1987 ADEC Report

EXECUTIVE SUMMARY

Red Devil Mine, located eight miles down river from Sleetmute on the Kuskokwim River, is a facility on the State of Alaska list of potential hazardous waste sites. A site investigation, including a site visit of June 26, 1986 was conducted to interview residents and gather information for evaluation.

Mining, milling and mercury recovery operations at Red Devil Mine spanned a period of 38 years. During this period, site operations evolved from a hand mining and retorting operation into a full scale, mechanized mine. Approximately 35,000 flasks of mercury were produced. The mine has been inactive since 1971.

Three previous site sampling investigations by other investigators were conducted in March, 1971; May, 1971; and July, 1979. Sufficient analytical data was available from these investigations to evaluate the site. Samples taken contained water and sediment mixed. Test results from these investigations showed mercury in the water/sediment of Red Devil Creek below the mine settling ponds at 0.3 mg/l. The release of metals to the Creek could be attributed to discharges from the mine.

Red Devil Mine is located in a rural area of Alaska. Only 50 persons live within three miles of the site. They use groundwater as a source for drinking water supply. Residents interviewed during a site visit of June, 1986 were aware of the mining operations and the presence of mercury at the mine.

An Alaska Site Investigation Score was calculated for this site. The score is Sm = 15.75 (Sgw = 16.33; Ssw = 21.82; Sa = 0). The direct contact score is 12.50.

RED DEVIL MINE

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RED DEVIL MINE

1.0 INTRODUCTION

1.1 Purpose

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 authorizes the Environmental Protection Agency (EPA) to respond to releases or threats of releases of hazardous substances to the environment which present an imminent or substantial danger to public health, welfare, or the environment. Under the CERCLA or Superfund program, the Alaska Department of Environmental Conservation (DEC) has been authorized by EPA to perform site inspections at sites in the State of Alaska in order to better define the extent of problems where hazardous substances may be present at or may be migrating from the sites. The scope of the Alaska site investigations as developed by Tryck, Nyman and Hayes (TNH) for DEC included a Phase I records search and data synthesis to provide a data base sufficient to apply the EPA Hazard Ranking System (HRS). For sites that required more information, a Phase II on-site inspection was undertaken to fill in persistent data gaps, further document site conditions, and to collect and analyze soil, water, or air samples on- and off-site in order to complete the HRS scoring and to satisfy the overall site investigation and CERCLA objectives. The information gathered may also be used to determine whether further action is warranted.

1.2 Site Identification and Problem Statement

This report summarizes the site investigation activities at the Red Devil Mine, CERCLA No. AKD-980495618, located eight miles down the Kuskokwim River from

