Stibnite/Yellow Pine Mining Area

Yellow Pine, Idaho

EPA Facility ID: ID9122307607

Basin: Upper Middle Fork Salmon

HUC:17060208

Executive Summary

The Stibnite/Yellow Pine Mining Area site is in northern-central Valley County, Idaho, along the East Fork South Fork Salmon River (East Fork). Gold-antimony ore and tungsten were mined at the Stibnite site from the early 1900s through 1997. The East Fork is a tributary of the South Fork Salmon River. The NOAA trust habitats of concern are the surface waters and sediments of the East Fork, which is designated as habitat for salmonid spawning. NOAA trust resources using the East Fork are Snake River spring/summer chinook salmon, Pacific lamprey, and steelhead trout. Chemicals of concern at the Stibnite site are metals and cyanide.

Site Background

The Stibnite/Yellow Pine Mining Area (Stibnite) site is in northern-central Valley County, Idaho, along the East Fork South Fork Salmon River (East Fork), approximately 23 km (14 mi) southeast of Yellow Pine, Idaho (Figure 1). The site boundary begins approximately 1.6 km (1 mi) upstream of the Meadow Creek Diversion Channel and extends north to approximately 0.4 km (0.25 mi) downstream of the confluence of Sugar Creek and the East Fork (Figure 2). The site and nearby terrain consist of narrow valleys surrounded by steep mountains. The Payette and Boise National Forests both border the Stibnite site (URS 2000).

Mining and mineral processing, primarily of gold, antimony, and tungsten, have taken place at the Stibnite site since the early 1900s. Major operations within the Stibnite site included the Meadow Creek Mine and ore processing facilities in Meadow Creek Valley (1919-1938); the Yellow Pine Mine (1937-1952); the West End mining area (1982-1990); and the Homestake ore body (1988-1992). Mining activities ceased in 1997 (URS 2000).

Originally, tailings from the Meadow Creek Mine and the Yellow Pine Mine were disposed of at impoundments called the Bradley Tailings and were also directly discharged into Meadow Creek (Figure 2). Near the end of World War II, a larger tailings impoundment (known as the Historical Bradley Tailings) was constructed in the upper Meadow Creek Valley, upstream of Blowout Creek. Meadow Creek was diverted to provide room for these tailings deposits. Over time, ponding of upper Meadow Creek occurred behind the impoundment. On one or more occasions between 1952 and 1978, a period when the Stibnite site was mostly idle, the Meadow Creek diversion failed, allowing the creek to erode the tailings. The U.S. Department of Agriculture Forest Service (USDA Forest Service) has estimated that approximately 9,072 metric tons (10,000 tons) of tailings washed into Meadow Creek as a result (URS 2000).

The Yellow Pine Mine began as underground workings in 1937. In May 1943, it was converted to an open-pit mine, and the East Fork was diverted around the pit. In 1952, the Yellow Pine Mine

