

ABBREVIATED PRELIMINARY ASSESMENT

SUNSET MINE AND MILLSITE



Mt. Baker-Snoqualmie National Forest
Skykomish Ranger District
Snohomish County, WA

September, 2003

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EXECUTIVE SUMMARY

The Forest Service performed an Abbreviated Preliminary Assessment for the Sunset Mine and Millsite (Site) to determine the need for further site characterization. The Site is located approximately 5 miles northeast of the town of Index, Washington along Trout Creek, a tributary of the North Fork of the Skykomish River. The Site is situated on moderate to steep side slopes with an elevation of 1,300 ft. above mean sea level (MSL) at the mill; mine workings are scattered on the slope above the mill up to an elevation of just over 1,600 ft. above MSL. The site consists of the foundation of the mill, one open adit (Adit 1), two collapsed adits (Adits 2 and 3) with associated waste dumps, two large open stopes, and one open ventilation raise. Mine waters discharge from Adit 2, the main haulage level, at a rate of 150 to 450 gallons per minute, depending on the season, and flow directly into Trout Creek.

A Niton XRF unit was used for In Situ field screening and bench testing of the samples collected around the foundation of the mill building as well as from waste dumps at the main underground mine workings for any potential contaminants. Water and sediment samples were not collected as part of this investigation. However, the Washington Department of Natural Resources (WA-DNR) collected water samples from the Site in 2002; analytical results were reported in Wolff and others (2002).

Arsenic was the only element that exceeded EPA Region IX Preliminary Remediation Goals (PRG) as to acceptable industrial levels in soil. Water sampling conducted by WA-DNR on the mine effluent discharging from Adit 2 indicated that the mine effluent exceeded chronic surface water standards for copper. Background sampling of the waters in Trout Creek indicate an increase in copper concentrations downstream of the Site.

Trout Creek and the North Fork of the Skykomish River are known to have anadromous fish populations including Fall Chinook, Chum, Coho, and Pink Salmon as well as Summer and Winter Steelhead (WA-Department of Fish and Wildlife, 2002). Additionally, Dolly Varden/Bull Trout have been documented in the North Fork of the Skykomish River (WA-Department of Fish and Wildlife, 2002).

There are also extreme physical hazards associated with the Site. The main health and safety concerns involve the two collapsed stopes that are open to the surface as well as the ventilation raise.

Based on the environmental and extreme physical hazards associated with the Site, it is recommended that a Site Inspection (SI) be performed.

1.0 INTRODUCTION

An Abbreviated Preliminary Assessment (APA) was performed by the US Forest Service in accordance with the EPA “Guidance for Performing Preliminary Assessments Under CERCLA”, EPA “Improving Site Assessment: Abbreviated Preliminary Assessments” of 1999, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Contingency Plan as outlined in 40 CFR Parts 300.410(c)(1)(i-v).

The purpose of this assessment was to determine whether or not there is a potential for a release of contaminants to the environment and/or to human health. The purpose of an APA is to determine whether further site characterization is warranted. A Niton XRF 700 Series was utilized to help in the preliminary screening of this Site.

2.0 SITE DESCRIPTION, OPERATIONAL HISTORY, AND WASTE CHARACTERISTICS

The Sunset Mine and Millsite is located approximately 5 miles northeast of Index, WA along Trout Creek, a tributary of the North Fork of the Skykomish River. The Site is on National Forest System lands administered and managed by the Skykomish Ranger District of the Mt. Baker-Snoqualmie National Forest. The Site was acquired through a land exchange with Murray Pacific Corporation, a forest products company, in 1985. The federal government owns and manages the surface estate but the mineral estate at the Site remains outstanding. The Site falls within the Index mining district.