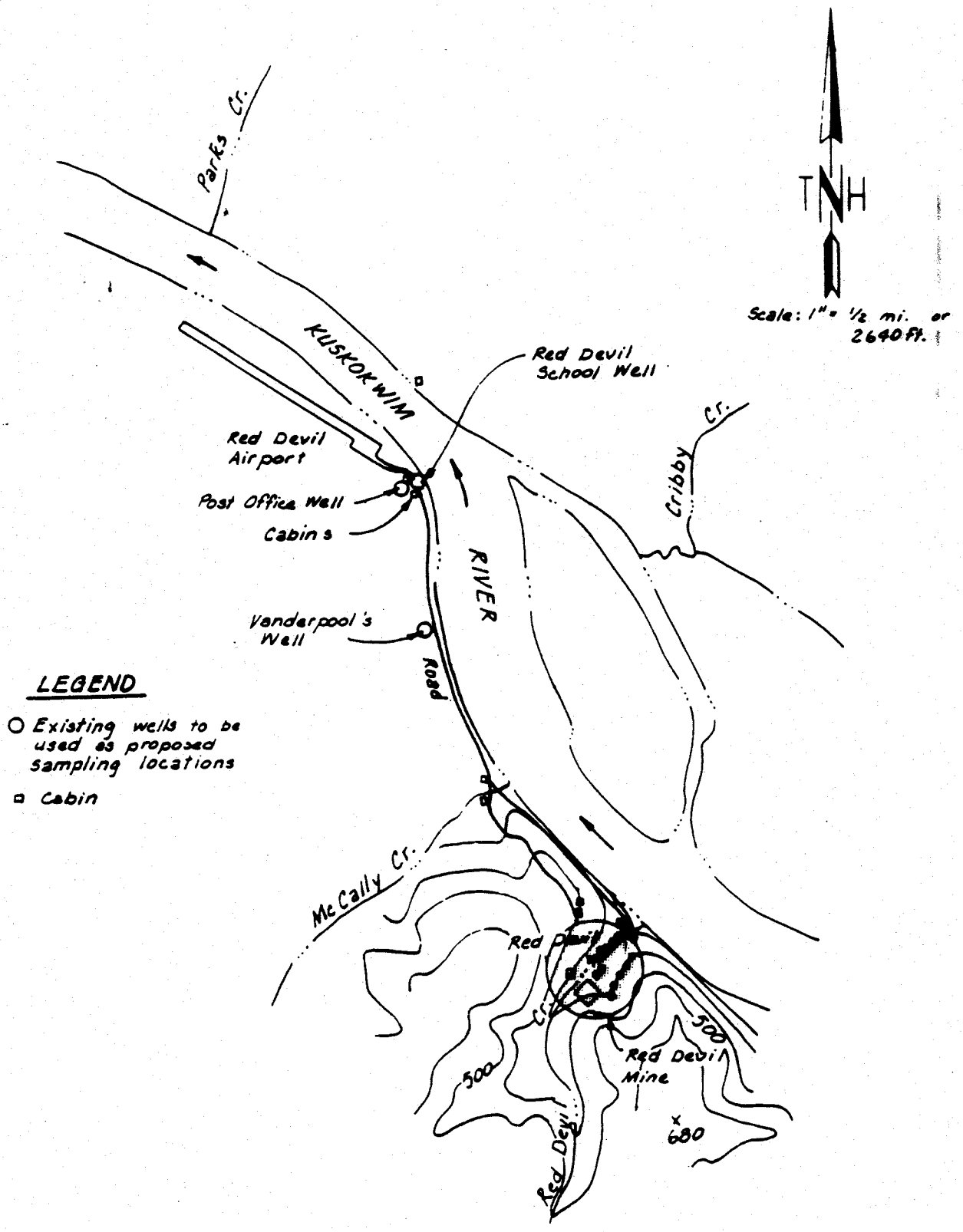
2.0 FACILITY DESCRIPTION

2.1 Location and Surrounding Land Use

The Red Devil Mine is located eight miles down the Kuskokwim River from Sleetmute, on Red Devil Creek 450 feet above its confluence with the Kuskokwim River. The area is in western Alaska, half way between Denali National Park and Bethel, about one hundred miles downstream from McGrath (T19N, R44W, Section 6, Seward Meridian) (Figure 1). The area surrounding the mine is mostly undeveloped land. Fifty people live within three miles of the site, mostly in widely dispersed cabins (Vanderpool, 1986). The closest resident lives three-quarters of a mile down the Kuskokwim River from the mine. Red Devil Village consists of a public school, post office and a 4,500 ft. airstrip located two miles from the mine (Figure 2).

2.2 Site History/Responsible Parties

The information included in this section was obtained from documents and files reviewed while conducting library research and during interviews with agency personnel. Also, persons who worked at Red Devil Mine, during the time it was operating, were contacted. By far the most useful reference was written by Mark P. Meyer, Geologist, U.S. Bureau of Mines, Anchorage. His report includes a compendium of historical information, including site history and responsible parties. The following discussion was derived primarily from his report. Additional information was obtained from the original investigations by Burr S. Webber and W.S. Wright, who traced the mine activities from its discovery through 1946. The following text summarizes, to a large extent, the observations, findings and quoted material from these primary sources.



TRYCK NYMAN & HAYES	ALASKA HAZARDOUS WASTE PROGRAM RED DEVIL MINE AREA MAP	FIGURE 2

Up through July 1943, the total mercury produced from the Lower Kuskokwim area, principally Red Devil Mine, was 800 76-pound flasks. During World War II, the increased demand and high prices offered the incentive to boost production. During 1943-1944, 1096 flasks were recovered from 2,652 tons of ore from Red Devil alone. On June 30, 1944, operations were curtailed due to poor market conditions (Meyer, 1985).

