC's abandonment of the site. The Temporary Restraining Order was granted on May 29, 1998 in Circuit Court in Sturgis, SD. The Temporary Restraining Order was followed by a Preliminary Injunction granted on June 5, 1998 in Circuit Court in Deadwood, SD. BMC's parent company, Dakota Mining Corporation, filed for bankruptcy in Canada in July 1999. SDDENR assumed water treatment operations using the South Dakota Regulated Substance Response Fund in 1999 and sought NPL listing from EPA in February 2000. The EPA Region 8 Emergency Response Program assumed water treatment operations in August 2000.

2.2.2 Enforcement-Related Activities

The following summarizes the history of documented releases of hazardous substances into surface water and enforcement actions at the site.

December 1939 through September 1941 - Mine tailings were discharged down Strawberry Creek and into Bear Butte Creek. When the mine closed in 1941, piles of acidic tailings were left along Strawberry Creek. These tailings continually discharged acid and metal-laden water into the creek, until they were removed by Brohm Mining Corporation (BOR 2000).

June 20-21, 1991 - Cyanide leaked from the cyanide heap leach pad and was released into Strawberry Creek and Bear Butte Creek. Sodium cyanide was used in the heap leach process to extract gold from crushed ore (EPA 2000). The SDDENR issued Brohm a Notice of Violation (NOV) and Order and received a penalty of $99,800.

1991 - A Preliminary Assessment of the Gilt Edge Mine site was prepared in 1991 by the SDDENR.

May 19, 1992 - EPA conducted an NPDES Inspection and found that two areas were discharging without a permit: (1) water seeping from the toe of Ruby Repository, and (2) pollutants from several point sources entering the Strawberry Creek diversion culvert through sedimentation ponds. The pH of the water from the toe of Ruby Repository was low and contained the following pollutants: aluminum, cadmium, copper, lead, and zinc; the pH of water discharged to Strawberry Creek was also low and contained the following pollutants: AMD, aluminum, cadmium, copper, iron, lead, and zinc (EPA 2000).

August 10, 1992 - EPA transmitted an inspection report to Brohm requiring application for a NPDES permit (EPA 2000).

November 24, 1992 - EPA issued Findings of Violation and Order for Compliance setting forth monitoring requirements and interim performance standards for Strawberry Creek and Ruby Gulch (EPA 2000).

April 19, 1993 - SDDENR issued a Notice of Violation based on low pH and concentrations of sulfate, aluminum, copper, iron, manganese, and zinc in the Ruby Gulch discharge (EPA 2000).

September 14, 1993 - EPA executed an Order for Compliance on Consent, which superceded the November 24, 1992 order (EPA 2000).

September 15, 1993 - EPA issued NPDES permit Number SD-0026891 to Brohm (EPA 2000).

February 15, 1994 - SDDENR issued a letter regarding NPDES permit violations at Compliance Point 002 in Ruby Gulch (for pH, cadmium, copper, and zinc) in February 1994 (EPA 2000).

March 31, 1994 - EPA issued a Notice of Proposed Assessment of Class II Civil Penalty on NPDES permit Number SD-0026891 (EPA 2000).

August 25, 1994 - EPA issued a Consent Order based on permit violations including February 1994 violations in Ruby Gulch (EPA 2000).

February 20, 1997 - The SDDENR issued a NOV for the discharge of acid mine discharges into Strawberry Creek. Brohm paid a $5,400 penalty.

September 15, 1997 - The SDDENR issued a NOV for two discharges of acid mine discharges into Strawberry Creek. Brohm paid an $18,000 penalty.

March 31, 1994 through January 31, 2000 - Numerical violations of NPDES permit limits at Compliance Points 001 and 002 (EPA 2000).

September 5, 1998 - SDDENR issued a Notice of Violation and Order for Compliance for NPDES permit violations (including cadmium, copper, zinc) at Strawberry Creek Compliance Point 001in 1996, 1997, and 1998 (EPA 2000).

July 1999 - The SDDENR averted an acid water discharge by taking over necessary water treatment operations at the site using the State's Regulated Substance Response Fund.

SDDENR maintained the water treatment plant to remove metals using standard pH adjustment methods with sludges discharged back into an open pit.

1999 - UOS prepared the Site Investigation (SI) for the site in 1999. Soil, sediment, and surface water samples were collected and analyzed for heavy metals and cyanide during the SI (UOS 1999).

February 2000 - The Governor of South Dakota requested that EPA propose the site for the Superfund National Priorities List (NPL) and provide emergency response, as well as long term remedial cleanup. The Site was proposed for NPL listing on May 11, 2000. The final listing of the site was on December 1, 2000.

Present - Superfund removal and remedial programs have begun cleanup remedial investigations and feasibility studies. The EPA Region 8 Emergency Response Team has been maintaining interim water-treatment operations since August 2000. Site management and water treatment requirements are severely straining the Region 8 emergency response budget and the ability for EPA to respond to additional emergency response needs elsewhere. This ROD will transfer funding responsibility for water management and treatment operations to the Superfund Remedial Program which has responsibility for long-term remedial response actions.

2.3 Community Participation

On October 25, 2000 an initial public information meeting was held in Deadwood by Region 8's Office of Community and Public Involvement and the Superfund Remedial Program.

The Proposed Plan for the Interim Action for OU2 at the Gilt Edge Mine Site was made available to the public in November 2000. It can be found in the Administrative Record file and the information repository maintained at the EPA Docket Book in Region VIII and at the Lead Community Library. The notice of the availability of the Proposed Plan was published in the Lawrence County Centennial Newspaper on November 11, 2000. A public comment period was held from November 11, 2000 to December 11 , 2000. No written comments pertaining to this Proposed Plan were received. In addition, a public meeting was held on November 29, 2000 to present the Proposed Plan to a broader community audience than those that had already been involved at the site. At this meeting, representatives from EPA and the SDDENR answered questions about the water treatment problems at the site and the remedial alternatives. Part 3, the Responsiveness Summary addresses questions and comments taken at the November 29 public meeting.

2.4 Scope and Role of Operable Unit

As with many Superfund sites, the problems at the Gilt Edge Mine Site are complex. As a result EPA has organized the site management and remedial response activities into three operable units:

- Operable Unit 1: Site-Wide Gilt Edge Mine
- Operable Unit 2: Interim Water Treatment (Early-Action and Interim ROD's)
- Operable Unit 3: Ruby Waste Rock Dump Cap

The first operable unit, Site-Wide Gilt Edge Mine, addresses contamination of the overall sources. OU-1 addresses all components of the site including final water treatment plans and the Ruby Waste Rock Dump. EPA is currently implementing a remedial investigation and feasibility study and a site-wide risk assessment for this operable unit.

The second operable unit, the subject of this early action interim ROD, addresses the continuing need to treat the residual waters and the acid rock drainage at the site. Discharge of this water without treatment poses a current and potential risk to the environment because contaminant concentrations are greater than the Surface Water Quality Criteria for Strawberry Creek and Bear Butte Creek. This early interim action addresses a principal threat at the site by reducing the volume of contaminated water stored onsite, treating ongoing accumulation of ARD, and by reducing the contaminant concentrations in water leaving the site. In addition, this interim action will neither be inconsistent with, nor preclude, implementation of the final remedy(ies) at the Site. EPA anticipates a subsequent Interim ROD to address further water treatment needs.

The third operable unit addresses the contamination associated with the Ruby Waste Rock Dump. The Emergency Response Program has begun construction of run-on diversions and regrading of the dump to a final 3.5:1 slope. EPA is currently completing a Focused Feasibility Study for the dump cap and anticipates a ROD will be issued in early 2001.

2.5 Site Characteristics

2.5.1 Surface Features

The Gilt Edge Mine NPL Site is located in the Black Hills of South Dakota, immediately adjacent to the upper reaches of Strawberry Creek and Ruby Gulch. The area has mountainous topography with elevations from approximately 5,320 to 5,520 feet above mean sea level (UOS 1999). The Site (see Figure 1) currently consists of:

- Heap Leach Pad covers 37 acres with approximately 3.2 million tons of spent ore. Two eastward expansions to this pad were built, however, no ore was processed on the last expansion pad. The heap leach pad and its expansion areas consist variously of an asphalt and several types of polyethylene and geosynthetic clay composite liner materials.