Location information:

Lat./Long.:	N 47.8583°	W 121.4614°
Legal:	Willamette Meridian, T 27 N, R 10 E, Section 1	
USGS quadrangle:	Baring	

The property was originally discovered in 1897 and the Sunset Copper Company was formed that same year. The Sunset Copper Company was the principle owner-operator of the mine from 1902 until 1935 (Wolff and others, 2002). Copper ore was first produced from the property in 1902 and sent by surface tram to the town of Index and then by rail to the Tacoma smelter. By 1905, ore shipments ceased. Production resumed in 1916 with the construction of a logging railroad from Index to the mine. A 150 ton-per-day floatation mill was constructed 1918 (Toepfer, 1953). Most production occurred from 1923 through 1930 when the low price of copper caused the mine to close (Toepfer, 1953). In 1935, the Sunset Syndicate Corporation leased the mine to settle labor liens held against the parent company for unpaid wages (Wolff and others, 2002). The lien holders operated the mine at a reduced scale until 1940 when profits were sufficient to settle the liens and the property reverted to the bond holders (Toepfer, 1953). From 1941 to 1943, the mine and mill were operated by Kromona Mines Corporation of Seattle, WA (Toepfer, 1953). The property was then purchased by the Index Mining Company in 1946 (Toepfer, 1953) or 1948 (Wolff and others, 2002). Grandby Resources, Mono Resources, and others leased the property in the late 1950s and early 1960s (Wolff and others, 2002). Total production from 1902 to 1946 amounted to 12,912,015 pounds of copper, 155,971 ounces of silver, 1,500 ounces of gold, and 263,416 tons of crude ore (Toepfer, 1953).

The ore on the property occurs as lenticular masses in six roughly parallel shear zones (Wolff and others, 2002). The primary ore minerals at the site are chalcopyrite, bornite, molybdenite, silver, and copper (Derkey and others, 1990). Gangue minerals include pyrite, quartz, calcite, marcasite, serpentine, talc,

chlorite, and kaolinite (Derkey and others, 1990). The host rock for the mineralization is granodiorite and tonalite.

The site consists of the foundation of the mill, one open adit (Adit 1), two collapsed adits (Adits 2 and 3) with associated waste dumps, two large open stopes, and one open ventilation raise. Historic photos suggest tailings were discharged on the north bank of Trout Creek and into the Creek itself (Wolff and others, 2002). Periodic flooding washed the tailings downstream (Wolff and others, 2002). In the mine, five levels were developed from the three horizontal adits. In total, the mine has 12,000 feet of drifts, stopes, raises, and winzes. The main haulage adit, Adit 2, drains the mine at a rate of 150 to 450 gallons per minute, depending on the season (Wolff and others, 2002).

The property is heavily overgrown with vegetation in most places. There are remains of other structures in the area and additional mine workings may exist at the Site. Access to the Site can be accomplished from Index, WA by following County Route 63 to the northeast for 4.5 miles to Trout Creek, then proceeding southeast on Forest Service Road 6320 for approximately 1.5 miles to the mine. A four-wheel-drive vehicle is required on the Forest Service road to the mine.

Currently, the Site is inactive but the mineral rights remain outstanding.

3.0 SITE SAMPLING AND TEST RESULTS

Water Samples

Water samples were collected by Washington State Department of Natural Resources (WA-DRN) personnel at the Site in 2002 as part of the State's Inactive and Abandoned Mine Lands (IAML) inventory. The State's surface water quality standards for most elements are hardness dependent (Washington Administrative Code, Chapter 173-201A) because metals toxicity generally decreases with increasing hardness. WA-DNR did not have samples analyzed for hardness. Table 1A shows chronic surface water standards for a hypothetical hardness of 100 mg/L for reference.

The standards for arsenic, copper, lead, and zinc are for the dissolved fraction (Table 1A). Samples collected by WA-DNR were analyzed for total metal content and are hence conservative when compared to the State standards. Table 1B lists analytical results for the samples collected by WA-DNR. At the mine, effluent discharging from Adit 2, the main haulage, exceeds state chronic standards for surface waters for copper. In addition, background copper concentrations in Trout Creek noticeably increase downstream of the mine site (Table 1B).

Table 1A. State of Washington chronic surface water standards at a hypothetical hardness of 100 mg/L, metals concentrations are in µg/L.