Burr Webber, a mining engineer for U.S. Bureau of Mines, has described site history and production in 1945. Webber reports that in 1945, the mine operated 127 days between April and September. During that period 962 flasks were produced from 1,514 tons of ore by reducing the feed rate to the furnace from the previous 25 tons/day to 6-1/2 tons per day. Mercury recovery increased dramatically from 24 pounds/ton to 66.6 pounds/ton of ore. This increase was not attributed to any change in ore concentration but to removal of the heavy bed of crushed material that was preventing air from freely circulating between ore particles, thus reducing the formation of sulfur dioxide. The conclusion was that only a partial oxidation of the sulfur in the cinnabar (HgS) was occurring (Webber, 1947).

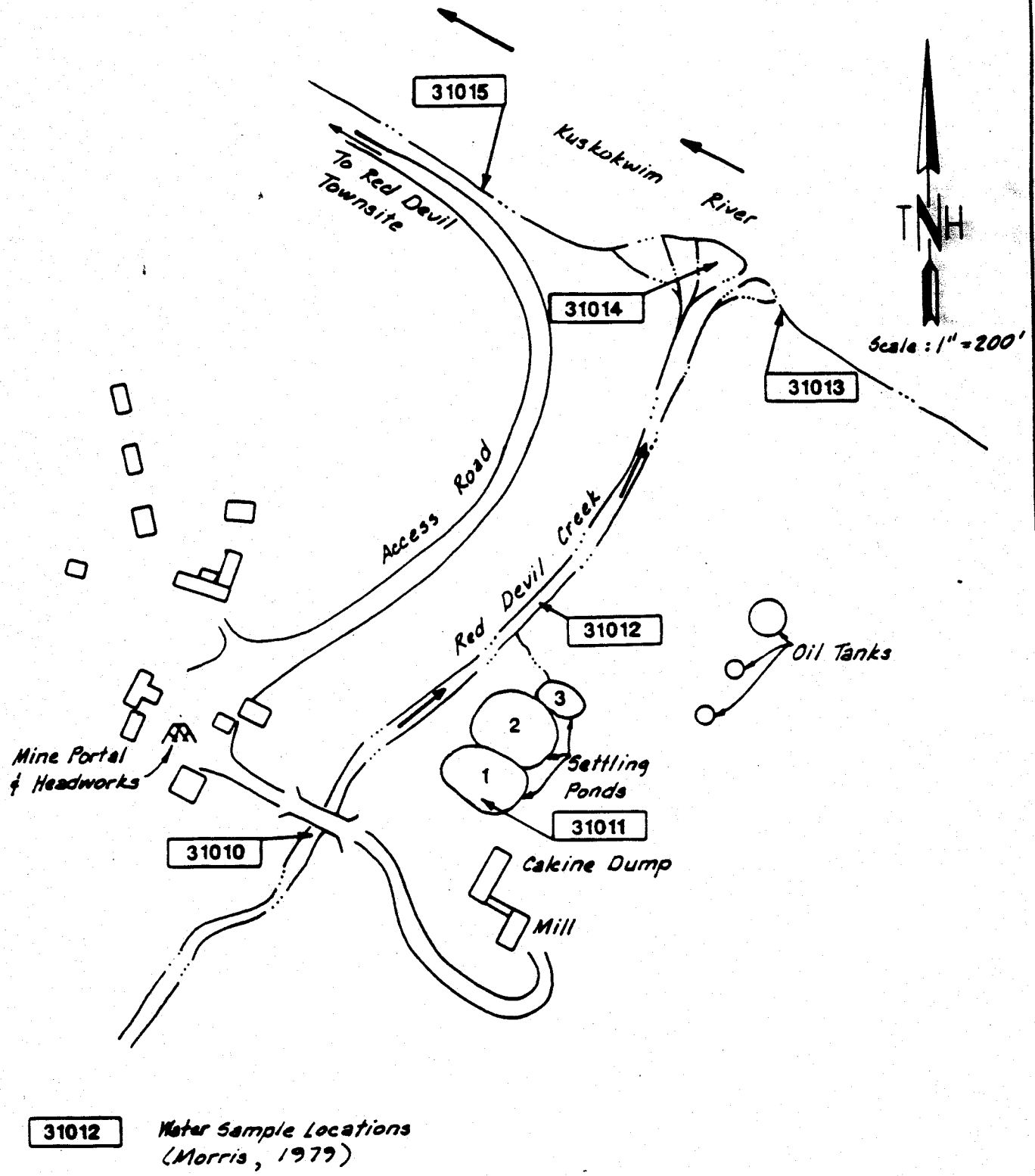
According to Meyer, development work by the Kuskokwim Mining Company continued through the rest of 1945 and 1946, during which time 499 feet of drifting, 155 feet of crosscuts and 112 feet of shafts/winzes were excavated. Operations continued, but by the end of 1946, the company suffered a loss when mercury prices dropped. The mine was shut down. Robert Lyman held a lease on the property and produced about 500 flasks (probably from stockpiled ore).