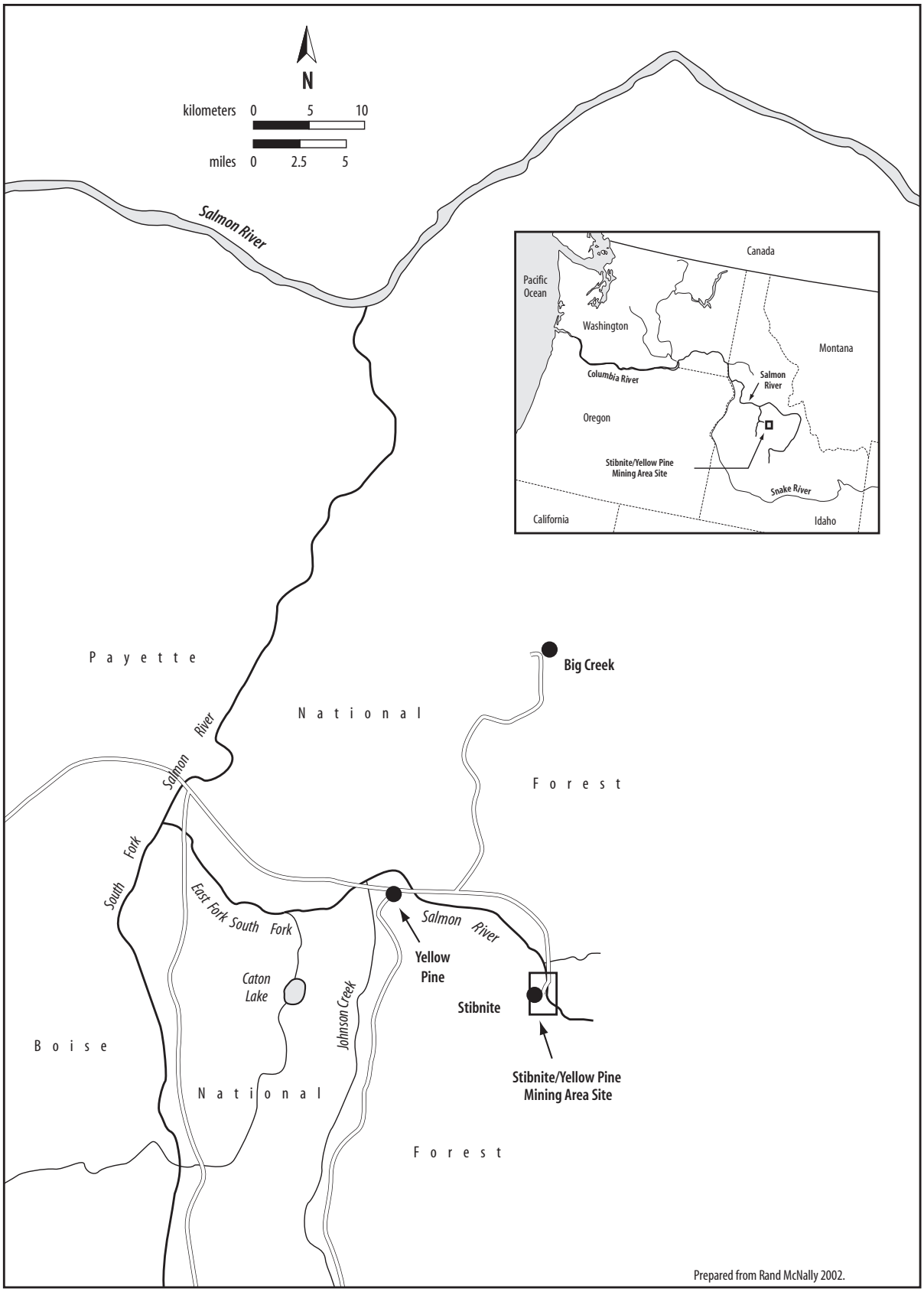

Figure 1. Location of Stibnite/Yellow Pine Mining Area site, Yellow Pine, Idaho.