	Arsenic	Copper	Lead	Zinc
State Standard	190	11.4	2.5	104

Table 1B. Analytical results from WA-DNR samples acquired at the Sunset Mine in 2002; metals concentrations are in µg/L (modified from Wolff and others, 2002).

Location	Discharge (gpm)	pH	Arsenic	Copper	Lead	Zinc
Trout Creek- Upstream	9,000	5.5	11	26	≤10	28
Adit 2 Effluent	150-450	5.9	≤10	64	≤10	33
Trout Creek- Downstream	9,000	5.5	19	96	≤10	27

Soil Samples

A Niton XRF, XL-722S was used to assess the material within and adjacent to the mill foundation and from the waste dumps for potential contamination. In Situ testing was performed on the Site per EPA Method 6200. Surface soils were removed to approximately 4 to 6 inches below grade in order to get below highly oxidized surface layers. Rocks, debris and other deleterious materials were removed. The soil was worked to gain a flat surface area on which to set the Niton. In addition to In Situ sampling, samples were collected, dried, and prepared for bench top sampling. The results from this effort are provided below.

The following constituents exceeded EPA Region IX PRG industrial levels:

<u>Location</u>	<u>Constituent</u>	<u>Result (mg/kg)</u>	<u>PRG (mg/kg)</u>
Mill foundation	Arsenic*	47.8	1.6
Ore piles adjacent to mill foundation	Arsenic*	143-290	1.6
Waste Dump - Adit #3	Arsenic*	98.3	1.6
Sediment - Portal of Adit #2	Arsenic*	64.4	1.6

*Arsenic – for noncancer endpoint, the PRG is 260 mg/kg. For cancer endpoints, the PRG is 1.6 mg/kg.

4.0 SUMMARY

The remains of this facility are accessible to the public and promoted in Northwest Underground Exploration's *Discovering Washington's Historic Mines* (1997). A well established trail system accesses the various mine workings at the Site. The Site is located along Trout Creek, a tributary of the North Fork of the Skykomish River. Trout Creek and the North Fork of the Skykomish River are known to have anadromous fish populations including Fall Chinook, Chum, Coho, and Pink Salmon as well as Summer and Winter Steelhead (WA-Department of Fish and Wildlife, 2002). Additionally, Dolly Varden/Bull Trout have been documented in the North Fork of the Skykomish River (WA-Department of Fish and Wildlife, 2002).

The only constituent of concern that exceeded EPA Region IX industrial levels in soil was arsenic. Analytical results from water sampling suggest exceedences of chronic surface water quality standards for copper in mine effluent discharging from Adit 2. In addition, background copper concentrations in Trout Creek noticeably increase downstream of the Site.

The Site poses significant physical hazards to the general public recreating at the Site. Two stopes have collapsed to the surface and there is one ventilation raise open to the surface. Numerous collapse features along strike of the mined out veins suggests continued subsidence may be a problem at the site.

5.0 RECOMMENDATION

Based on the In Situ screening and bench sampling of the material from the foundation of the millsite, adjacent ore piles, and waste dumps with the Niton XRF unit, water quality data, the proximity of Site to Trout Creek which is known to contain threatened and endangered fisheries, physical hazards associated with the Site, and EPA's APA Checklist (Appendix A), it is recommended that a Site Inspection (SI) be completed. As part of this inspection, a thorough study of the area to determine the extent of contamination is warranted as well as sampling water from pore spaces of the stream gravels immediately above and below the Site. Sampling of the benthic macroinvertebrates are also required. In addition to testing water samples from the pore spaces of the gravels for the presence of metallic elements, water parameters such as pH, conductivity, turbidity, dissolved oxygen, temperature, total dissolved solids, hardness, and oxygen reduction potential are required. The area should be sampled to determine the presence of waste material and tailings, and if present, the potential waste piles and tailings should be sampled at depth and a determination of volumes should be calculated. Acid base accounting (ABA) is required if waste material is present besides what had been observed during this assessment. Sediment samples are to be collected from transects of the stream and preferably at depth and analyzed for total as well as for available metals. Surface water samples are also required for analyses of both total and dissolved metal concentrations in Trout Creek and the North Fork of the Skykomish River as well as in any other seeps and/or tributaries that may be present in the vicinity of the Sunset mine and millsite.