- Sunday Pit is a 29.5-acre pit that is partially backfilled. In October 2000, the pit contained approximately 65 million gallons of acid water.

- Dakota Maid Pit is a 17.1-acre pit that is partially backfilled. In October 2000, the pit contained no standing water.

- Langley Pit is an 8.1-acre pit mined by Brohm in early 1997. The northern portion of the pit is partially backfilled.

- Anchor Hill Pit is a 23.6-acre pit mined as recently as 1997. In October 2000 the pit contained 56 million gallons of acid water.

- Ruby Waste Rock Dump (59.1 acres) was constructed as a tiered valley fill in Ruby Gulch, for storage area for waste rock from the mining activities as well as spent ores from the leach pads. The Ruby Waste Rock Dump (Ruby Dump) is recognized as a significant source of ARD from the Gilt Edge mining operations (UOS 1999).

- Ruby Pond is a containment pond located in Ruby Gulch at the toe of the Ruby Dump to capture the ARD emanating from the repository. This lined pond has a reported capacity of 1,200,000 gallons. The ARD that drains from the Ruby repository is collected in the containment pond and then pumped to the Sunday pit for storage prior to treatment. The ARD is treated at an onsite water treatment plant and released into the Strawberry Creek drainage. ARD from other site sources, including the Anchor Hill Pit and Dakota Maid Pit, is also pumped to the Sunday Pit for holding and treatment.

- Process Plant and Ponds occupy 14.5 acres and include the plant buildings, Surge Pond, Neutralization Pond, and Diatomaceous Earth Pond, all constructed with HDPE primary liners and HDPE/soil composite secondary liners (EPA 2000).

- Pond C, D, E, and the stormwater pond occupy approximately 15 acres.

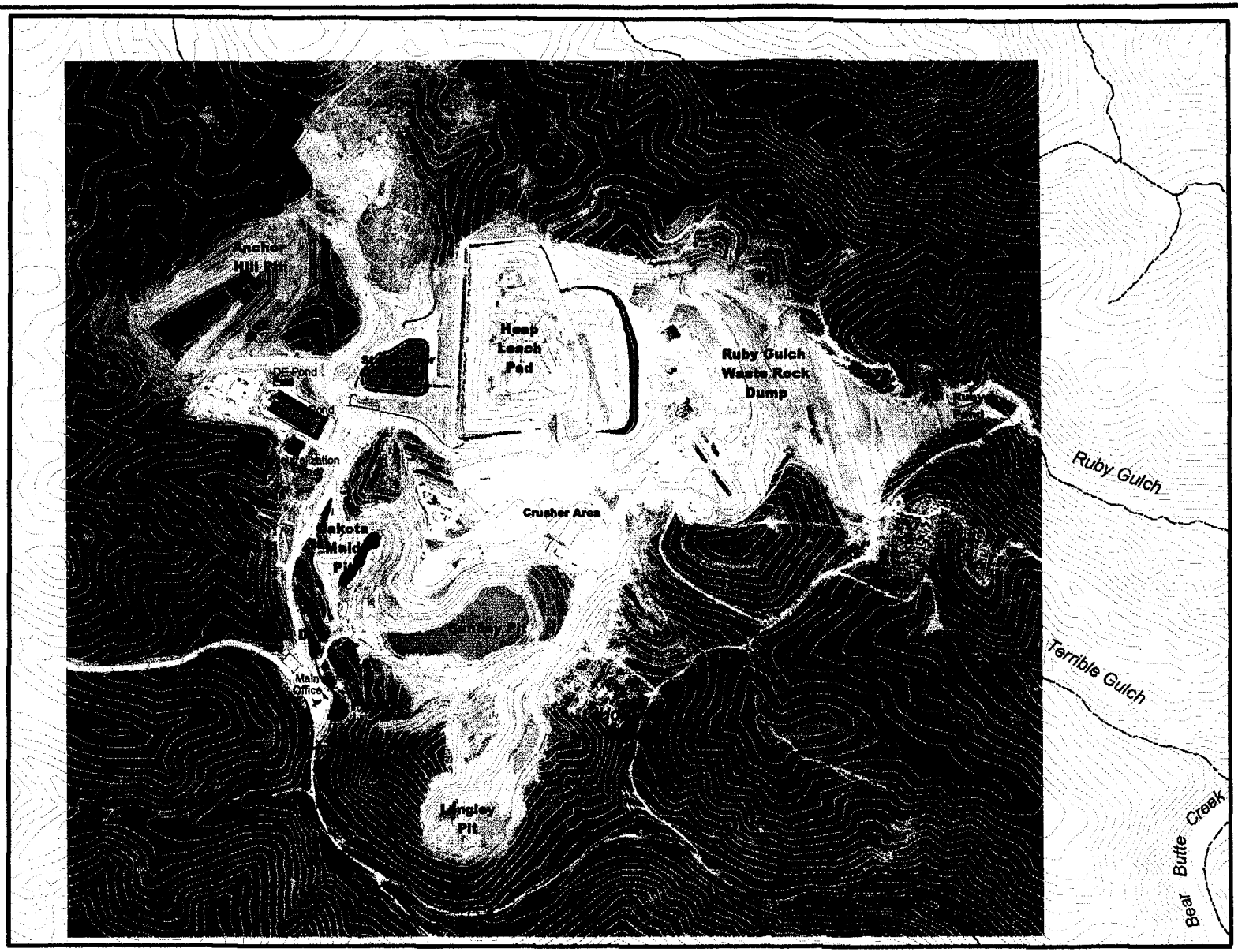
- Crusher Area and Ore Storage covers 10.3 acres (EPA 2000).

- Various fill materials used for constructing haul and access roads are reportedly a source for AMD; unknown quantity (EPA 2000).

- Relic tailings in Hoodoo Gulch; unknown quantity (EPA 2000).

Color Photo(s)

The following photos contain color that does not appear in the scanned images.
To view the actual images please contact the Superfund Record Center at (303) 312-6473.



LEGEND

- Creek or Stream
- Topographic Contour - 25-foot interval
- Mine Site Extent

N

400 0 400 800 Feet

FIGURE 1

SITE FEATURES
GILT EDGE MINE SITE
LAWRENCE COUNTY, SOUTH DAKOTA

12-19-00 e:\giltedgemine\giltedge7_e.apr SiteFeatAerial

2.5.2 Geology

2.5.2.1 Regional Setting

The Gilt Edge Site is located in the North-Central Black Hills of South Dakota in an area intruded by Tertiary age igneous rocks. The site hosts many rock types and has a complicated geologic structure (BOR 2000).

The porphyry ores historically mined at the site occur in thin sheets of auriferous limonite, such as filling in small fractures, or in impregnations of decomposed parts of the porphyry. The limonite merges downward into pyrite and other sulfides, particularly copper sulfide. The main ore shoots occur where parallel and cross fracturing have formed brecciated zones that have become partly or wholly mineralized The shoots are irregular in shape; some have been stoped as much as 100 feet in length and 50 feet in width (UOS 1999). Recent open pit mining has exposed large areas of sulfide bearing high walls and acid-generating fills to precipitation and groundwater.

2.5.2.2 Soils

Quaternary age sediments are found along creek bottoms and slope cover on the hillsides in the Gilt Edge area. These unconsolidated alluvial and colluvial materials are of various composition. The grain sizes range from cobbles and gravel to sand, silt, and clay size materials. The alluvial materials range from 15 to 25 feet thick in the drainages and are often less than 1 foot thick along the mountain slopes near bedrock outcrops. The alluvium of Strawberry Creek thins to less than 10 feet thick near the lower mine site (BOR 2000).

2.5.3 Climate

According to the Great Plains International Data Network, mean, minimum, and maximum temperatures in January and July are 5 and 33 degrees Fahrenheit ($^{\circ}$F), and 55 and 80°F, respectively. Mean number of freeze-free days is 150. Prevailing winds are out of the northwest at approximately 10 to 13 miles per hour (UOS 1999).