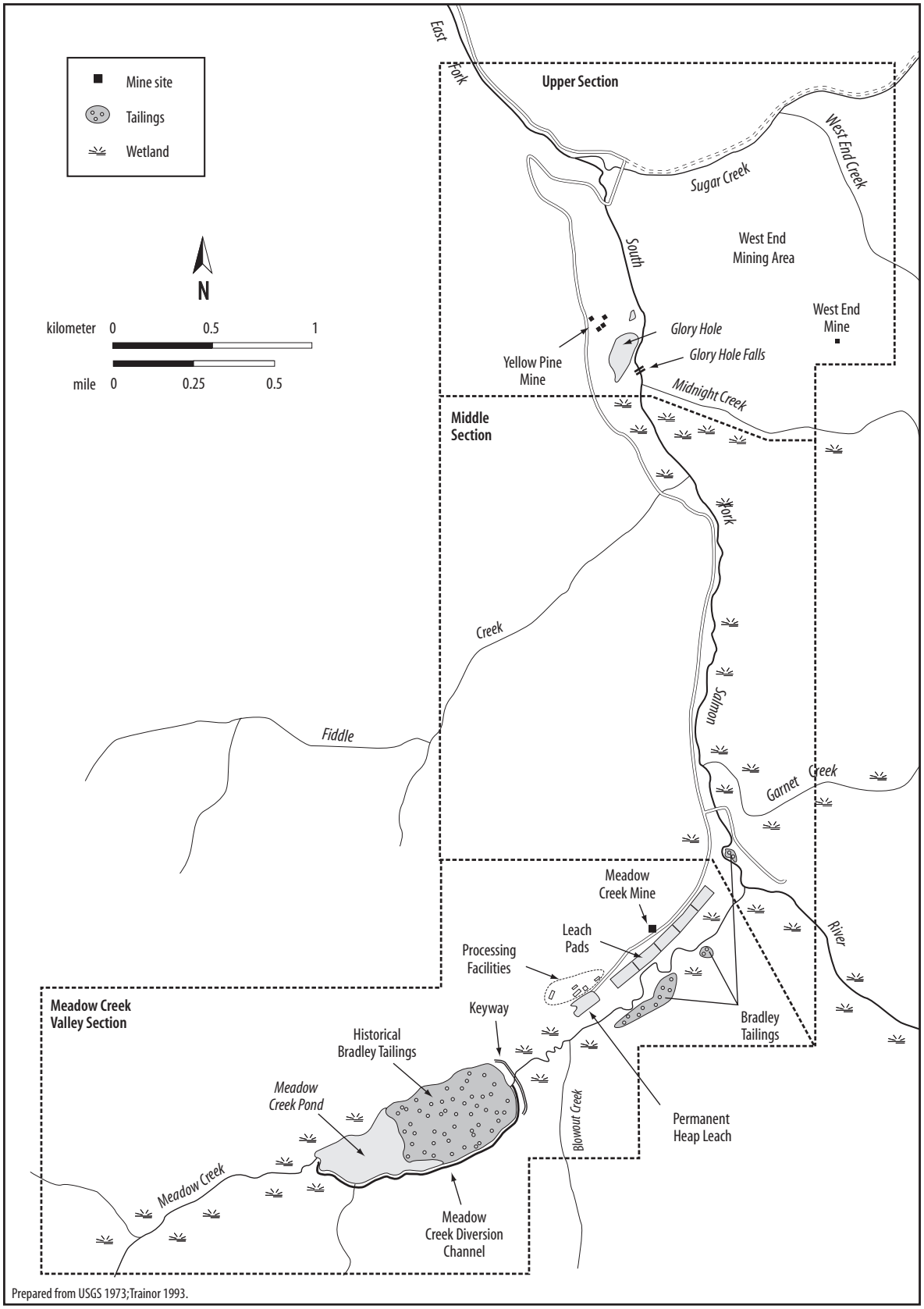

Figure 2. Detail of Stibnite/Yellow Pine Mining Area site.

closed, and the East Fork was diverted back to its original stream channel, running through and filling the pit, now termed the Glory Hole. This action also created a waterfall upstream of the Glory Hole (pit lake), known as Glory Hole Falls (NMFS 1995).

In 1982, the mining of low-grade oxide gold ore began in the West End mining area. On/off leach pads and cyanidation processing facilities associated with the West End mining area were constructed near the site of the former Meadow Creek Mine and processing facilities (URS 2000). In spring 1990, a cyanide release occurred as the result of one mining company's practices related to the disposal of spent ore from the West End mining area. The cyanide release caused the U.S. Environmental Protection Agency (USEPA) to consider the site for possible placement on the National Priorities List (NPL) (USDA Forest Service 1994).

Between 1988 and 1992, oxide gold ore was mined from the Homestake ore body. The exact location of the Homestake ore body could not be determined from available information for this report, but it is generally east of the Yellow Pine Mine. A permanent heap leach associated with mining at the Homestake ore body was constructed along Meadow Creek near the old processing facilities in Meadow Creek Valley (URS 2000).

A number of investigations and data collection programs have been undertaken at the Stibnite site, including surface water quality monitoring and flow measurement studies, groundwater monitoring, and the sampling of soil, tailings, and sediment (URS 2000). In addition, several reclamation activities have been undertaken within the Stibnite site. The Historical Bradley Tailings impoundment has been encapsulated with neutralized ore from the leach pads. To reduce the sediment load to Meadow Creek from tailings deposits, Meadow Creek has been diverted/realigned around the tailings impoundment, a keyway (earthen dam) has been constructed at the base of the tailings impoundment, and other tailings impoundments have been covered with waste rock and other materials. Revegetation along the banks of Meadow Creek and stream restoration have also been undertaken (URS 2000).

Surface water provides the primary pathway for the migration of contaminants from and within the Stibnite site to NOAA trust resources. Surface water bodies at the site include the East Fork and its tributaries, the Glory Hole (pit lake), wetlands in Meadow Creek Valley, and various springs throughout the area. The East Fork is the main drainage running through the site, and all of the site's minor drainages flow into the East Fork (URS 2000).

The Stibnite site was proposed to the NPL on September 13, 2001 (USEPA 2001). No information is currently available regarding possible further actions to be taken at the site.

NOAA Trust Resources

The NOAA trust habitats of concern are the surface waters and sediments of the East Fork South Fork Salmon River and the South Fork Salmon River. The NOAA trust resources found within the East Fork are Snake River spring/summer chinook salmon, Pacific lamprey, and steelhead trout (Table 1).

