

**FIFTH FIVE-YEAR REVIEW REPORT FOR
SILVER MOUNTAIN MINE SUPERFUND SITE
OKANOGAN COUNTY, WASHINGTON**



Prepared by

**U.S. Environmental Protection Agency
Region 10
SEATTLE, WASHINGTON**

In Cooperation with

**Washington State Department of Ecology
Central Regional Office
YAKIMA, WASHINGTON**

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9/22/17

Date

Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS	3
I. INTRODUCTION	4
FIVE-YEAR REVIEW SUMMARY FORM	5
II. RESPONSE ACTION SUMMARY	5
III. PROGRESS SINCE THE LAST REVIEW	9
IV. FIVE-YEAR REVIEW PROCESS	10
Community Notification, Involvement & Site Interviews.....	10
Data Review.....	10
Site Inspection.....	11
V. TECHNICAL ASSESSMENT	12
QUESTION A: Is the remedy functioning as intended by the decision documents?	12
QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?	12
QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?	12
VI. ISSUES/RECOMMENDATIONS	13
OTHER FINDINGS.....	13
VII. PROTECTIVENESS STATEMENT	13
VIII. NEXT REVIEW.....	13
APPENDIX A – SITE PLAN AND VICINITY MAP	14
APPENDIX B – SITE CHRONOLOGY	16
APPENDIX C – MAINTENANCE PLAN	17
APPENDIX D – SITE INSPECTION REPORTS AND ANALYTICAL DATA	29
APPENDIX E – PHOTO LOG	34
APPENDIX F – REFERENCE LIST	36

LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
ICs	Institutional Controls
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SSC	State Superfund Contract
TBC	To be considered

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the Silver Mountain Mine Superfund Site (Site). The triggering action for this statutory review is the initiation of the remedial action in 1992. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of one Operable Unit (OU) that will be addressed in this FYR.

The Silver Mountain Mine Superfund Site Five-Year Review was led by Jeremy Jennings of EPA. Jeff Newschwander of the Washington State Department of Ecology (Ecology) conducted a site inspection and prepared the draft FYR Report. Mr. Newschwander also contacted the current landowner and the Okanogan County Auditor's office during the review. The review began on 4/20/2017.

Site Background

The Site is located in Okanogan County, in north-central Washington State, about six miles northwest of the town of Tonasket. A site plan and vicinity map is available as Appendix A. The five-acre Site lies in a north-south running valley known as Horse Springs Coulee and is currently owned by RR Ranch LLC of Loomis, Washington. The area around the Site is generally unpopulated, is semi-arid with scrub vegetation, and is primarily used for cattle grazing.

Underground, hard rock mining for silver and gold began at the Site in 1902. By 1956, the sporadic development of the mine produced about 2,000 feet of underground workings and several tailings piles in a mine dump consisting of waste and mineralized rock. A 400-ton per day mill was constructed in 1952, but was never used. The mill had been removed prior to the Superfund investigations.

From 1980 to 1981, Precious Metals Extraction, Ltd. constructed a cyanide heap leach pile located north of the mill foundation and attempted to extract silver and gold from the previously mined tailings. The heap pile consisted of about 5,300 tons of mineralized rock in a 100-foot by 105-foot by 14-foot pile on top of a 20 thousandths of an inch-thick plastic liner. About 4,400 pounds of sodium cyanide was mixed with water and sprayed on the top of the heap pile. The cyanide-laden solution was then collected in a leachate collection pond located south of the heap pile.

In July 1981, the Site was abandoned without cleanup or treatment of chemicals on the Site. Cyanide solution remained in the leachate collection pond and in the heap pile. Several empty cyanide drums and

large containers of carbon also were abandoned on-site.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Silver Mountain Mine		
EPA ID: WAD980722789		
Region: 10	State: WA	City/County: Okanogan County
SITE STATUS		
NPL Status: Deleted		
Multiple OUs? No	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Jeremy Jennings and Jeff Newschwander		
Author affiliation: EPA and Washington State Department of Ecology		
Review period: 4/20/2017 - 9/21/2017		
Date of site inspection: 4/25/2017		
Type of review: Statutory		
Review number: 5		
Triggering action date: 9/21/2012		
Due date (five years after triggering action date): 9/21/2017		

II. RESPONSE ACTION SUMMARY

Early Actions

Ecology recommended the Site for the NPL in 1982. In October 1984, the Site was added to the NPL by the EPA.

Ecology investigated the Site in November 1981. In 1982, it was determined that an emergency action was necessary and sodium hypochlorite was used to neutralize the cyanide solution. Sodium hypochlorite was applied twice and recirculated through the heap pile and leachate collection pond. Cyanide levels were reduced in the collection pond, but continued to leach in the heap pile, as cyanide was detected in the heap pile in 1989. In 1985, Ecology removed the drums of hazardous materials left on-site when the Site was abandoned.

In 1988, EPA contract with the U.S. Bureau of Mines (BOM) to conduct the Remedial Investigation and Feasibility Study (RI/FS) and obtained the data necessary to determine the nature and extent of contamination.

The investigation identified and evaluated the following three potential sources of contaminants identified at the Site:

- The heap leach pile.
- The unprocessed rock.
- The mine drainage water.

Potential exposure pathways for contaminants were identified as:

- On-site soils.
- On-site surface water.
- On-site ground water in a shallow aquifer.
- Off-site ground water in the region.

The baseline risk assessment identified arsenic and cyanide as the primary contaminants of concern. Arsenic is a component of the native rock in the area. The concentration of arsenic in the soil is related to the amount of arsenic in the native rock and whether it is oxidized in the native rock. Excavation and exposure of arsenic-containing rock and soil through the mining process will often result in the conversion of arsenic to an oxidized state. The oxidized arsenic is more soluble which in turn can increase the concentration in the soils from all of the mined materials, the heap pile, and the mine dump. During 1980 and 1981, cyanide was brought to the Site by Precious Metals Extraction, Ltd., and spread on the prepared heap of previously mined materials. Both arsenic and cyanide were found above background levels in the perched shallow aquifer at the edge of the heap pile during the RI/FS. Due to the low yield, or low hydraulic conductivity, in the aquifer under the Site and diversion of the surface seeps away from the Site, natural attenuation was expected to result in a gradual decrease in these groundwater values.

Although elevated levels of arsenic were found in the mine drainage, it was anticipated that blocking the mine entrance would divert surface water runoff and eliminate this exposure route.

Record of Decision

On March 27, 1990, the Record of Decision (ROD) was signed by EPA. Three primary contamination sources were identified in the ROD. First, arsenic and cyanide were found in the heap leach pile of mined material and in the trench remaining from the abandoned cyanide heap leaching operation. Second, west of the heap pile was a larger pile of unprocessed rock from which the material was taken for the heap leaching operation. The rock contained high levels of arsenic. Third, mine drainage water from the mine entrance (adit or portal) contained high levels of arsenic. This drainage water was piped from within the adit to a cattle watering trough adjacent to the leachate collection pond. Water from the trough overflowed and ponded on the Site.