Mean annual precipitation in the Black Hills area ranges from 19 to 24 inches. Mean annual snowfall is approximately 60 to 100 inches per year (UOS 1999). For the purposes of stormwater modeling, the 10-year, 24-hour storm event was rated at 3.1 inches of precipitation and the 100-year, 24-hour storm event was rated at 6.0 inches of precipitation. In response to measurements of intense storms at the mine in the 1990s, mine consultants Steffen, Robertson, and Kirsten revised upwards the design storm events for the site to 9.47 inches for the 100-year, 24-hour event, 5.87 inches for the 25-year, 24-hour event, and 4.28 inches for the 10-year, 24-hour event. The Probable Maximum Precipitation (PMP) event has

been estimated to be a 6-hour storm event of 19.6 inches (BOR 2000). These precipitation rates drive the water accumulations, continued ARD generation and need for water treatment at the site.

2.5.4 Site Groundwater

Detailed site investigations regarding groundwater aspects are ongoing as part of the site-wide studies. Groundwater is known to be a contributor to water inflows.

2.5.5 Site Surface Water

The site is located at the headwaters of Strawberry Creek (a perennial stream) and Ruby Gulch (which is ephemeral in the upper reaches and intermittent in the lower reaches of the drainage). Strawberry Creek and the Ruby Gulch drainage are tributaries to Bear Butte Creek, a northeastward-flowing perennial stream. Drainages in two other gulches originate at the site. Hoodoo Gulch, a relatively small tributary to Strawberry Creek, joins Strawberry Creek below the mining operation. Another tributary is Boomer Gulch, which joins Strawberry Creek from the south approximately 1,500 feet above the confluence of Strawberry Creek and Bear Butte Creek (EPA 2000).

The surface water at the Gilt Edge site drains through three sub-basins into Bear Butte Creek (Figure 2). The sub-basins are Strawberry Creek drainage, Hoodoo Gulch, and Ruby Gulch, and are 0.39, 0.05, and 0.07 square miles in area, respectively. The topography is characterized by mountainous terrain with narrow valleys. Anchor Hill forms the highest point on the north side of the site area at an elevation of 5,680 feet. An unnamed peak on the east side of the site area is at elevation 5,650 feet. The lowest point is at approximately elevation 4,880 feet at the confluence of Bear Butte and Ruby Gulch. The mountain slopes range from 6 to 60 percent and the soil permeability is classified as moderate, averaging about 4 inches per hour (BOR 2000).

Precipitation and runoff accumulate within the drainage sub-basins of the site. Surface water movement on the site is divided into areas based on whether the water from the particular area is treated or not treated at the on-site water treatment plant. These primary areas are listed as follows and are shown on Figure 2:

- Heap Leach Pad
- Anchor Hill Pit
- Stormwater Pond
- Dakota Maid Pit
- Upper Strawberry Creek

- Process Area (including Ponds)
- Ruby Waste Rock Dump and Pond
- Sunday Pit
- Ponds C, D and E
- Hoodoo Gulch, water treatment plant and Langley Pit

These areas are connected by a complicated surface water conveyance system as shown in Figure 3 and discussed below.

Water from the Heap Leach Pad is re-circulated via evaporative spray onto the pad during warm months and pumped to the Surge Pond and Anchor Hill Pit. The Stormwater Pond can be used to store ARD water. Waters from the Heap Leach Pad (and Surge Pond), Anchor Hill Pit, and Stormwater Pond may be treated at the water treatment plant.

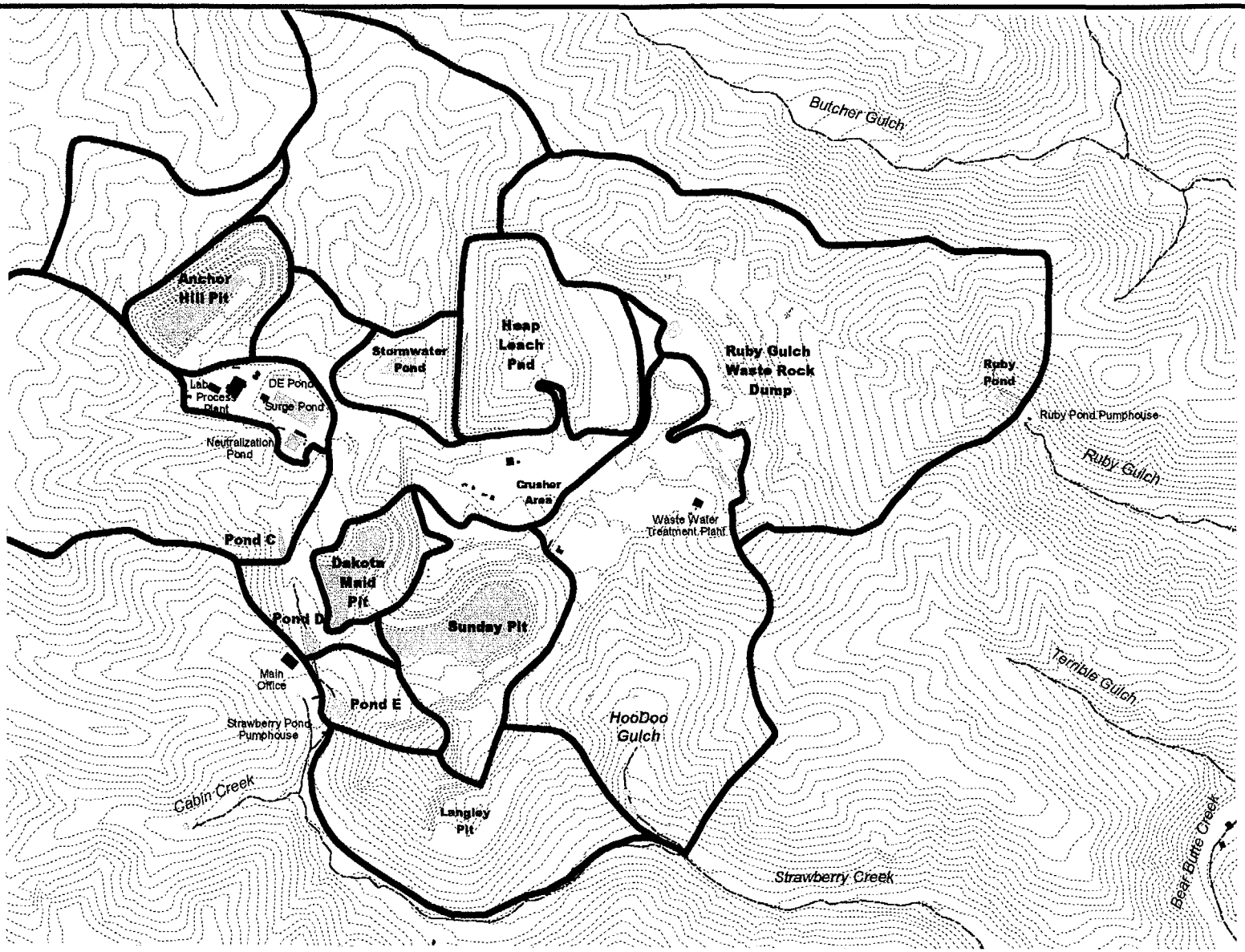
At the present time, the Dakota Maid Pit has been dewatered.

Pond C collects surface water from both impacted and non-impacted areas in the west portion of the site, which includes the Process Area and upper Strawberry Creek. Surface water runoff from upper Strawberry Creek is diverted around the Stormwater Pond through a pipe and then discharged to Pond C. A portion of the water flowing into Pond C is batch treated with sodium hydroxide, and is discharged directly to Strawberry Creek. Pond C water is not treated at the water treatment plant.

Surface water from the Ruby Waste Rock dump drains to the Ruby Pond and then is pumped to the Sunday Pit and Pond E. Most of the surface area that is disturbed at the top of the site drains to Pond D. Collected water from Pond D drains to Pond E. Collected water in Pond E is pumped and treated at the water treatment plant.

Surface water from Hoodoo Gulch is not presently treated at the water treatment plant, although it receives rudimentary treatment with sodium hydroxide.

Topography directs surface water flow from the Gilt Edge Mine site to Strawberry Creek. Strawberry Creek flows approximately 1.5 miles before draining into Bear Butte Creek. Approximately 2 miles downstream of the Strawberry Creek and Bear Butte Creek confluence, Bear Butte Creek loses a significant portion of its flows underground into outcrops of the Pahasapa limestone and the Minnelusa Formation (UOS 1999). The Pahasapa limestone, equivalent to the Madison Formation, and the Minnelusa Formation, contain the aquifers for downgradient communities.