Appendix B contains additional photos of the Site.

REFERENCES

- Derkey, R.E., Joseph, N.L., and Lasmanis, R., 1990, Metal mines of Washington-preliminary report: Washington Department of Natural Resources, Division of Geology and Earth Resources Open File Report 90-18. 577 p.
- Northwest Underground Explorations, 1997, Discovering Washington's historic mines, Volume 1: The west central cascade mountains: Oso Publishing, Arlington, WA, 230 p.
- Toepfer, P.H., 1953, Investigation of the Sunset copper mine, Snohomish County, Washington: U.S. Bureau of Mines Report of Investigations 4989, 9 p.
- Washington State Department of Fish and Wildlife, StreamNet Database, Priority Anadromous and Resident Fish Presence Report for T27N R10E Section 1, April 11, 2002.
- Wolff, F.E., McKay, D.T., Jr., and Norman, D.K., 2002, Inactive and abandoned mine lands: Sunset Mine, Snohomish County, Washington: Washington Department of Natural Resources, Division of Geology and Earth Resources Open File Report 2002-4. 9 p.

Appendix A

ABBREVIATED PRELIMINARY ASSESSMENT CHECKLIST

ABBREVIATED PRELIMINARY ASSESSMENT CHECKLIST

This checklist can be used to help the site investigator determine if an Abbreviated Preliminary Assessment (APA) is warranted. This checklist should document the rationale for the decision on whether further steps in the site assessment process are required under CERCLA. Use additional sheets, if necessary.

Checklist Preparer: Greg Graham, Geologist for
Dennis Boles, Environmental Engineer September 15, 2003
 (Name/Title) (Date)

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 (Address) (Phone)

djboles@fs.fed.us
 (E-Mail Address)

Site Name: Sunset Mine and Millsite

Previous Names (if any):

Site Location: The Site is located approximately 5 miles northeast of Index, WA along Forest Service Road 6320.

Legal Description: Willamette Meridian, T27N, R10E, Section 1

Latitude: N47.8583°

Longitude: W121.4614°

Describe the release (or potential release) and its probable nature: The material on and adjacent to the mill foundation and mine waste dumps is contaminated. Arsenic concentrations of 47.8 to 290 mg/kg exceed EPA Region IX PRGs for industrial soils of 1.6 mg/kg for cancer endpoint and 260 mg/kg for noncancer endpoint.

Water sampling performed by WA-DNR indicates exceedences of chronic surface water quality standards for copper in the mine effluent discharging from Adit 2. Background copper concentrations in Trout Creek noticeably increase downstream of the Site.

Part 1 - Superfund Eligibility Evaluation

If All answers are "no" go on to Part 2, otherwise proceed to Part 3	YES	NO
1. Is the site currently in CERCLIS or an "alias" of another site?		X
2. Is the site being addressed by some other remedial program (Federal, State, or Tribal)?		X
3. Are the hazardous substances potentially released at the site regulated under a statutory exclusion (i.e., petroleum, natural gas, natural gas liquids, synthetic gas usable for fuel, normal application of fertilizer, release located in a workplace, naturally occurring, or regulated by the NRC, UMTRCA, or OSHA)?		X
4. Are the hazardous substances potentially released at the site excluded by policy considerations (i.e., deferred to RCRA corrective action)?		X
5. Is there sufficient documentation to demonstrate that no potential for a release that could cause adverse environmental or human health impacts exist (i.e., comprehensive remedial investigation equivalent data showing no release above ARAR's, completed removal action, documentation showing that no hazardous substance release have occurred, or an EPA approved risk assessment completed)?		X

Please explain all "yes" answer(s). _____

Part 2 - Initial Site Evaluation

For Part 2, if information is not available to make a “yes” or “no” response, further investigation may be needed. In these cases, determine whether an APA is appropriate. Exhibit 1 parallels the questions in Part 2. Use Exhibit 1 to make decisions in Part 3.