The ROD included the following remedial action objectives (RAOs):

- Prevent human and environmental exposure to contaminants of concern (COCs) in soils above protective levels.
- Prevent migration of COCs in soils off-site or to groundwater.
- Determine whether COCs are present in groundwater above protective levels, and if so the extent of the contamination. (Note that a 1994 Explanation of Significant Differences (ESD) documented that the last RAO was unnecessary and was eliminated – See below.)

The ROD required implementation of the following cleanup actions:

- Consolidation of the arsenic and cyanide contaminated soil and mined rock.
- Leach heap, mine dump and soil cleanup standards were established for arsenic (200 mg/kg) and cyanide (95 mg/kg).
- Construction of a soil/clay cap over the consolidated soil and rock.
- Closure of the mine entrance to divert the flow of mine drainage away from the Site and for safety reasons.
- Fence the Site to protect the cap.
- Place deed restrictions on the property to prevent future disturbance and to make future owners aware of the Site.
- Installation of a new well in the Horse Springs Coulee aquifer to provide an alternate stock water supply.
- Installation of new ground water monitoring wells.

The March 1990 ROD was followed in October 1994 by an ESD to address conditions encountered during the construction phase that made the project unable to meet all the requirements of the ROD. Both of the changes reflect new information about groundwater conditions at the site, but neither impacts the health risk or cleanup standards for the site. New risk calculations conducted to support the issuance of the ESD determined the mine drainage posed no ecological threats. This is discussed in greater detail below.

Explanation of Significant Differences

In October 1994, EPA completed an ESD to address conditions encountered during the construction phase that made the project unable to meet all the requirements of the ROD. Both of the changes reflect new information about groundwater conditions at the site, but neither impacts the health risk or cleanup standards for the site. The EPA made the following two changes to the selected remedy:

- To allow the stock water tank to be reestablished using the mine drainage; and
- To eliminate the requirement for groundwater monitoring.

New risk calculations conducted to support the issuance of the ESD determined the mine drainage posed no ecological threats.

Remedial Implementation Activities

The following construction work was completed during the summer of 1992:

- Consolidation of mined material
- Closure of the mine entrance
- Construction of cap and cover
- The Site was fenced and hydroseeded

The consolidation action removed contaminated mine dumps from four areas around the Site and consolidated them in a single location. The Site consolidation met the ROD performance goals for arsenic in exposed soils remaining at the Site. Cyanide was not detected in any of the soil samples collected during these activities.

Following construction activities, surface water continued to enter the Site at a slow rate from a new

seep coming from the blocked mine entrance. This flow was diverted away from the capped landfill area towards an area off-site and infiltrates into the ground before reaching the Site fence.

Two attempts were made to locate a groundwater source to replace the mine drainage as a water supply for livestock. Neither of the attempts were productive and water was not found despite drilling locations that were determined to be prime locations. Since stock water is critical to the usefulness of the land and water resources are very limited in the vicinity of the Site, the evaluation of other sources necessarily focused on whether the mine drainage could still be used. Although the baseline risk assessment qualitatively noted an “enhanced” ecological risk from the stock tank, updated risk assessment calculations showed that no significant risk concerns arise from the use of mine drainage as drinking water for livestock.

The ROD required monitoring the groundwater to assure that it does not become contaminated. Three wells were installed in October 1988 and a fourth well in June 1989. Although the wells were protected during construction in 1991 and 1992, in August 1993 they were found to be damaged and inoperable. Following review of the monitoring well status, depths, and considering the lack of useable groundwater near the Site, it was determined that the Site conditions did not warrant reestablishment of a groundwater monitoring network for the Site. After consultation with Ecology, EPA determined that cleanup actions diminished the threats to the groundwater aquifer; the shallow groundwater aquifer was not found above the bedrock formation at the Site where water was previously thought to be located; and monitoring wells constructed during Site studies were damaged beyond use. This change was documented in a 1994 ESD.

EPA and Ecology conducted a final site inspection on May 27, 1997 and determined that the remedial action was functioning as designed and was protective of human health and the environment. A Final Close Out Report documenting completion was issued on June 19, 1997. A Notice of Intent to Delete (NOID) the Silver Mountain Mine Site from the NPL was published on July 30, 1997. Following a public comment period during which no comments were received, the Site was deleted from the NPL on September 22, 1997. A Sitewide Ready for Anticipated Use (SWRAU) determination was made for the site on January 16, 2008. A full Site chronology is available in Appendix B.

IC Summary Table

Table 1: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil and Groundwater	Yes	Yes	3826340013 and 9938263401	Restrict soil cap disturbance. Restrict water use except for livestock.	Declaration of Deed Restrictions, Recorded December 4, 1996

Systems Operations/Operation & Maintenance

EPA implemented the remedy in 1992 and oversaw operations and maintenance until July 10, 1997, at which time, Ecology agreed to accept long-term operations and maintenance.

Current operations and maintenance consists of monitoring the condition of the soil cap and perimeter fencing and collecting a water sample from the mine seep as prescribed in the Silver Mountain Mine Maintenance Plan (Appendix C). Following the 2012 FYR, it was determined that inspections would be conducted twice during each five-year period rather than annually due to the lack of potential impacts to the remedy from current land uses. There were two inspections conducted during the last five-year period, one in April 2016 and one in April 2017. During each inspection, a water sample was collected from the mine seep and analyzed for arsenic. In the event of potential cap or fencing failure, Ecology will work with the current landowner to implement repairs. A few noxious weeds were identified during the inspections and a broadleaf herbicide selectively applied.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations, protectiveness statements, and recommendations from the last five-year review completed in 2012, as well as the status of those recommendations.

Table 2: Protectiveness Determinations/Statements from the 2012 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Short-term Protective	The remedy at the Site currently protects human health and the environment. The cap remains in excellent condition and institutional controls remain in-place and effectively protect the remedy. Fencing surrounding the site limits access to the site and exposures to site-related contaminants. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: 1) During site inspections, inspect fencing installed by adjacent property owner and confirm it remains in place and undamaged. If fence is damaged or removed, require Site property owner to replace the fence to ensure access to the Site remains controlled. and 2) Ecology and EPA will work with the current property owner to develop a new environmental covenant that follows the guidelines of UECA. This will be done to resolve some questions about legal ownership of the Site and to ensure long-term protectiveness of the cap and non-usage of groundwater for human consumption.

Table 3: Status of Recommendations from the 2012 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description
Sitewide	Fencing Owned by Adjacent Property Owner	Continue monitoring	Completed	Adjacent fencing continues to be maintained by RR Ranch LLC and checked during inspections.
Sitewide	Update Environmental Covenant	Develop and implement new environmental covenant under the Uniform Environmental Covenant Act.	Considered But Not Implemented	Property owner was not willing to develop new environmental covenant. Existing deed restrictions in place provide required controls.