The East Fork's watershed covers approximately 101,000 ha (250,000 acres). The East Fork flows into the main stem of the South Fork Salmon River approximately 48 km (about 30 mi) downstream of the site. The South Fork Salmon River joins the Salmon River approximately 54 km (about 33 mi) farther downstream. The Salmon River then forms a confluence with the Snake River, which flows into the Columbia River and ultimately to the Pacific Ocean (URS 2000).

Table 1. NOAA trust fish species found within the East Fork South Fork Salmon River and the South Fork Salmon River (Apperson 2002).

Species		Habitat Use			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Rec. Fishery
ANADROMOUS FISH						
Pacific lamprey	*Lampetra tridentata*	◆	◆			
Snake River spring/summer chinook salmon[a]	*Oncorhynchus tshawytscha*	◆	◆			
Steelhead trout	*Oncorhynchus mykiss*	◆	◆			◆[b]

a: Federally listed as a threatened species
b: Catch-and-release basis only

The Salmon River, a major river system in Idaho, supports anadromous fish (USDA Forest Service 1994). The South Fork Salmon River drainage, including the East Fork, has historically contained one of Idaho's largest salmon runs. The East Fork has been designated by the State of Idaho as habitat for salmonid spawning (URS 2000). Specifically, the Salmon River and its tributaries (including the East Fork) are proposed for designation as "critical habitat" for the Snake River spring/summer chinook salmon, which were listed as a threatened species under the Endangered Species Act on April 17, 1992 (Greystone 1993; USDA Forest Service 1994). Approximately 6.4 km (4 mi) of chinook salmon habitat exist upstream of the Glory Hole (pit lake) in the East Fork (NMFS 1995).

There are eight dams between the Pacific Ocean and the Stibnite site: four along the lower section of the Columbia River and four along the Snake River. All eight dams are equipped with adult and juvenile fish passage facilities (NDPSCO 2002).

Although there are no dams on the Salmon River, the South Fork Salmon River, or the East Fork, Glory Hole Falls creates a complete migration barrier to returning adult chinook salmon and returning adult steelhead. Chinook salmon have been planted above Glory Hole Falls by the Idaho Department of Fish and Game and are known to have spawned successfully (Apperson 2002). The Idaho Department of Environmental Quality has submitted a grant proposal to the Bonneville Power Administration (BPA) for a project to restore fish passage and habitat on the upper East Fork, including restoration work to Glory Hole Falls. The BPA is in the process of reviewing the proposal (Schuld 2002).

Both A-run and B-run steelhead migrate up the Columbia River Basin. The A-run fish pass over Bonneville Dam by August 25, have mostly spent one year rearing in the ocean, and average 63 to 70 cm (about 25 to 27 in) in length and about 3 kg (about 6.5 lb) in weight. The B-run fish pass over Bonneville Dam after August 25, have mostly spent two years rearing in the ocean, and average 80 to 88 cm (about 31 to 34 in) in length and 5 to 6 kg (about 11 to 13 lb) in weight (NOAA 1994). Steelhead found in the East Fork are predominantly B-run fish, although both A-run and B-run fish do get up into the stream (Apperson 2002).

Pacific lamprey, although historically documented in the South Fork Salmon River, have not been observed since the mid-1980s. The South Fork Salmon River still provides suitable habitat for this species to spawn (Apperson 2002).

There is no commercial fishing in the Salmon River and its tributaries. Chinook salmon is closed to fishing to protect the wild chinook runs. There is recreational fishing of steelhead in the East Fork

and in the South Fork Salmon River, but only on a catch-and-release basis. No fish consumption advisories are currently in effect for the Stibnite area (Apperson 2002).

Site-Related Contamination

Contaminants of concern at the Stibnite site include metals and cyanide (Greystone 1993) (Table 2). Groundwater, surface water, soil, and sediment samples collected from the site have all been analyzed for metals. Groundwater and surface water samples have also been analyzed for cyanide (URS 2000).

Table 2. Maximum concentrations of contaminants of concern detected in environmental media collected from the Stibnite site (Trainor 1993; URS 2000).