All known ore was mined and processed by September 1963, at which time the equipment was removed and the mine allowed to flood. By September 19, 1963 water filled the mine, the shaft was sealed and all portals closed.

In October 1963, Don Holloway and Mariano Juancorena obtained a one-year lease. Jack Neubauer joined them and after driving a 100 foot adit in Red Devil Gulch, they were able to find and stockpile 40 tons of high grade ore. By 1964 all new known ore bodies were exhausted. Exploration financed by an Office of Mineral Exploration (OME) loan failed to provide any new ore. Production was limited to that from small lease holders.

Between 1964 and 1969 the mine was inactive. Meanwhile, the price of mercury rallied to $780 per flask in 1966. Alaska Mines and Minerals, Inc., decided to start up operations. Plans were made in 1968 to build a ball mill and flotation unit at a cost of $300,000 with the assistance of the Matanuska Valley Bank. Nissho-Iwai Co. Ltd. and Nomura Mining Co., Ltd., Japanese companies, agreed to add $225,000 for opening and exploration. Agreements were reached for the concentrated cinnabar to be shipped to Japan for processing. The mine began operation in July 1969. Ray Wolfe was the president of Alaska Mines and Minerals at that time (Meyer, 1985).

Bill Mrak arrived in November to take over as manager and helped turn Red Devil mine once again into Alaska's No. 1 producer. About 2,600 tons of ore were mined and processed through the flotation unit from underground and open pit mining in 1970 and 1971. The mill operated for 13 months at almost maximum capacity. A crew of 34 was employed.



TRYCK NYMAN & HAYES	ALASKA HAZARDOUS WASTE PROGRAM RED DEVIL MINE SITE MAP	FIGURE 3

were not reported. However, a compendium written by Mark P. Meyer, Geologist, U.S. Bureau of Mines, Anchorage, summarized the operation from available files and literature. Burr Webber and Wilford Wright wrote reports in 1947 that discussed the operation up to that time. In addition, first hand information concerning mercury mine operations in general and Red Devil Mine in particular, was obtained through personal communications with persons who were previously employed at the mine and with individuals who are knowledgeable with mercury mining, milling and recovery operations. The following overview was developed from these sources. Refer to Figures 3 and 4 for a depiction of the site.

According to Meyer, prior to 1942 mining consisted of surface trenching and hydraulic sluicing of the overburden. Ground sluicing continued into the bank until 1942. After 1942, adits were driven from a surface shaft. The early use of Johnson-McKay tubes for recovery was discontinued in 1940, when two "D" type retorts were installed. A "D" retort is a manually charged, cast iron cylinder that is D shaped in cross section. Between 1941 and 1944, mining and furnacing equipment was brought in and a 40-ton/day rotary kiln and a condensing system were installed (Meyer, 1985). The process flow of the furnacing and retort is described in Figure 5 (Webber, 1947). Between 1943 and 1945, fuel for the kiln and retort was seasoned wood. The kiln was converted to fuel oil in 1946 (Wright, 1947).