Attempts were made to work with the current property owner, (b) (6), to implement a new environmental covenant. (b) (6) was not interested in taking any actions at this time. It was determined that, while it would be appropriate to implement a new environmental covenant that meets the standards of UECA, the required deed restrictions are currently in place. The remedy remains protective of human health and the environment as long as the conditions of the current deed restriction are being observed. The effectiveness of these deed restrictions will continue to be monitored.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was made available by posting a notice in the local newspaper, the Omak-Okanogan County Chronicle, on 6/28/2017, stating that there was a five-year review and inviting the public to submit comments to the U.S. EPA. No comments were received. The results of the review will be made available at the Site information repository located at the Washington State Department of Ecology, Central Region Office located at 1250 West Alder Street in Union Gap, Washington and on EPA's website.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. The results of these interviews are summarized below.

The Okanogan County Auditor's office was contacted to determine the current status of institutional controls at the Site. The deed restrictions were found, and it was determined that they are still active and no other instruments had been recorded affecting the enforceability of the covenant.

The current landowner was contacted and interviewed to clarify elements of this report. The landowner stated that the Site is currently used for horse and cattle pasture. Cattle grazing is limited at the Site due to the lack of sufficient water supply. The mine drainage output is not sufficient to sustain a significant number of cattle. Cattle may graze the Site for up to one-month per year during the winter and spring when water is ponded and available at the Site. The landowner does not visit the Site routinely.

Data Review

Ecology reviewed the previous five-year report, along with the annual inspection report from 2016. Water samples were collected from seepage from the mine adit during the inspection in 2016 and during

the site visit for this review in April 2017. Samples were collected per the Operations and Maintenance (O&M) Plan and delivered to Cascade Analytical Laboratory in Wenatchee, Washington for analysis. Laboratory results of the samples detected total arsenic concentrations of 77.8 ug/L in 2016 and 62.6 ug/L in 2017. These concentrations are consistent with historical data from the mine seep and indicate that arsenic concentration are neither increasing nor decreasing. Table 4 presents arsenic levels measured in water samples taken from the mine seep since 1994.

Table 4: Arsenic Concentrations in Mine Seep Water Samples

Date	Mine Seep Arsenic Concentration (ug/L)
7/7/1994	46
8/23/1994	93.6
7/25/2005	67
9/27/2011	89.1
4/12/2012	86.8
4/27/2016	77.8
4/26/2017	62.6

The upper confidence limit for this data is 92.3 ug/L, below the risk threshold of 200 µg/L used in the baseline risk assessment and the ESD for evaluating risks to agricultural uses including stock watering.

Contaminant flow was not measured during any of the sampling events and no mass contaminant movement into the soil column is known at this time. It is not clear if flow rates from the mine seep vary from season to season or year to year. Overall concentrations remain below the regulatory level of concern.

Site Inspection

On April 26, 2017, Jeff Newschwander (Ecology) conducted a Site inspection of the Silver Mountain Mine. The purpose of the inspection was to assess the protectiveness of the remedy.

The Site inspection included all elements of the Silver Mountain Mine Maintenance Checklist as developed in December 1994 and amended July 1997 and November 2011. The cap continues to maintain moderate grass cover. There is evidence of invasive grasses on the cap, but no rooted plants that could penetrate or alter the cap were found. The fence installed as part of the remedial action is gone, except for the fence posts; however, a newer fence surrounding the property prevents general access to the Site. The newer fence containing a gate still provides for controlled access of cattle to the watering hole near the mine adit. Access to the watering hole by cattle was evident; however, there was little evidence that cattle routinely frequented the cap. One water sample was collected from the mine seepage, as discussed above in the Data Review section. There are two water wells located approximately one mile to the southeast of the Site. One is for domestic use and one is for livestock watering. Both are completed to a depth of approximately 400 feet and are unlikely to be impacted by perched groundwater at the Site.

Site inspection reports and analytical data are available as Appendix D. A photo log is available as Appendix E.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

Yes, the remedy is functioning as intended by the decision documents. The remedy continues to be protective of human health and the environment, and it continues to prevent exposure to contaminated soils at the Site. The final remedy allows wildlife and livestock access to Site surface waters where concentrations of arsenic were determined to be acceptable for stock watering and human consumption of those livestock. Institutional controls in the form of deed restrictions prevent human consumption of groundwater by restricting groundwater use and the installation of groundwater wells. Based on the 2017 Site inspection, the cap remains in excellent condition and no new uses of surface or groundwater in the vicinity of the Site has occurred. Although the Site fence is in disrepair, a newer adjacent landowner-owned fence in excellent condition surrounds and restricts access to the Site.

The deed restrictions appear to be working, as the current landowner is knowledgeable and understanding of the purpose of the restrictions. In April 2017, Jeff Newschwander confirmed that the deed restrictions are in place at the Okanogan County Auditor's Office. The document is registered as Okanogan Document Number 847844 and is located in Volume 150, Pages 0191-0192. In 2007, a copy of the deed restrictions were included in EPA's Institutional Controls Tracking System.

During the 2017 site inspection the growth of invasive weed species was observed on the Site cap. On May 9, 2017, Jeff Newschwander returned to the Site and selectively applied a broadleaf herbicide to the areas infested with invasive species. Other than this undesirable vegetative growth, there have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy.

Following the 2012 FYR, it was determined that Site inspections should be conducted twice per five-year interval. A site inspection was also completed in 2016, and a seep sample was collected at that time.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Question B Summary:

Exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid.

Changes in Standards and TBCs

The land use at the site, standards and TBCs have not changed.

Changes in Exposure Pathways, Toxicity, and other Contaminant Characteristics

The exposure assumptions used to develop the human health and ecological risk assessments remain valid. There has been no change in the toxicity factors for the contaminants of concern. The assumptions in the analysis are considered reasonable in developing risk-based cleanup levels.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

There is no new information to question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

No issues were identified during this FYR.

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
<i>Sitewide</i>

OTHER FINDINGS

- Invasive weed growth was observed on the soil cap at the site. A general broadleaf herbicide was selectively applied. An additional site visit will be conducted later in the summer to observe effectiveness of the herbicide application.