LEGEND

- Surface Water Subbasin
- Creek or Stream
- Topographic Contour - 25-foot interval
- Building
- Lake or Pond

N

300 0 300 600 Feet

FIGURE 2

SURFACE WATER SUBBASINS
GILT EDGE MINE SITE
LAWRENCE COUNTY, SOUTH DAKOTA

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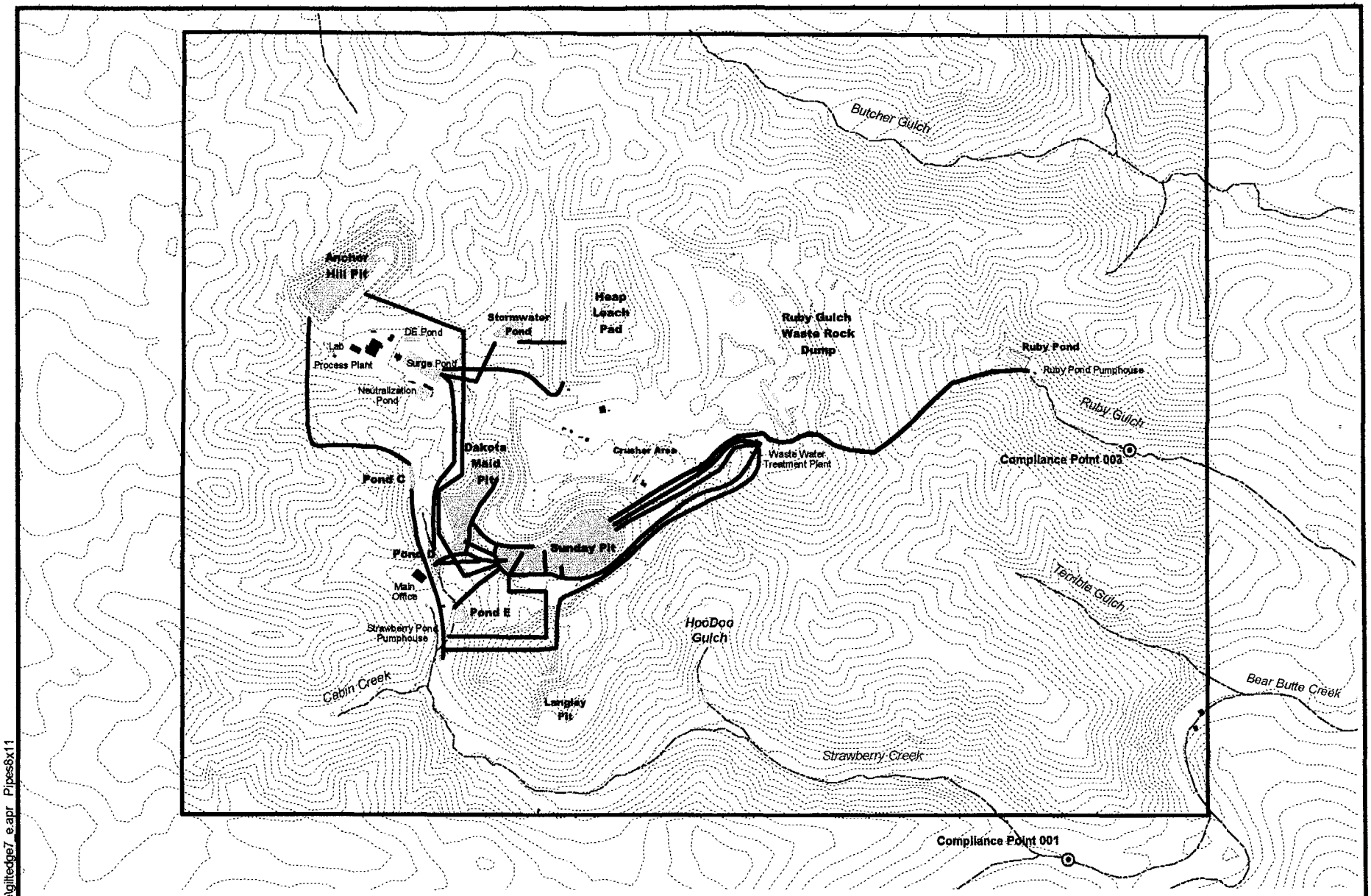

FIGURE 3

WATER MANAGEMENT PIPELINES
GILT EDGE MINE SITE
LAWRENCE COUNTY, SOUTH DAKOTA

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The USGS maintains a gauging station in Bear Buttte Creek 0.5 miles downstream of the Bear Butte - Strawberry Creek confluence. Water discharge data from October 1996 to September 1997 indicates that Bear Butte Creek's high flow is in April with more than 100 cubic feet per second (cfs) for five days and a one-day maximum of 180 cfs. By June, the flow has fallen to less than 10 cfs. March, April, May, and June gauging data show flows over 10 cfs in Bear Butte Creek, with all other months having flows under 10 cfs. It is possible that Strawberry Creek could approach 10 cfs under high water flow conditions, but for the majority of the year, the flow in Strawberry Creek is well under 10 cfs (UOS 1999).

Remedial investigations and ecological assessments are underway. There are no discernible streamside wetlands along Strawberry Creek through and downstream of the Site. There appears to be a wetland in the lowermost portion of Ruby Gulch downstream of the site near its confluence with Bear Butte Creek. There are streamside wetlands along Bear Butte Creek. These environments are important to the following State Species of Concern (South Dakota Natural Heritage Database, SD Game, Fish & Parks, December 2000) in the Bear Butte Creek watershed: American dipper, red-belly snake, longnose sucker, mountain sucker, longnose dace, and Townsends big-eared bat. The potential is high that these species would be adversely impacted if water treatment operations are not continued.

2.5.6 Contaminant Characterization

The sources of site contamination associated with discharges to Strawberry Creek include the Heap Leach Pad, Ruby Repository, Sunday Pit, Dakota Maid Pit, and road fills.

A remedial investigation has not yet been completed for this site or operable unit. However high levels of contamination have been documented. Water quality data from June 2000 are shown in Table 1, indicating the extreme toxicity of ARD waters in the existing site impoundments.

Table 1
June 2000 Surface Water Sampling Results from Site Impoundments

Metal	Results in parts per billion (ppb)	Surface Water Quality Daily Maximum Goal (ppb)
Arsenic	1,480	332.5
Cadmium	692	5.9
Copper	97,900	67.6
Lead	33.3	32.5
Selenium	51.6	8.75

2.5.7 Water Treatment Operations

The water treatment plant used to treat the ARD water at the site (installed by BMC) adds sodium hydroxide to the acidic feed solution. The metals are precipitated as oxides or hydroxides. A polymer is added to the solution to promote settling of the precipitants. The treated water is separated from the precipitants in a lamella plate clarifier. The treated water is pumped to Strawberry Creek and the precipitates have either been returned to the Sunday Pit or the Stormwater Pond as a slurry. The design capacity of the treatment plant was 350 gallon per minute (gpm). As of October 2000, the plant was operating at a capacity of 250 gpm.

When the water treatment plant was initially operated by BMC, the sludge from the treatment operation was disposed in unlined pits on top of the Ruby Waste Rock Dump. During 2000, the sludge/slurry residues had migrated to the bottom of the Ruby Dump and began to break through into the Ruby Pond. The sludge was then discharged into Sunday Pit. However, with declining water levels, discharging the sludge into the Sunday Pit has caused the pH of the acid water in the Sunday Pit to increase beyond the point where iron hydroxide is soluble. Therefore, the iron concentration in the feed stream has decreased causing the water treatment plant to operate inefficiently, resulting in degradation of discharge water quality. The iron provides for a denser sludge and also assists in the removal of trace metals. Continued delivery of the sludge to the Sunday Pit will further degrade the efficiency and operations of the treatment plant. These problems will be addressed and rectified by the actions to be completed under this ROD.

2.5.8 Water Quality Discharge Monitoring

Water quality discharges from the Gilt Edge Mine site are being monitored at the following compliance points (see Figure 3) using the same criteria as the former National Pollution Discharge Elimination System (NPDES) permit that BMC acquired when it operated the mine site:

- Compliance Point 001 - In Strawberry Creek, 10 yards downstream from the confluence of Strawberry Creek and Boomer Creek.
- Compliance Point 003 (replaced former Compliance Point 002)- In Ruby Gulch below Ruby Waste Rock dump and the final sedimentation pond, approximately 1,000 feet below former compliance point 002.