If the answer is “no” to any questions 1, 2, or 3, proceed directly to Part 3.	YES	NO
1. Does the site have a release or a potential to release?	X	
2. Does the site have uncontained sources containing CERCLA eligible substances?	X	
3. Does the site have documented on-site, adjacent, or nearby targets?	X	

If the answers to questions 1, 2, and 3 above were all “yes” then answer the questions below before proceeding to Part 3.	YES	NO
4. Does documentation indicate that a target (i.e., drinking water wells, drinking surface water intakes, etc.) has been exposed to a hazardous substance released from the site?		X
5. Is there an apparent release at the site with no documentation of exposed targets, but there are targets on site or immediately adjacent to the site?	X	
6. Is there an apparent release and no documented on-site targets or targets immediately adjacent to the site, but there are nearby targets (i.e., targets within 1 mile)?	X	
7. Is there no indication of a hazardous substance release, and there are uncontained sources containing CERCLA hazardous substances, but there is a potential to release with targets present on site or in proximity to the site?	X	

Notes:

EXHIBIT 1
SITE ASSESSMENT DECISION GUIDELINES FOR A SITE

Exhibit 1 identifies different types of site information and provides some possible recommendations for further site assessment activities based on that information. You will use Exhibit 1 in determining the need for further action at the site, based on the answers to the questions in Part 2. Please use your professional judgment when evaluating a site. Your judgment may be different from the general recommendations for a site given below.

Suspected/Documented Site Conditions		APA	FULL PA	PA/SI	SI
1. There are no releases or potential to release.		Yes	No	No	No
2. No uncontained sources with CERCLA-eligible substances are present on site.		Yes	No	No	No
3. There are no on-site, adjacent, or nearby targets		Yes	No	No	No
4. There is documentation indicating that a target (i.e., drinking water wells, drinking surface water intakes, etc.) has been exposed to a hazardous substance released from the site.	Option 1: APA SI	Yes	No	No	Yes
	Option 2: PA/SI	No	No	Yes	No
5. There is an apparent release at the site with no documentation of exposed targets, but there are targets on site or immediately adjacent to the site.	Option 1: APA SI	Yes	No	No	Yes
	Option 2: PA/SI	No	No	Yes	N/A
6. There is an apparent release and no documented on-site targets and no documented immediately adjacent to the site, but there are nearby targets. Nearby targets are those targets that are located within 1 mile of the site and have a relatively high likelihood of exposure to a hazardous substance migrating from the site.		No	Yes	No	No
7. There is no indication of a hazardous substance release, and there are uncontained sources containing CERCLA hazardous substances, but there is a potential to release with targets present on site or in proximity to the site.		No	Yes	No	No

Part 3 - EPA Site Assessment Decision

When completing Part 3, use Part 2 and Exhibit 1 to select the appropriate decision. For example, if the answer to question 1 in Part 2 was “no,” then an APA may be performed and the “NFRAP” box below should be checked. Additionally, if the answer to question 4 in Part 2 is “yes,” then you have two options (as indicated in Exhibit 1): Option 1 -- conduct an APA and check the “Lower Priority SI” or “Higher Priority SI” box below; or Option 2 -- proceed with a combined PA/SI assessment.

Check the box that applies based on the conclusions of the APA:	
<input type="checkbox"/> NFRAP	<input type="checkbox"/> Refer to Removal Program – further site assessment needed
<input checked="" type="checkbox"/> Higher Priority SI	<input type="checkbox"/> Refer to Removal Program – NFRAP
<input type="checkbox"/> Lower Priority SI	<input type="checkbox"/> Site is being addressed as part of another CERCLIS site
<input type="checkbox"/> Defer to RCRA Subtitle C	<input type="checkbox"/> Other: _____
<input type="checkbox"/> Defer to NRC	
Regional EPA Reviewer: <u> N/A </u>	
_____	_____
Print Name/Signature	Date

PLEASE EXPLAIN THE RATIONALE FOR YOUR DECISION:

The Site is promoted in Northwest Underground Exploration's *Discovering Washington's Historical Mines (1997)* and trails at the Site suggest frequent visitation by the public for rock and mineral collecting. The Site is located on Trout Creek, a tributary of the North Fork of the Skykomish River, known to contain threatened and endangered anadromous and resident fish populations. In addition to contaminated soils and exceedences of surface water quality standards, extreme physical hazards are present at the Site in the form of two collapsed stopes and a ventilation shaft. Public recreating at the Site could be placed in jeopardy. Based on these facts, it is recommended that an SI be implemented.