VII. PROTECTIVENESS STATEMENT

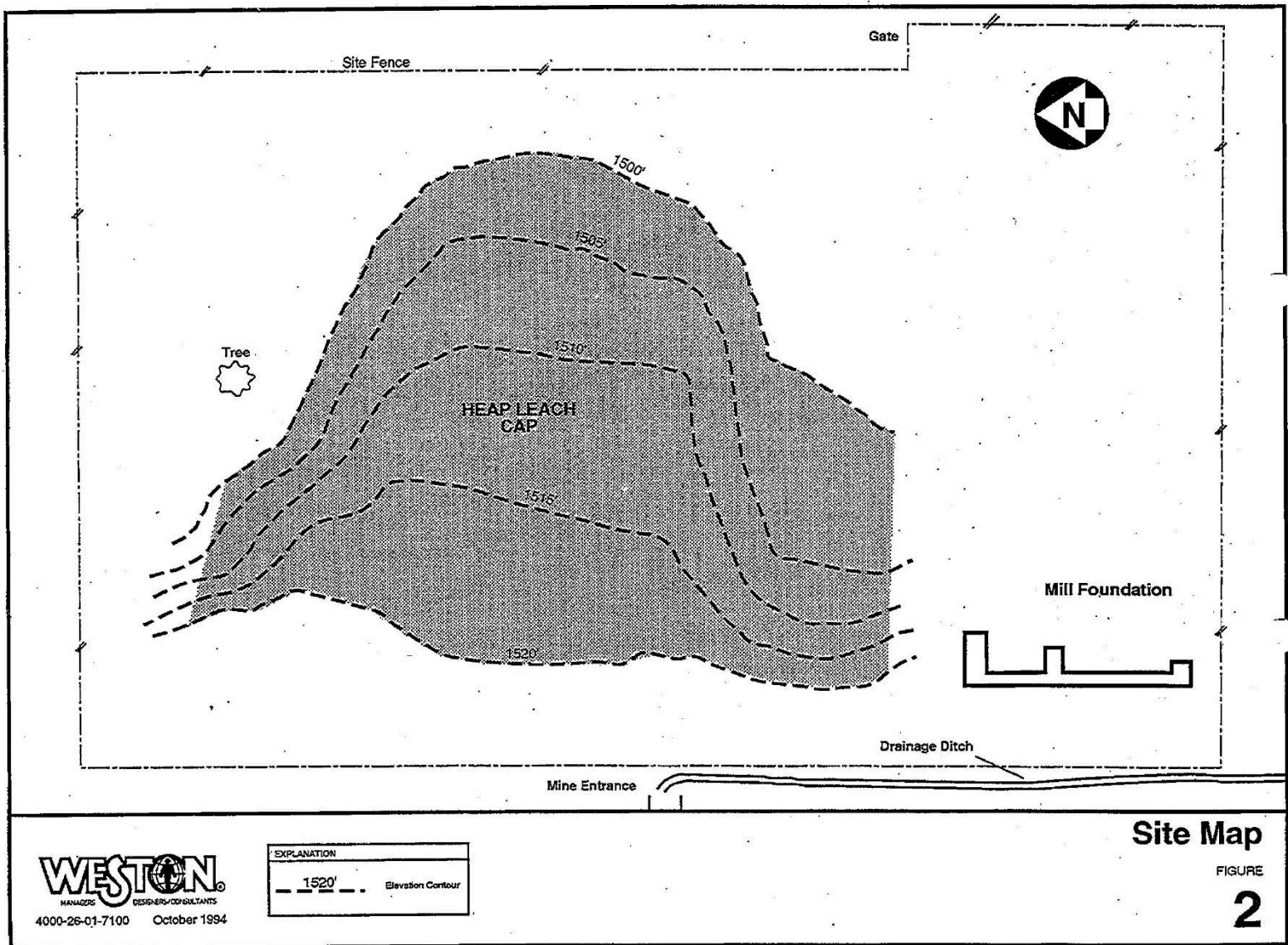
Sitewide Protectiveness Statement
<i>Protectiveness Determination:</i> Protective
<i>Protectiveness Statement:</i> The remedy at the Silver Mountain Mine Site is protective of human health and the environment.

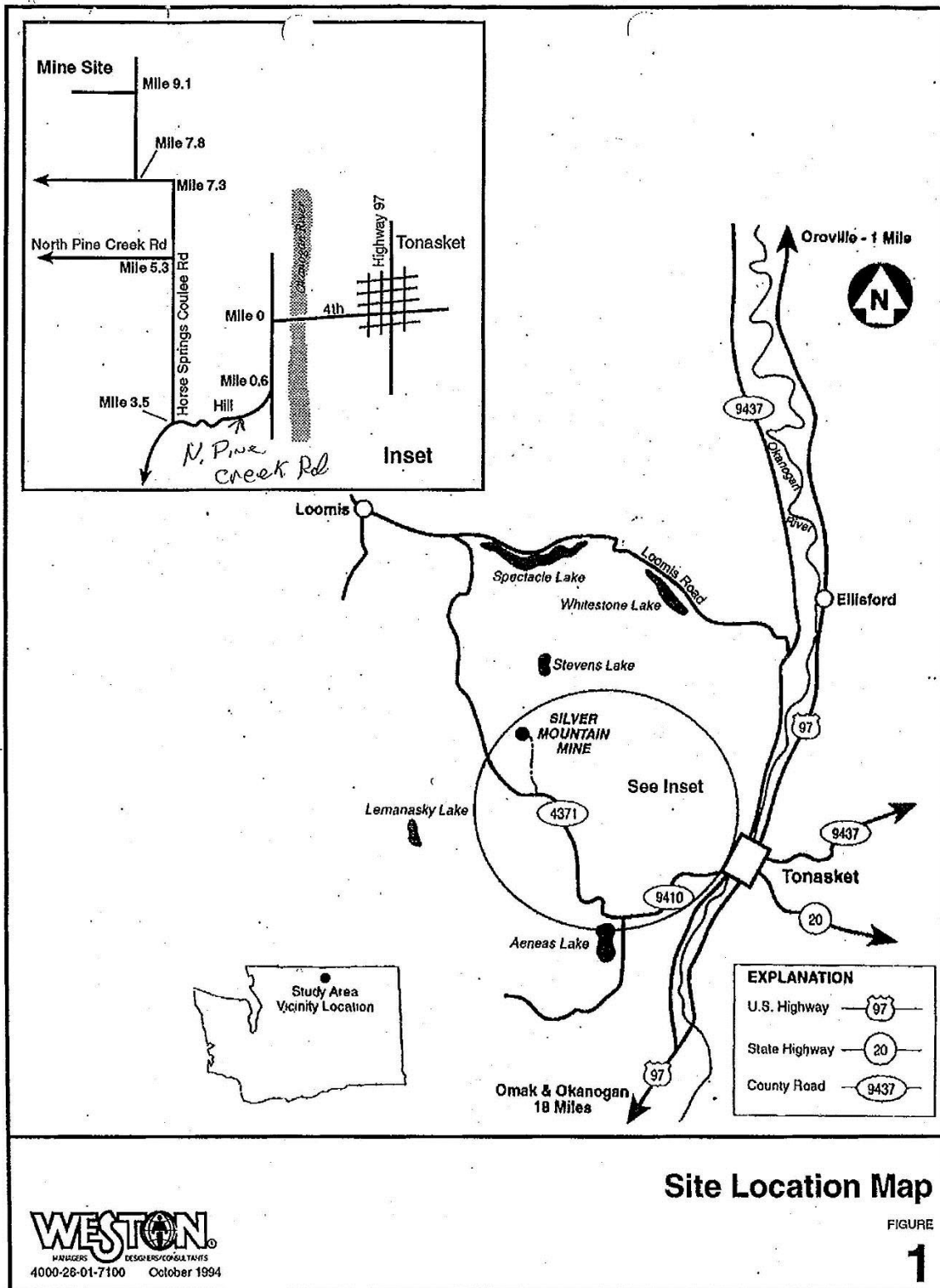
- The cap remains in excellent condition and prevents direct contact to residual tailings.
- Institutional controls remain in-place and effectively protect the remedy by preventing ingestion of groundwater and inappropriate disturbance of the cap.
- Fencing surrounding the site limits access to the site and exposures to site-related contaminants.