SDDENR and EPA have continued to use the former NPDES permit standards that were established for BMC's operations. For this interim action, EPA will continue to use the water quality discharge objectives of the former NPDES permit as the surface water quality discharge goals. These water quality objectives are listed in Table 2 below (BOR 2000).

Table 2
Water Quality Discharge Objectives (former NPDES Permit Limits)

Parameter	Units	Daily Maximum		24-hour[B]	30-Day Average
		001[AH]	002/003	001[H]	
Total Recoverable Arsenic	ug/L	332.5	NE	190	NE
Total Recoverable Cadmium	ug/L	5.9	100	3.4	NE
Total Recoverable Chromium	ug/L	1147	NE	655	NE
Total Recoverable Copper	ug/L	67.6	300	39	150
Total Recoverable Lead	ug/L	32.5	600	18.6	300
Total Recoverable Mercury	ug/L	0.021[C]	2	0.012	1
Total Recoverable Nickel	ug/L	891	NE	509	NE
Total Recoverable Selenium	ug/L	8.75	8.75	5.0	NE
Total Recoverable Silver	ug/L	44	NE	44	NE
Total Recoverable Zinc	ug/L	343	1500	343	750
Total Cyanide	ug/L	20	70	NE	NE
TPH	mg/L	10	10	NE	NE
TSS[D]	mg/L	157.5	30	NE	90[F]/20[G]
Settleable Solids[E]	mL/L	NE	0.5	NE	NE
pH	SU	6.5 - 8.8	6 - 9	NE	NE

TPH Total Petroleum Hydrocarbons
NE Not Established
TSS Total Suspended Solids
A - Standards apply when a grab sample is collected.
B - Applicable for a 24-hour composite sample.
C - The standard for mercury is less than the current approved analytical method for determining mercury concentration. Therefore, a practical quantitation limit (PQL) has been established for mercury at 1.0 ug/L. Analytical values less than 1.0 ug/L should be recorded as such.
D - Dry weather
E - Wet weather
F - Established for compliance point 001
G - Established for compliance points 002/003.
H - Limits are hardness dependent–limits shown are for a 400 hardness and over.

2.6 Current and Potential Future Site and Resource Uses

The site is currently an abandoned hard rock mine. The site and the surrounding area is zoned as a PF - Park Forest District by Lawrence County. The usages permitted in the PF - Park Forest District include:

- Detached single-family dwellings, cabins, and summer homes;
- Transportation and utility easements, alleys, and right-of-way;
- Public parks and/or playgrounds;
- Historical monuments or structures;

- Utilities substations;
- Plant nursery;
- Tree or crop growing areas and grazing lands;
- For lots adjacent to a stream, drainfield setbacks shall be at least one hundred (100) feet from the stream's high water mark.
- Residential usage may include normal home occupations and offices of recognized profession provided:
    1. They are conducted by the occupant;
    2. Advertising shall conform to sign regulations;
- Other uses approved under County and State Conditional Use Permits

County and State permits or use restrictions remain in effect for the Site.

2.7 Site Risks

If the water control and treatment systems presently operating at the site are discontinued or are not upgraded as proposed, uncontained hazardous releases would occur.

Along Strawberry Creek, there have been documented impacts to the benthic macroinvertebrate communities. In addition, there have been documented reductions of fish species observed below the confluence of Strawberry Creek (EPA 2000). The SDDENR conducted fish tissue sampling in Bear Butte Creek in September 1997. Fish tissue from longnose dace, white sucker, mountain sucker, and brook trout were analyzed. Metals were detected in all of the fish filet samples.

Bear Butte Creek is managed as a fishery by the South Dakota Game Fish and Parks Department. The fishery had been described as marginal, with little use. A 23-day creel survey conducted in 1994 by South Dakota Game Fish and Parks Department revealed no fish caught during the survey.

However, Bear Butte Creek was stocked with brook, brown and rainbow trout through the 1980s and with brown trout through the 1990s. Recent sampling by the South Dakota Game Fish and Parks Department indicates there are now viable populations of native as well as introduced sport fish in Bear Butte Creek downstream of Strawberry Creek, indicating that water treatment operations have been beneficial.

If water at the site was no longer treated, the source water would be free to release pollutants down the Strawberry Creek and Ruby Creek drainages with severe impacts to the Bear Butte Creek environment. The interim response action selected in this Record of Decision is

necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

There is a potential impact to downstream wells that are constructed in alluvium. In the event of site releases of untreated waters, there also is a potential loss of flow to the Madison and Minnelusa aquifers which are significant aquifers used by numerous public and private entities as a drinking water source (most significantly the Sturgis Water Department which has six wells supplying 6,000 people).

2.8 Remedial Action Objectives

The remedial action objectives for this interim action for operable unit 2 are to:

- Maintain site security and operation infrastructure;
- Capture source water and ARD;
- Treat source water and ARD on-site to reduce the toxicity of the water prior to discharge;
- If possible, treat sufficient ARD volumes to gain storage and/or dewater the site during low precipitation cycles;
- Meet surface water discharge quality goals at the compliance point in Strawberry Creek;

For the interim, EPA has adopted the water quality discharge objectives of the former NPDES permit as the surface water quality discharge goals.

2.9 Description of Alternatives

Three alternatives were evaluated for this interim action. These alternatives are:

- No Action; only maintain site security
- Water Collection and Treatment in Existing Treatment Plant
- Water Collection with Enhanced Metals Reduction Treatment and Improved Sludge Management

2.9.1 Description of Remedy Components

Alternative 1 - No Action

Regulations governing the Superfund program require that the "no action" alternative be evaluated generally to establish a baseline for comparison. This would require discontinuing operations of the water collection, control and treatment systems now in place. Under this alternative, the existing water treatment plant would not be operated. EPA would take no action to prevent off-site releases of contaminated water. However, the site controls and operational infrastructures would still have to be maintained to prevent direct exposure to ARD and contaminated source water and provide for ongoing remedial investigation and feasibility study activities. In addition, repairs to the administrative building need to be performed.

Alternative 2 - Water Collection and Treatment in Existing Treatment Plant

In this alternative, the existing collection and treatment system would continue to be operated without modification to treat source water and ARD. Treated water would be discharged to Strawberry Creek. Sludge would be discharged to an interim on-site containment area until the final remedy is implemented. The water treatment of this alternative is currently being implemented at the site as part of the emergency response action. Repairs to the administrative building would be performed.

Alternative 3 - Water Collection with Enhanced Metal Reduction Treatment and Improved Sludge Management

The components and requirements of this alternative would be the same as described in Alternative 2, but in addition a ferric iron unit would be added to the treatment process within the existing treatment plant. The addition of ferric iron would facilitate enhanced precipitation of metals from the acid water and allow the facility a better opportunity to meet surface water quality goals for Strawberry Creek. Sludge management operations would be optimized using improved on-site storage basins and/or sludge filtering. Repairs to the administrative building would be performed. This alternative would address the problems with current operations decribed in Section 2.5.7.

2.9.2 Common Elements and Distinguishing Features of Each Alternative

Each of the alternatives includes site management and infrastructure maintenance activities.

Alternatives 2 and 3 include collection and treatment of the acid water via the Sunday Pit and the Ruby Pond. For this interim action, the existing water treatment plant is used for each alternative. The existing treatment plant remains capable of reducing the toxicity of the waste stream and allows immediate and continued control of source water and ARD. The treated water in Alternatives 2 and 3 will be discharged to Strawberry Creek.

In response to the operational problems described in Section 2.5.7, Alternative 3 adds ferric iron to the treatment process, increasing the likelihood that treated water will meet the water quality discharge objectives for the site. Sampling and analysis of the treated water will be consistent with the requirements in the former NPDES permit established by SDDENR. Alternative 3 also includes the improved sludge management.

The distinguishing features of each alternative are discussed below.

Alternative 1 - No Action

Estimated Capital Cost:	$25,000
Estimated FY2001* O&M Cost:	$1,100,000

Under the alternative, EPA would take no action at the site to prevent discharge of ARD. The existing treatment system would not be operated. However, site controls and operational infrastructures would still have to be maintained to prevent exposure to ARD and source water and provide for ongoing remedial investigation and feasility study activity. The administrative building will be repaired.