NOTES:

Access to the Site is accomplished by proceeding northeast on paved County Road 63 from the town of Index, WA. At four miles, proceed southeast on Forest Service Road 6320 for 1 mile to the Site. Four-wheel drive vehicles are required on the unimproved Forest Service road.

The inactive/abandoned Non Pareil mine is located approximately ½ mile up Forest Service Road 6320 from the Site. Additional mine workings likely exist at the Site but were not found during this investigation.

Appendix B

ADDITIONAL SITE PHOTOS



Photo 1. Remains of mill foundation, view to the northwest (photo by G. Graham, 7/30/2003).

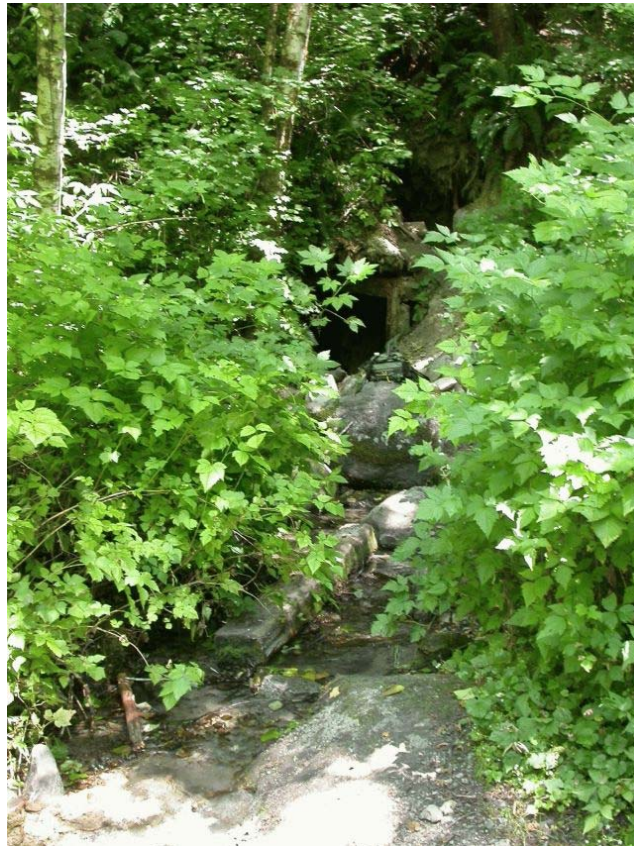


Photo 2. Partially caved Adit 2 which was the main haulage level for the mine. Note discharge stream in the foreground, view to the northeast (photo by G. Graham 7/30/2003).



Photo 3. Discharge from Adit 2 on access road en route to Trout Creek, view to the east (photo by G. Graham, 7/30/2003).



Photo 4. Discharge from Adit 2 entering Trout Creek approximately 500 feet east of the portal, view to the southwest (photo by G. Graham, 7/30/2003).



Photos 5 and 6. Adit 1 and associated waste dump, view to the northwest (photo by G. Graham, 7/30/2003).



Photos 7 and 8. Caved adit 3 and associated waste dump, view to northeast (photo by G. Graham, 7/30/2003).



Photo 9. Air shaft open to the surface, view to northwest (photo by G. Graham, 7/30/2003).



Photo 10. Collapsed Stope 2 open to surface, view to southeast (photo by G. Graham, 7/30/2003).



Photo 11. Surface expression of collapsed Stope 2 at surface, view to northwest (photo by G. Graham, 7/30/2003).