VIII. NEXT REVIEW

The next five-year review report for the Silver Mountain Mine Superfund Site is required five years from the completion date of this review.

APPENDIX A – SITE PLAN AND VICINITY MAP





APPENDIX B – SITE CHRONOLOGY

Event	Date
Initial discovery of problem or contamination	11/1981
Pre-NPL responses	
Preliminary assessment	08/31/1984
HRS package	09/06/1984
Proposal to NPL	10/15/1984
Site inspection	02/27/1985
NPL RP search	05/15/1985
NPL listing	06/10/1986
Removal actions	1982
Remedial Investigation/Feasibility Study complete	03/27/1990
ROD signature	03/27/1990
ROD amendments or ESDs	10/12/1994
Enforcement documents (CD, AOC, Unilateral Administrative Order)	NA
Remedial design start	05/01/1990
Remedial design complete	11/27/1991
Superfund State Contract	01/04/1991
Actual remedial action start	06/15/1991
Construction initiation date	06/29/1992
Preliminary Close Out Report	09/28/1992
Construction completion date	11/06/1992
Deed Restrictions Recorded	12/1996
Final Close Out Report	06/19/1997
Deletion from NPL	09/22/1997
Sitewide Ready for Anticipated Use	01/16/2008
Previous Five-Year Reviews	07/16/1997 09/23/2002 09/21/2007 09/20/2012

APPENDIX C – MAINTENANCE PLAN

RECEIVED
DEC 29 1994
SUPERVISOR REMEDIAL BRANCH

Silver Mountain Mine Maintenance Plan

Okanogan County, Washington

Prepared for

**U.S. Environmental Protection Agency
Region X
1200 Sixth Avenue
Seattle, Washington 98101**

**Contract No. 68-W9-0046
Work Assignment No. 46-30-0R56
Work Order No. 4000-026-001-7000
Document Control No. 4000-026-001-AAAQ**

December 1994

Prepared by

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ARCS QUALITY ASSURANCE CONCURRENCE

Project Name: Silver Mountain Mine Maintenance Plan
Contract Number: 68-W9-0046
Work Assignment Number: 4000-026-001-7000
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Signature: Larry Vanselow

Date: Dec. 27 1994

Name: Daniel Handschin
Title: Deputy QA Manager, Roy F. Weston, Inc.
Signature: Daniel Handschin

Date: 27 December 1994

Name: Frank C. Monahan, PE
Title: ARCS Program Manager, Roy F. Weston, Inc.
Signature: Frank C. Monahan

Date: 12/27/94

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 INTRODUCTION	1
2.0 SITE LOCATION	1
3.0 SITE DESCRIPTION AND DESCRIPTION OF REMEDIAL ACTION ...	1
4.0 MAINTENANCE	3
4.1 Execution	3
4.2 Inspection and Maintenance Activities	3

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1 Site Location Map	2
2 Site Map	3
3 Silver Mountain Mine Maintenance Checklist	8

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1 Silver Mountain Mine Maintenance Requirements	6

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94-795.DOC
DCN 4000-26-01-AAQ

iii

19 December 1994
PR10/SEA

SILVER MOUNTAIN MINE MAINTENANCE PLAN

1.0 INTRODUCTION

This document presents operation and maintenance items for the Silver Mountain Mine Superfund site. The site consists of an abandoned mine and heap leach pile. Cleanup of the site was completed in August 1992 by the EPA with initial maintenance of the site performed by EPA. Long-term maintenance will be performed by the Washington State Department of Ecology (Ecology). This document provides a list of maintenance items to be performed during the maintenance period.

Agency contacts for additional information are:

Agency	Contact	Phone
Environmental Protection Agency	Peter Contreras	206-553-6708
Washington State Department of Ecology	Martha Maggi	206-407-7232

2.0 SITE LOCATION

The Silver Mountain Mine Superfund site is located in Okanogan County, in the north-central part of Washington state. The site is approximately 10 miles northwest of the town of Tonasket (Figure 1).

3.0 SITE DESCRIPTION AND DESCRIPTION OF REMEDIAL ACTION

The Silver Mountain Mine Superfund site lies northwest of Tonasket, Washington, in a north-south-running valley known as Horse Springs Coulee. The site consists of five acres. Prior to remediation, the site consisted of a heap leach of mined material, a cyanide leach trench and a collection pond. Miscellaneous small piles of debris and mine tailings were scattered around the heap leach pile. The heap leach pile and other miscellaneous tailings piles were estimated to contain 5200 tons of ore. The mine entrance was located directly above the heap leach pile. A mine vent was constructed in the hillside above the mine.

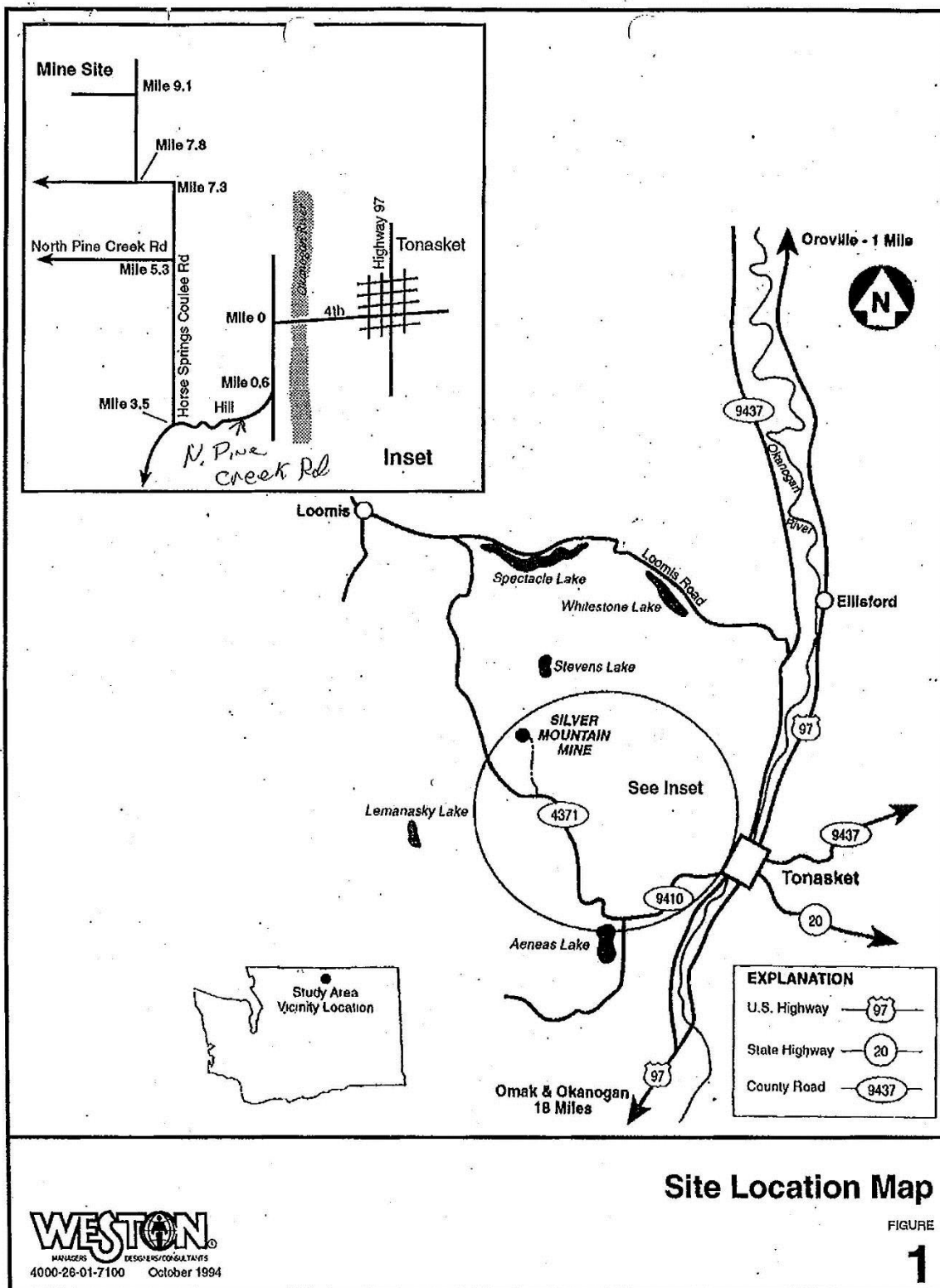
The remedial action consisted of consolidating the miscellaneous tailings and debris piles within the heap leach. Contaminated soil around the heap leach was excavated and placed on the tailings pile. The heap leach pile was graded to a configuration that complemented existing land features. The heap leach was covered with two feet of clay and three feet of topsoil. The soil cap was subsequently revegetated with native grasses. A barbed wire fence