(*Estimated O&M cost for Fiscal Year 2001)

Alternative 2 - Water Collection and Treatment in Existing Treatment Plant

Estimated Capital Cost:	$1,075,000
Estimated FY2001 O&M Cost:	$2,945,000

In this alternative, the existing collection and treatment system would continue to be operated. Sludge would be discharged to an interim on-site containment area until the final remedy is implemented. In addition, repairs to the administrative building need to be performed.

Alternative 3 - Water Collection and Enhanced Metals Reduction Treatment and Improved Sludge Management

Estimated Capital Cost:	$1,125,000
Estimated FY2001 O&M Cost:	$3,895,000

This alternative uses the existing collection and treatment system, but adds ferric iron to the treatment system. The addition of the ferric iron will facilitate enhanced precipitation of metals from the acid water and allow the facility a better opportunity to meet water quality objectives for Strawberry Creek. Sludge management operations will be optimized using on-site storage basins or sludge filtering. The O&M costs for this are higher than Alternative 2 due to costs for the ferric iron reagents, establishing a slurry/sludge impoundment, and costs for leasing and maintaining filter press equipment.

2.10 Comparative Analysis of Alternatives

2.10.1 Overall Protection of Human Health and the Environment

All of the alternatives, except the "no action" alternative are protective of human health and the environment by reducing the risks posed by the site through the collection and treatment of ARD and acid water. Alternative 3 provides the greater protection because the improvements in the treatment and sludge handling systems will further reduce the contaminants in the waste stream.

2.10.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Compliance with ARARs addresses whether a remedy will meet all the applicable or relevant and appropriate requirements of Federal and State environmental statutes or provides a basis for invoking a waiver. The former NPDES discharge criteria have been identified as the principal ARARs for this action.

The former NPDES discharge criteria will not be met under Alternative 1, the "no action" alternative.

The former NPDES discharge criteria may be met for the two remaining alternatives. Alternative 2 is currently being implemented at the site as part of EPA's emergency response actions. Treated water leaving the site has periodically exceeded the former NPDES discharge limits. Alternative 3 will provide a better opportunity for meeting the discharge

objectives due to the addition of ferric iron to the treatment system and sludge management. However, discharge objectives could still be periodically exceeded.

CERCLA and the NCP would still allow for the selection of Alternatives 2 or 3 as the preferred alternative since the alternative is an interim action that will become part of a total remedial action that will attain the applicable or relevant and appropriate federal or state requirement (see 40 CFR 300.430(f)(1)(ii)(C)(1).

2.10.3 Long Term Effectiveness and Permanence

This is an interim action remedy. Long term effectiveness is not a criterion. EPA will be evaluating the final remedy for Operable unit 2 in a subsequent Record-of-Decision.

2.10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 1 does not include treatment as a component of the remedy. Therefore, this alternative does not reduce the toxicity, mobility, or volume of contamination at the site.

Alternatives 2 and 3 include treatment of metals in water as components of the remedies. Both alternatives reduce the toxicity of the waste stream and the volume of acid water onsite.

Alternative 3 will further reduce toxicity, mobility, and volume of site water due to improvements in the treatment and sludge management systems.

2.10.5 Short-Term Effectiveness

Alternative 1 would not be an effective alternative because current risks from acid water would continue to exist on site and would be discharged to Strawberry Creek.

Water quality objectives would probably not be met with Alternative 2 based on current operating results and the effects of sludge on the feed water.

The addition of ferric iron will facilitate enhanced precipitation of metals from the waste stream and a better opportunity to meet water quality objectives.

2.10.6 Implementability

All of the alternatives are easily implementable. All materials and services are readily and commercially available.

Minimal construction activities are associated with Alternative 2. Existing facilities will be used for treatment of the acid water. Operations of the treatment facilities would be conducted in accordance with federal and state regulations for protection of the workers.

Alternative 3 includes minor construction for the filter press pad and construction of a sludge storage impoundment.

2.11 Principal Threat Waste

The acid waters in the Anchor Hill, Dakota Maid, and Sunday Pits, and the ARD in the Ruby Pond are considered Principal Threat Wastes. Alternatives 2 and 3 both include treatment of this waste and therefore meet the statutory requirement to treat principal threat waste.

2.12 Selected Remedy

The selected remedy for this interim action is Alternative 3, Water Collection with Enhanced Metals Reduction Treatment and Improved Sludge Management. This alternative was selected over the other alternatives because it has a better opportunity to achieve the water quality objectives and allow further reduction of toxicity and volume of acid water on site.

Based on the information available at this time, EPA and SDDENR believe that the Selected Remedy would be protective of human health and the environment, would comply with ARARs, and would be cost-effective. Because it would treat source materials constituting principal threats, the remedy would also meet the statutory preference for the selection of a remedy that involves treatment as a principal element.

2.13 Statutory Determinations

2.13.1 Protection of Human Health and the Environment

The selected remedy is protective of human health and the environment because it collects the acid water generated at the site and treats the water to reduce the toxicity and volume of the waste. The existing risk of offsite migration of acid water will be reduced or eliminated, thereby protecting human health and the environment. The remedy will not pose unacceptable short term risks during implementation.

2.13.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy should be able to attain the water quality objectives for the site detailed in the former NPDES permit established by SDDENR. Periodic episodes of non-attainment are possible.

The identification of Alternative 3 as the selected remedy is still appropriate since CERCLA and the NCP allow for the selection of alternatives that will become part of a total remedial action that will attain the applicable or relevant and appropriate federal or state requirement (see 40 CFR 300.430(f)(1)(ii)(C)(1).

2.13.3 Cost-Effectiveness

In addition, the proposed remedy uses existing collection and treatment systems which reduces overall capital costs. The selected remedy is thereby the most cost effective reduction of toxicity and volume of the principal threat wastes through treatment.

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

The selected remedy is an interim action that is not designed or expected to be final, but represents the best balance of alternatives recognizing the limited scope and time-critical nature of the action. It is anticipated that some portion of this selected remedy will be incorporated into the final remedy of the site.

2.13.5 Preference for Treatment as Principal Element

The selected remedy incorporates water treatment to reduce the toxicity and volume of the waste stream.

2.13.6 Five-Year Review Requirements

Because this is an interim action ROD, review of this operable unit and remedy will be ongoing as EPA continues to develop remedial alternatives for the operable unit. Upon selection of the final remedy, five year reviews will be required per the NCP.

2.14 References

Bureau of Reclamation (BOR). 2000. *Closure Plan for Gilt Edge Mine, Lawrence County, South Dakota.* U.S. Department of Interior, Bureau of Reclamation, Technical Services Center, Denver, Colorado. February 11.

URS Operating Services (UOS). 1999. *Analytical Results Report for Site Inspection for Gilt Edge Mine, Lead, South Dakota.* July 12.

U.S. Geological Survey (USGS). 1971. 7.5 minute - Series Topographic Quadrangle Map of Deadwood, South Dakota. 1:24,000 scale.

U.S. Environmental Protection Agency (EPA). 2000. Hazard Ranking System Package. May.

Part 3
Responsiveness Summary

RESPONSIVENESS SUMMARY FOR EARLY INTERIM ACTION
OPERABLE UNIT 2, WATER TREATMENT OPERATIONS
GILT EDGE MINE NPL SITE
LAWRENCE COUNTY, SOUTH DAKOTA

This Responsiveness Summary provides responses to comments received by the United States Environmental Protection Agency (EPA) regarding the Proposed Plan for continuation of interim water treatment operations at the Gilt Edge Mine NPL Site. The proposed plan was issued on November 11, 2000. EPA received no comment letters or e-mail messages directly pertinent to the solicitation for comments. Questions and comments on the Proposed Plan were received at the November 29 public meeting, and a transcript of the meeting has been attached hereto. The transcript is also on file in the administrative record for the site which is available for review at the Hearst Public Library, 315 Main Street, Lead, South Dakota 57754 and at EPA Superfund Records Center, 999 18th Street, 3rd Floor, South Tower, Denver, Colorado 80202.