	Soil (mg/kg)		Water (µg/L)			Sediment (mg/kg)	
Contaminant	Soil	Mean U.S.[a]	Groundwater	Surface Water	AWQC[b]	Sediment	TEL[c]
INORGANIC COMPOUNDS							
Arsenic	9,500	5.2	14,000	610	150	2,200	5.9
Cadmium	5.3	0.06	38	1.7	2.2[d]	6.6	0.596
Chromium[h]	33	37	14	5.4	11	18	37.3
Copper	290	17	180	110	9[d]	290	35.7
Cyanide, free	N/A	NA	0.26[g]	700[g]	5.2	N/A	NA
Lead	750	16	15	44	2.5[d]	720	35
Mercury	470	0.058	0.99	7.7	0.77[e]	11	0.174
Nickel	36	13	87	14	52[d]	22	18
Selenium	67	0.26	4.6	<5	5.0[e]	4.5	NA
Silver	20	0.05	<10	5.8	0.12[df]	7.5	NA
Zinc	290	48	440	2,200	120[d]	110	123.1

NA: Screening guidelines not available.

N/A: Analyte not analyzed for.

a: Shacklette and Boerngen (1984), except for cadmium and silver, which represent average concentrations in the Earth's crust from Lindsay (1979).

b: Ambient water quality criteria for the protection of aquatic organisms (USEPA 1993, 1999). Freshwater chronic criteria presented.

c: Threshold effects level is the geometric mean of the 15th percentile of the effects data and the 50th percentile of the no-effects data. The TEL is intended to represent the concentration below which adverse biological effects rarely occurred (Smith et al. 1996).

d: Criterion expressed as a function of total hardness; concentrations shown correspond to hardness of 100 mg/L.

e: Criterion expressed as total recoverable metal.

f: Chronic criterion not available; acute criterion presented.

g: Site concentrations based on weak acid disassociated figures, which were assumed to be equivalent to free cyanide concentrations.

h: Screening guidelines represent concentrations for $Cr.^{+6}$

In soil samples, maximum concentrations of several metals exceeded mean U.S. soil guidelines. The maximum concentrations of arsenic and mercury exceeded the U.S. soil guidelines by three orders of magnitude. The maximum concentrations of selenium and silver exceeded guidelines by two orders of magnitude, while maximum concentrations of cadmium, copper, and lead exceeded guidelines by one order of magnitude. The maximum concentrations of nickel and zinc exceeded the U.S. soil guidelines by factors of approximately three and six, respectively. The maximum concentration of chromium did not exceed U.S. soil guidelines. Maximum concentrations of arsenic, mercury, and selenium occurred in samples from the site's middle section; maximum concentrations of cadmium, copper, lead, nickel, silver, and zinc occurred in the Meadow Creek Valley area; and the maximum concentration of chromium occurred in the site's upper section.

Several metals were detected in groundwater samples collected from the site; all but two of the maximum concentrations exceeded ambient water quality criteria (AWQC). Maximum concentrations of arsenic, cadmium, and copper exceeded the AWQC by one order of magnitude. Maximum concentrations of chromium, lead, nickel, and zinc exceeded the AWQC by factors ranging from 1.3 to six times the AWQC. The maximum concentration of mercury slightly exceeded the AWQC. Selenium and cyanide were detected at maximum concentrations below the AWQC. Silver was not detected, but the detection limit was above the AWQC. The maximum concentrations of arsenic, cadmium, chromium, copper, lead, nickel, and zinc all occurred in samples from the Meadow Creek Valley area. The maximum concentration of mercury occurred in the site's middle section.

In surface water samples, the maximum concentration of cyanide exceeded the AWQC by two orders of magnitude, while maximum concentrations of copper, lead, mercury, silver, and zinc all exceeded the AWQC by one order of magnitude. The maximum concentration of arsenic exceeded the AWQC by a factor of four. Maximum concentrations of cadmium, chromium, nickel, and selenium did not exceed the AWQC. The distribution of maximum concentrations in surface water was similar to that in groundwater. Most of the maximum concentrations occurred in the Meadow Creek Valley, with some also occurring in the middle to upper sections of the site. The maximum concentration of cyanide occurred in a surface water sample from Meadow Creek Pond.

Sediment samples from the site also contained elevated metals concentrations. The maximum concentration of arsenic exceeded the threshold effects level (TEL) by two orders of magnitude. The maximum concentrations of cadmium, lead, and mercury all exceeded TELs by one order of magnitude. The maximum concentrations of copper and nickel exceeded TELs by factors of approximately eight and 1.2, respectively. Maximum concentrations of chromium and zinc did not exceed TELs. There are no TELs for comparison with the maximum concentrations of selenium and silver. Most maximum concentrations occurred in samples from the Meadow Creek Valley, including arsenic, cadmium, copper, lead, mercury, nickel, selenium, and silver. The maximum concentrations of chromium and zinc occurred in samples collected from Midnight Creek.

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