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with wood and metal posts was constructed around the cap area. The mine entrance and vent were backfilled with rock and native material to prevent access. A small drainage ditch was dug parallel to the hillside and away from the heap leach to divert mine drainage water from the site. The current site configuration is shown in Figure 2.

4.0 MAINTENANCE

4.1 Execution

Maintenance activities will be performed by EPA until the site is transferred to Ecology. Upon transfer, maintenance will be performed by Ecology. Inspection and maintenance will be performed in accordance with the guidelines in this section.

Ecology will notify the EPA Remedial Project Manager in advance of performing the inspection/maintenance. Notification will be provided 14 days in advance of the anticipated site activities. The inspection and maintenance actions outlined in this plan will be used as the basis for site upkeep. Additional items may be added prior to on-site work during the site inspection as needed. This operation and maintenance plan may be modified by mutual agreement between EPA and Ecology.

Field notes will be prepared during site maintenance and inspections. In addition, the checklist provided in Section 4.2 will be completed. The checklist, along with the field records (and any photographs) will be kept in Ecology's project records. The completed checklist, along with a transmittal cover letter, will be sent to EPA within 14 days of completing the work. The purpose of this transmittal is to inform EPA that the work was completed and update EPA on the site conditions.

Maintenance of the site was begun in the fall of 1993 by EPA when the first application of TORDON was applied. Also since that time, the EPA has performed minor fence repair (July 1994).

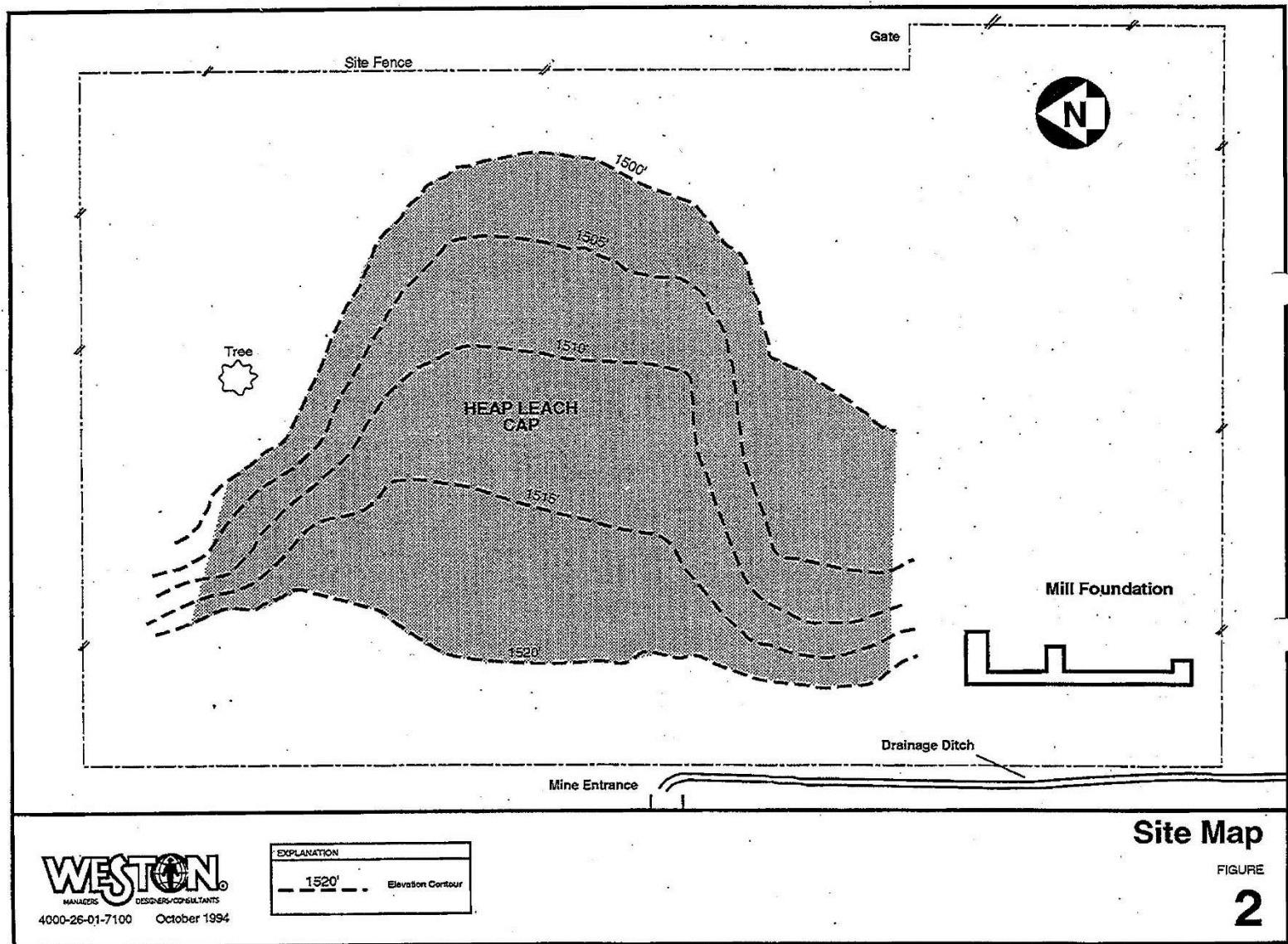
4.2 Inspection and Maintenance Activities

The site should be inspected annually due to the potential for damage resulting from livestock and trespassers (mostly hunters). The inspection should focus on items that could potentially jeopardize the functionality of the cap. In addition, the mine entrance and vent should be inspected to ensure their closure to prevent human injury.