EPA has given full consideration to the questions and comments posed at the November 29 public meeting; the following Responsiveness Summary has been prepared to more clearly address the questions and comments in finalizing the Early Action Interim Record of Decision (ROD) for Operable Unit 2 (OU2), Water Treatment Operations.

In those cases where questions or comments expressed similar ideas or concerns, these ideas or concerns have been combined into a single comment for EPA response. Comments/concerns have been grouped in the following categories:

Water treatment alternatives and rate
Sludge composition, stability, and storage
Alternative Cost (period of operation)
State obligations
Surface water quality and concerns
Ground water quality and concerns
Biological concerns

For this Responsiveness Summary, the text **in bold** is language prepared for this document to clarify or expand on the response given at the public meeting.. Secondary text (noted as Public Meeting Response) is the verbatim on-the-spot response (excerpted from the official transcript) to the question or comment provided by the EPA staff at the public meeting.

Water Treatment Alternatives and Rate:

Comment No. 1a (Water Treatment Alternatives and Rate)

One commenter questioned if there are only three alternatives being evaluated for water treatment at the site. One commenter also inquired if this alternative solves the water treatment problem at the mine or is it just a Band-aid start.

Response to Comment No. 1a (Water Treatment Alternatives and Rate)

This proposed plan for Early Interim Action addresses only the immediate on-going water treatment needs at the site. For the current situation and this early action, three operational alternatives have been put forward for consideration:

> **(1) No action (discontinue water treatment);**
> **(2) Water collection and treatment using the existing treatment plant, and in addition construct an isolated impoundment on-site for slurry-sludge containment;**
> **(3) Water collection and enhanced metal reduction treatment with improved sludge management by utilizing filter presses.**

Alternative 3 will provide the best immediate (band-aid) water treatment and sludge management at the site, until EPA can assess the projected water balance and more thoroughly evaluate the need for further treatment requirements or upgrades to the existing system.

Public Meeting Response: For this particular action there is the three alternatives, the no-action one; the one that would create an impoundment for the slurry; and then the third alternative, which we talked about at this meeting. This is a Band-aid start. This will enable us to be treating water right now the way we should be treating water out there for the immediate situation. That's our opinion. There may be more needed and that's being looked at right now. And we'll come back in a couple months as more is needed. We'll have another proposed plan, but let's not worry about that right now.

Comment No. 1b (Water Treatment Alternatives and Rate)

Several commenters expressed concern about the time it will take to implement the alternative. They also encouraged EPA to implement Alternative No. 3 of the Proposed Plan as soon as possible.

Response to Comment No. 1b (Water Treatment Alternatives and Rate)

After final consideration of this proposed plan and comments received, EPA Region VIII has made a remedy selection in the Record-of-Decision. Having a signed decision document that responds to commenters, as well as concurrence by SD-DENR, should provide support for Region VIII's request to EPA Headquarters for supplemental funding. If funding is obtained, it could then take several months for contracting, mobilization and installation of necessary equipment and operations startup.

Public Meeting Response: We would like to think it's not going to take very long. But as I said in our last meeting, we are coming out with a proposed plan, seeing what you all think about it, incorporating that into our final decision under our Record of Decision, which is the formal decision document -- I think the term I used last time was that the Record of Decision is our ticket to go to the big bank in Washington and say, we need money. The decision has

been made. Here's what needs to be done and we'd like to have the authorization to commence these expenditures and get it under way. So it may take several months. We'd like to have this Record of Decision done within the next couple of weeks so that we can hopefully be successful in getting funding to implement all of that stuff as soon as possible, but it could take several months.

Comment No.1c (Water Treatment Alternatives and Rate)

One commenter questioned if the treatment plant could process the amount of the water falling on the mine site.

Response to Comment No. 1c (Water Treatment Alternative and Rate)

The present operating plant is marginally treating approximately 250 gallons per minute (gpm). Average annual precipitation at the site is 28 inches, requiring approx. 281 gpm water treatment capacity. Low annual precipitation (20 inches) would require approx. 200 gpm capacity, and high annual precipitation (40 inches) would require approx. 400 gpm treatment capacity. Given that the past couple of years have purportedly been drier years, it is plausible that the treatment operation's ability to keep up with inflows, as well as modest gains made on stored ARD volumes, have been largely been a result of the lower precipitation cycle. Therefore, increasing treatment capacity is clearly needed, and is the reason for the proposed actions which should increase treatment rates to approximately 300-350 gpm. If precipitation rates increase markedly, the available storage capacity at the site would refill and the ability to treat at rates necessary to keep up with inflows would be doubtful. A focused feasibility study is currently underway to determine additional treatment capacities that may be necessary to meet higher inflows, as well as draw down stored volumes as a prerequisite for pit remediation activities.

Public Meeting Response. What's been discovered with the water treatment plant that is here, we can treat on an annual basis about the same amount of water that's coming out of the sky every year and we have been lucky. We have had a couple dryer years. If that drought cycle breaks, we would definitely be behind the curve.

With respect to how much water we get on the site each year, our experience over the past couple years has been around 80 million gallons has been falling onto the areas that have acid forming rocks and soils that we collect for treatment. So about 80 million gallons is what we're gathering each year to treat. In our treatment plant the capacity is in that neighborhood so there is a match there between the plant and the site.

We just prefer not to put that into any of the impoundments that are at the site because we're so touch-and-go with the water balance and treatment capacity out there, that if we get deluged with a heavy spring -- a few heavy spring snowstorms and some big storms next year, we may need every gallon of capacity that we have out there to store water and not have an overtop out of the site.

We actually just finished two days of meetings, part of which we talked about the water balance and water budget that is being prepared for the site. And it's looking like we may need - in addition to this system, we may need an additional 150 gallons per minute of treatment capacity to give us a safety margin against a real stormy season and a real wet cycle. But our engineers are working on that and we'll know about that in several months.

Comment No.2 (Sludge Composition, Stability, and Storage)

Several commenters expressed concern pertaining to composition, volume, and storage of the sludge generated at the water treatment plant.

Response to Comment No.2 (Sludge Composition, Stability, and Storage)

At 300-350 gpm treatment rates, the filter cake residue that would be produced from the filter press(es) would amount to 10-15 cubic yards per month. The filter press removes much of the water from the sludge, producing a filter cake of highly condensed sludge with a consistency much like heavy wet soil. The sludge filter cake has a very high pH, and will not redissolve unless exposed to highly acidic waters. Rainfall has near-neutral pH, so the filter cake can even be simply piled for temporary storage in an area that is isolated from acidic waters. EPA will select a small area on-site for bermed temporary sludge storage.

Public Meeting Response: Obviously it's full of heavy metals. But it's also -- those metals are bound up in a sludge particle of a sodium hydroxide sludge that has a very high pH. So the sludge is pretty stable. The filter cake sludge, if we pressed it down, that stuff is stable enough that the - we don't have to make any special precautions for storing it like you would a hazardous waste material. It's quite stable. Unless we dump it back in a pit or something and it resolidifies and remobilizes; and we would like to stop doing that.

The storage would not have to be in a building. We would just take -- there are plenty of lined impoundments out there. There is an area on the Heap Leach pad right now that was built -- that is a lined extension that was built on the Heap Leach pad. That's an area that's got plenty of capacity that we could store that stuff in, even temporarily. The volume -- it's pressed sludge that would be generated...

On a monthly basis, I would say maybe from 10 to 15 cubic yards a month after we optimize the system. That's a lot of material if you bring that much top soil into your front yard. That's trivial at this site. We can store that volume of sludge for some number of years and it's still a small amount of material to have to rehandle.

There are areas up in here. When -- what I meant by high and dry is up out of contact. Just somewhere that is up out of contact with all of the water that's accumulating in the impoundments.

The second thing I wanted to say was with respect to the sludge, just to clarify about what

happens to this filter cake once it's put on the ground and the high and dry concept, this material is chemically stable in -- if you just have rain water falling on the material and flowing over it, this material is stable. It's not going to melt or dissolve or give off metals as if we were to put it in a place on the site where acid water were to come into contact with it. Then you run the risk of redissolving that material and releasing the metals. That's why Ken said high and dry. What he meant is to get it up and out of the acid water flowing on the site and put it into a place where it won't come into those solidified flows.

Comment No.3a (Alternative Cost)

With regard to operation and maintenance cost capital cost for the shown in Proposed Plan, are these annual costs.

Response to Comment No.3a (Alternative Cost)

No. The costs listed in the Proposed Plan are projected costs of capital expenses for upgraded facilities as well as operation and maintenance costs for the nine-month period January 1 - September 30, 2001. Consequently while the listed capital costs are a one-time expense, the subsequent annualized operation and maintenance costs would be proportionately higher than the costs shown in the Proposed Plan.

Public Meeting Response: I neglected to point out -- this is for our fiscal year 2001, which we're in right now. Our fiscal year goes from October 1 to September 30. These would be costs through September 30 of 2001.

Right now that - if you -- since these costs only reflect a nine-month period, for next year we readjust this to a monthly cost, but that's the cost that it's going to cost on a monthly basis, a month, until we can start the major reconstructive surgery on the rest of the site to start putting caps and covers and get all the exposed materials remediated to the point where we're not generating these volumes of acid water any longer.

For water treatment operations right now, we're looking at $200,000 a month. I think that's about right. $200,000 a month to buy the chemicals, have the treatment plant operating, and be doing the sludge management and clean water reject.

Comment No.3b (Alternative Cost)

One commenter asked how much more expensive is doing what EPA has proposed compared to what Brohm was doing when they were acting

Response to Comment No.3b (Alternative Cost)

EPA is unaware of what Brohm Mining Company's costs were for water management and treatment while BMC operated the site.

I certainly don't know what their costs were while they were operating, so I am not sure that I can answer your question.

Comment No.3c (Alternative Cost)

One commenter asked if water at the site would require treatment for eternity.

Response to Comment No.3c (Alternative Cost)

Studies and remediation plans beyond the scope of this proposed plan will address this question. Mining site cleanups and remediation have historically had to implement permanent water treatment facilities. However, there are remediation technologies emerging which have the possibility of mitigating or eliminating the generation of acid rock drainage and associated metal toxicity. Given the substantial costs of long-term water treatment and the State's goal of minimizing or eliminating such O&M, several of these approaches are being evaluated for this site.

We hope not. That's getting into another subject area that isn't related to this proposed plan. But remediation -- remedial action objective number one for this State's site for the State's behalf -- because the State is going to have to pay for whatever water treatment permanently, our engineering team's number one goal is to see what it would take and how we can create zero active water treatment costs at this site for the long term. We'll know more about this in the next proposal.

Comment No. 4 (State Obligations)

One commenter inquired what percent is the State, then, obligated to pay.

Response to Comment No. 4 (State Obligations)

For fund-financed remedial actions involving treatment or restoration of ground- or surface-water quality to a level that assures protection of human health and the environment, the operation of such measures are considered part of the remedial action for a period of up to ten years after a final remedy becomes operation and functional. This expense requires a ten (10) percent State cost share. Activities required to maintain the effectiveness of such treatment following the ten-year period following the completion of final remediation are considered O&M, and are fully the responsibility of the State.

Public Meeting Response: Ten percent cost match per year. Ten percent for the capital costs and -- just for the O & M. I got confused for a second. This is a remedial action so it's ten percent of the bottom line.

Comment No. 5 (Surface Water Quality and Concerns)

With regard to water quality, do you have any idea how much effect this particular alternative will have on water quality down stream?

Response to Comment No. 5 (Surface Water Quality and Concerns)

It will have a markedly improved effect. Unfortunately, due to several factors the recent performance of the water treatment plant has declined substantially. The iron-imbalance between the inflow and the operating parameters within the plant have caused a drop in metal removal performance, as well as releases of polymer residues and other hydroxides into the receiving waters. If allowed to continue, such releases would have severe impacts to the water quality and benthic substrates of the receiving streams.

Public Meeting Response: On water quality, let me address water quality first. It will definitely improve the water quality that's coming out of that plant right now. That plant right now is -- I called it -- last time I think I said, we think that plant might be getting ready to have a heart attack. Yeah, it's on the verge and it needs a little more than that stint thing that they put in Dick Cheney last week. So with these operations here, the water quality out of this plant will definitely improve. Second of all, it will definitely improve and the risk -- the risk of having something really bad happen will be dramatically improved.

Second of all, by being able to up the through-put rates on the plant, we'll undoubtedly increase the base flow going down Strawberry Creek and into Bear Butte Creek. We'd have to ask the biologists if that's a benefit or not.

Comment No. 6a (Ground Water Quality and Concerns)

Several commenters expressed concerns about pit water leaking into the aquifer and surface water entering the aquifer via downstream sinkholes.

Response to Comment No. 6a (Ground Water Quality and Concerns)

Public Meeting Response: It is a good question. We just had a briefing today at the mine site from the team leader of the hydrogeology team that is doing all of the groundwater studies that I told you we were embarking on a month ago, and every indication right now from those studies is that the answer to your question is no.

It appears that there is some leakage of groundwater from the Dakota Maid Pit area and maybe the Sunday Pit into the Strawberry Creek but it doesn't appear that it's significant. But we're working really hard on that question. Because if we backfill these pits and the water table fills back up, we want to understand the hydraulics of that system. But right now, it appears that there is no problem.

The studies are not done and I would say they are probably 50 percent toward completion. But

what we learned this week from that team took my nervousness way back down.

As I told you at the last meeting, the very first thing that the Emergency Response Program did when they came and took over operations in July -- actually, it was before July even before our Emergency Response Program started our groundwater studies, and we installed nine additional wells particularly around the Dakota and Sunday Maid Pit area. They installed nine wells, and since May, we have done a gigantic pump test. Normally you put a pump in a well and suck the water out of a well and monitor the drawdown characteristic in adjacent wells. We had a really big well. A ten foot in diameter shaft, a hundred feet approximately straight down in the Dakota Pit that was full of water. We pumped that shaft down a hundred feet. All those wells that I told you about had 24 hour monitoring instrumentation on them and we watched the drawdown characteristics and hydraulics of those wells. And for some other reasons we let that shaft fill back up, and during the recovery phase of that, the hydrologists have been watching the recovery patterns on those wells and we just got some briefing today and that's how come I am comfortable in answering your question, no, right now.

Response to Comment No. 6b (Ground Water Quality and Concerns)

One commenter who lives near Bear Butte Creek stated the this is the first time this year, since the flood of '95, that I have seen fish, trout in the creek. Also, I got my results back from the EPA testing from Denver and they said I was the only one that called in to find out about the results. My arsenic level was 3.0. It can be four times higher than that before there is any need for concern. There is other ones that were just as good. And my well, by the way, is probably 75 feet from the creek. I am 125 feet deep.

Response to Comment No. 6b (Ground Water Quality and Concerns)

Public Meeting Response: Well, I am embarrassed to tell you that I don't think I know, personally, exactly what that sampling was. There is so many teams doing so much sampling out there. I do know they have been routinely monitoring wells in the area starting last May. There was a pretty extensive sampling effort that was done just last month. It was a pretty detailed sampling effort of both groundwater and surface water to try to bracket carefully all the metal loading coming into the site and hopefully your well was sampled as a part of that.

Comment No. 8 (Biological Concerns)

One commenter asked it there any provision at the site to prevent bird kill from exposed contaminants in the ponds and if the Migratory Bird Act would be addressed at the site.

Public Meeting Response: I don't have an answer for you on that one. We do have a team that's working on a baseline ecological risk assessment and they'll be going through the water chemistry data at the site and they'll be doing a risk assessment to tell us if that problem exists. I don't know right now and I don't think any of us know.

You might point out that the traditional problem has been associated with the cyanide where we have had high mortality of birds and as a result of that, we've made the mining companies put either nets or bird balls -- they are little plastic balls to cover the water surface so the birds can't land and come in contact with the cyanide water. That problem does not exist at this site.

While this mine was in active operation and there were cyanide leaching operations going on this pad, this was the process water pond where they then took the gold saturated solution of cyanide into the male gross circuit for processing. These ponds -- they call them bird balls, you know, like you see in the McDonald's restaurants, they would fill the ponds with balls so the birds would not come and land on the pond. But that cyanide has all been neutralized. There is --there's no cyanide risk left out there. The State was monitoring that while the mine was closing down.

The waters out there contain a lot of metals in them. That's why we're spending this kind of money. But does that present an acute threat to migratory birds and wild life, probably not, but that's what the baseline risk assessment will establish.