Items inspected should include fence integrity, cap integrity, vegetative cover, drainage ditch functionality, and closure of the mine entrance and vent.

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DCN 4000-26-01-AAAQ



Most of the damage resulting from human intrusion and livestock is anticipated to occur in summer and fall months. Based on the site inspection, damage that has occurred should be repaired. The repairs should be made prior to the winter months to prevent accelerated damage as a result of winter weather.

A list of maintenance activities is provided in Table 1. Other items should be added to this list as necessary. A checklist to document the completion of site inspections and maintenance is provided in Figure 3..

The four site groundwater monitoring wells were decommissioned in October 1994 because contaminants suspected in a perched aquifer beneath the site were determined not to impact the regional aquifer. Therefore, no periodic groundwater monitoring will be performed.

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Table 1—Silver Mountain Mine Maintenance Requirements

Operation and Maintenance Requirements	Corrective Action	Frequency
1) Heap leach cap inspection		
a) Check for cap subsidence.	Remove topsoil, fill with clay, compact, replace topsoil and revegetate.	Annually
b) Check for erosion of cap particularly on east-facing wall between mill and south side of heap leach.	Fill with topsoil and revegetate. Areas where continual erosion occurs may need to be covered with riprap.	Annually
2) Vegetative cover inspection		
a) Verify adequate grass coverage.	Reseed areas where grass is not established.	Annually
b) Check for occurrence of knapweed or other weeds.	Spray site with herbicide, such as TORDON® or 2-4D. ²	Annually
c) Check for holes caused by burrowing animals	Fill bottom of hole with large rock. Fill top of hole (top 8 inches) with clay from stockpile located south of cap. Add moisture to clay if needed to provide plasticity. Compact during and after placement.	Annually
d) Remove woody vegetation from cap cover ²	Not applicable.	Annually
3) Fence inspection		
Inspect cap perimeter fence for damaged posts, broken wire and gate damage.	Repair as required to ensure the integrity of the cap.	Annually
4) Mine entrance drainage ditch inspection		
a) Inspect side slopes of ditch for sloughing into ditch.	Round edges of ditch. Remove sloughed material.	Annually
b) Verify ditch drains water beyond cap mound towards mill facility.	Remove ditch material as needed for drainage away from cap.	Annually
c) Check for high spots in ditch bottom and for vegetative growth.	Remove vegetation in ditch. Remove high spots to promote drainage.	Annually
5) Inspect closure of mine vent		
Inspect mine vent closure for subsidence or breakthrough.	Fill with surrounding soil for subsidence. Plug with large rock or concrete rubble if broken through. Backfill with soil.	Annually

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6

19 December 1994
PR10/SEA

Table 1—Silver Mountain Mine Maintenance Requirements (Continued)

Operation and Maintenance Requirements	Corrective Action	Frequency
6) Mine entrance closure Inspection Inspect entrance of mine to verify no openings into mine shaft have developed.	Plug with large stone.	Annually
7) Sample Mine Drainage Water Collect mine drainage water samples and analyze for total arsenic.	Not applicable.	Annually

^a For additional information on herbicide application or weed control call Okanogan County Noxious Weed Control Board (509-422-7165) or the Okanogan County Cooperative Extension Office (509-422-7245).

^b Mowing may be required to kill woody vegetation such as sagebrush, bitterbrush, or rabbit brush, whose deep roots could penetrate the clay cap and increase the potential for infiltration into the heap leach.

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FIGURE 3
SILVER MOUNTAIN MINE
MAINTENANCE CHECKLIST

ACTIVITY	COMPLETED (Y/N)	REPAIRS PERFORMED (Explain)	COMMENTS
1) Inspect cap for: a) Subsidence b) Erosion	 		
2) Inspect cover for: a) Adequate vegetation b) Weeds c) Holes d) Minimal woody vegetation on cap cover ^a	 		
3) Inspect fence	 		

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DCN 4000-26-01-AAAQ

Silver Mountain Mine Maintenance Plan

ACTIVITY	COMPLETED (Y/N)	REPAIRS PERFORMED (Explain)	COMMENTS
4) Inspect drainage ditch to ensure water is draining away from cap	_____		
5) Confirm mine entrance is closed	_____		
6) Confirm mine vent is closed	_____		
7) Other (specify)	_____		

* Woody vegetation such as sagebrush, bitterbrush, and rabbit brush must be removed to prevent their deep roots from penetrating the clay cap.

Inspection Performed By: _____

Agency: _____

PRINT NAME

DATE

SIGNED

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APPENDIX D – SITE INSPECTION REPORTS AND ANALYTICAL DATA

Figure 3 Revised by State of Washington Department of Ecology, 2011

Silver Mountain Mine Maintenance Checklist

Activity	Completed (Y/N)	Repairs Performed (Explain)	Comments
1) Inspect cap for: a) Subsidence b) Erosion	<u>Yes</u> <u>Yes</u>	None	No evidence of subsidence or erosion
2) Inspect cover for: a) Adequate vegetation b) Weeds c) Holes d) Minimal woody vegetation on cap ^a	<u>Yes</u> <u>Yes</u> <u>Yes</u> <u>Yes</u>	None	Consistent vegetative cover. Some weeds beginning to establish. Some sage just off the west (uphill) side of cap. Beginning to encroach.
3) Inspect fence	<u>Y</u>	None	Field perimeter fence in good condition. No fence around cap.
4) Inspect drainage ditch to ensure water is draining away from cap	<u>Y</u>	None	Some seepage from adit above cap. No erosion potential. Abnormally wet year.
5) Confirm mine entrance is closed	<u>Y</u>	None	Adit is blocked
6) Confirm mine vent is closed	<u>Y</u>	None	Upper vent is blocked.
7) Sample seep discharge	<u>Y</u>		Silver Mt. Mine - 042716 Arsenic -
8) Other (specify)			

^a Woody vegetation such as sagebrush, bitterbrush, and rabbit brush must be removed to prevent their deep roots from penetrating the clay cap

Inspection Performed By:

Seff Newschwander

PRINT NAME

4/28/16

DATE

Agency:

Wa Dept of Ecology

SIGNED

[Signature]



(509) 662-1888
Fax: (509) 662-8183
3019 G. S. Center Road
Wenatchee, WA 98801

(509) 452-7707 Batch: 638670
Fax: (509) 452-7773 Client: WA State Dept of Ecology
1008 W. Ahtanum Rd Account: 15479
Union Gap, WA 98903 Sampler: Jeff Newschwander
PO Number:

--- Water Analytical Report ---

WA State Dept of Ecology
1250 W. Alder
Union Gap, WA 98903



Report Date: 5/10/16

Laboratory Number: 16-E009898
Sample Identification: Silver Mtn. Mine
Sample Comment: 042716

Date Received: 4/27/16
Date Sampled: 4/27/16

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Arsenic Total	77.8	ug/L	1.4	EPA 200.9	5/ 9/16	
Total Metals Digest Water	Metals Digest				4/28/16	

Approved By Name: *Lauren Mearsh*

Signature: *Lauren Mearsh*

Function: *PRCS*

Cascade Analytical uses procedures established by EPA, AOAC, APHA, ASTM, and FDA/BAM. Cascade Analytical makes no warranty of any kind the client assumes all risk and liability from the use of these results. Cascade Analytical, Inc.'s liability to the client as a result of use of Cascade's test results shall be limited to a sum equal to the fees paid by the client to Cascade Analytical, Inc. for analysis. PLEASE REVIEW YOUR DATA IN A TIMELY MANNER. DATA GAPS OR ERRORS AFTER THREE MONTHS WILL NOT BE OUR RESPONSIBILITY. THOUGH WE DO KEEP ALL ANALYTICAL DATA FOR SEVERAL YEARS, SAMPLES ARE DISPOSED OF AFTER SIX WEEKS.

Silver Mountain Mine Maintenance Checklist

Activity	Completed (Y/N)	Repairs Performed (Explain)	Comments
1) Inspect cap for:			No evidence of settling or erosion.
a) Subsidence	<u>Y</u>		
b) Erosion	<u>Y</u>		
2) Inspect cover for:			Good vegetative cover. Significant evidence of invasive weed species. No woody vegetation.
a) Adequate vegetation	<u>Y</u>		
b) Weeds	<u>Y</u>		
c) Holes	<u>Y</u>		
d) Minimal woody vegetation on cap*	<u>Y</u>		
3) Inspect fence	<u>Y</u>		Neighboring RR Ranch fence is in good condition.
4) Inspect drainage ditch to ensure water is draining away from cap	<u>Y</u>		Pipe discharge is not causing erosion.
5) Confirm mine entrance is closed	<u>Y</u>		Adit remains fully blocked.
6) Confirm mine vent is closed	<u>Y</u>		Vent shafts remain blocked.
7) Sample seep discharge	<u>Y</u>		SMM 042617
8) Other (specify)	<u> </u>		

* Woody vegetation such as sagebrush, bitterbrush, and rabbit brush must be removed to prevent their deep roots from penetrating the clay cap

Inspection Performed By:

Jeff Neuschwander

PRINT NAME

4/26/17

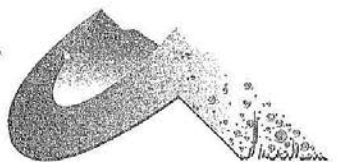
DATE

Agency:

Washington Dept. of Ecology

SIGNED

[Signature]



CASCADE ANALYTICAL, INC.

1-800-545-4206

(509) 662-1888
Fax: (509) 662-8183
3019 G. S. Center Road
Wenatchee, WA 98801

(509) 452-7707 Batch: 754853
Fax: (509) 452-7773 Client: Dept of Ecology/Yakima
1008 W. Ahtanum Rd. Account: 05265
Union Gap, WA 98903 Sampler: Jeff
PO Number:

--- Water Analytical Report ---

Report Date: 5/10/17

Dept of Ecology/Yakima
Jeff
1250 W Alder
Union Gap, WA 98903

Laboratory Number: 17-EQ08955
Sample Identification: SHM-042617

Date Received: 4/26/17
Date Sampled: 4/26/17

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Arsenic Total	62.6	ug/L	1.4	EPA 200.9	5/10/17	
Total Metals Digest Water	Metals Digest				4/27/17	

Approved By Name: *Jeff Kins*

Signature: *Jeff Kins*

Function: *LAB Supervisor*

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APPENDIX E – Public Notice



Cleanup Review Underway for Silver Mountain Mine, WA Public Comment to July 31, 2017

We would like to hear from you

The latest review of the environmental cleanup at the Silver Mountain Mine Superfund Site is underway. If you have information helpful to the review team, questions, or anything you would like us to consider during the review, please contact Jeremy Jennings, EPA Remedial Project Manager, at 206-553-2724 or 800-824-4372 ext. 2724 or jennings.jeremy@epa.gov.

About the site

The Silver Mountain Mine is in Horse Springs Coulee, northwest of Tonasket, Washington. Underground, hard rock mining for silver and gold left tailings piles of waste and mineralized rock. In 1980 to 1981 mined tailings were sprayed with a sodium cyanide solution to extract silver and gold. When the mine site was abandoned in 1981, a cyanide contaminated heap leach pile and collection pond was left. Cyanide and arsenic contamination spread to nearby soils and shallow groundwater.

About the cleanup

The cleanup was completed in 1992. Measures implemented included:

- ✓ Heap leach pile and collection pond treated to neutralize the cyanide;
- ✓ Mine tailings and heap leach piles consolidated, covered, and seeded;
- ✓ Drums of hazardous materials left on-site removed;
- ✓ Mine entrance blocked for safety and to divert runoff;
- ✓ Wells for groundwater monitoring installed; and
- ✓ Site fenced for safety and to restrict access.

The Site is currently used to graze cattle. The Washington Department of Ecology inspects the site annually and, every five years, the U.S. Environmental Protection Agency conducts a review to make sure that the cleanup measures continue to protect people and the environment. Previous reviews indicated the protective measures were in place and effective. The current review report will be available October 2017.

Send comments by July 31, 2017 to:

Jeremy Jennings, EPA Remedial Project Manager, at 206-553-2724
or 800-824-4372 ext. 2724 or jennings.jeremy@epa.gov.

Visit the online site page at: <https://www.epa.gov/superfund/silver-mt-mine>

**TDD and/or TTY users may call the Federal Relay Service at 1-800-877-8339.
Then please give the operator phone number 206-553-2724, for Jeremy Jennings.**

APPENDIX F – PHOTO LOG

Photo 1: Tailings Cap and Sealed Adit – from the east



Photo 2: Mine Drainage Pipe – from the west



Photo 3: Site Entrance Fence and Gate – from the east



Photo 4: Sealed Vent Portal – from the west



APPENDIX F – REFERENCE LIST

Record of Decision for the Silver Mountain Mine Superfund Site, Seattle, Washington. March 1990

Explanation of Significant Differences: Silver Mountain Mine. October 12, 1994

Five-Year Review Report for Silver Mountain Mine Superfund Site, Okanogan County, Washington. September 20, 2012.

Maintenance Checklist, Silver Mountain Mine, April 28, 2016

Maintenance Checklist, Silver Mountain Mine, April 26, 2017

Public Notice, The Omak-Okanogan County Chronicle, June 28, 2017