Stibnite and cinnabar were the only sulfides encountered in the deposit. The antimonial content from stibnite was almost equal to the mercury recovered from the cinnabar. Consequently, it took careful temperature control to keep the antimony out of the mercury. The oxides of antimony precipitate before the dew

point of mercury. Antimony oxides passing through the condensing system were eliminated by extra hoeing in the mercury table and by recycle retorting. No attempt was made to recover the antimony concentrate because no profitable market was available.

Mercury flasks were shipped down the Kuskokwim River by river boat to Bethel and then to a market in San Francisco by ocean steamer (Webber, 1947). Between 1943 and 1954, the site operations and recovery process remained essentially unchanged.

Wilford Wright, a mining engineer with the U.S. Bureau of Mines, reported that mined ore was crushed and transported by conveyor to a fine ore bin. A feeder loaded the inclined kiln. A fan kept negative pressure on the kiln. The hot gasses produced by the kiln contained mercury vapor. Mercury vapor passed through eight condensers for cooling. A secondary recovery system that incorporated a redwood water tank was placed in series with the condensers and stack. The tank condensed and captured small amounts of mercury that had passed through the condensers (Wright, 1947).

Marion H. Morris, Field Engineer, Sun Oil Company, recalled from his experience at a mine similar to Red Devil how metallic mercury, accompanied by wood tars, oil and soot was periodically washed down the condenser pipes with water and collected in cast iron pots. The soot/mercury "mud" was emptied onto a sloping mercury table and hoed with unslaked lime. The lime reacted with the water, producing heat. This broke the surface tension of the tars and oils surrounding the mercury particles and allowed them to coalesce. Mercury

"Mud" from the mercury table was recycled through a retort. Mercury losses during the hoeing operation are typically 0.01 Kg/metric ton (Nerkervis, 1976). Burned ore (calcine) was extracted at the low end of the kiln, near the firebox, and was trammed to dump sites and used for fill (Webber, 1947; Wright, 1947).

Sintered tailings (calcine) ranges from light pink to white in coloration. The chemical composition of water percolating through a mercury mine tailing pile processing 200,000 tons of ore per year was reported in part as follows (Nerkervis, 1976):

Boron	3.7
Cyanide	0.03
Lead	0.000
Arsenic	0.000
Copper	0.08
Mercury	0.02
Total Hardness	1950.0
pH	4.8-5.7

Meyer reported that during October 1954 a fire destroyed the mill equipment. When the mill was rebuilt by DeCoursey Brewis in 1955, it was relocated across Red Devil Creek, south of the mine portal and headworks (Figure 3). This facility is still intact and was observed during the TNH site visit in June 1987.

The new mill was designed and built to process 40-tons/day using an oil-fired Herrshoff 6 hearth furnace and a retort. Power was supplied by two 650-kw Ingersoll-Rand Generators.

probably carried over from the flotation unit (Morris, 1979). Very little water was discharged from the flotation system. The liquid contained flotation additives and was valuable. It was continually recycled (Mrak, pers. comm., 1987). The settling pond dimensions and estimated volume of discharged waste are provided in Table 1.

Between 1969 and 1971, the ore was obtained from both underground and open pit mining. Two surface operations were conducted northwest of the mine, on a slope above the Kuskokwim River (Mrak, pers. comm., 1987).

The first significant mercury production began in 1940 and continued through the fall of 1963 at which time recovery by furnacing and retorting ceased. Mineral cinnabar was concentrated but never furnaced after 1963. Production figures obtained for the period of operations are as follows (Meyer, 1985):

Year	Flasks of Mercury	Tons of Ore	Income from Sale
1933-40	11	---	---
1940	158	---	---
1941	135	---	---
1942	117	---	---
1943-44	1,096	2,652	$ 171,717.70
1945	962	1,514	114,825.49
1946	491	872	40,156.28
1953-54	1,084	2,500	---
1956-60	19,800	47,250	---
1961	3,200 (approx.)	---	---
1962-63	4,800	---	---
1969-71	3,146 (approx.)	---	---
Total:	35,000 (approx.)		

3.0 ENVIRONMENTAL SETTING

3.1 Climate

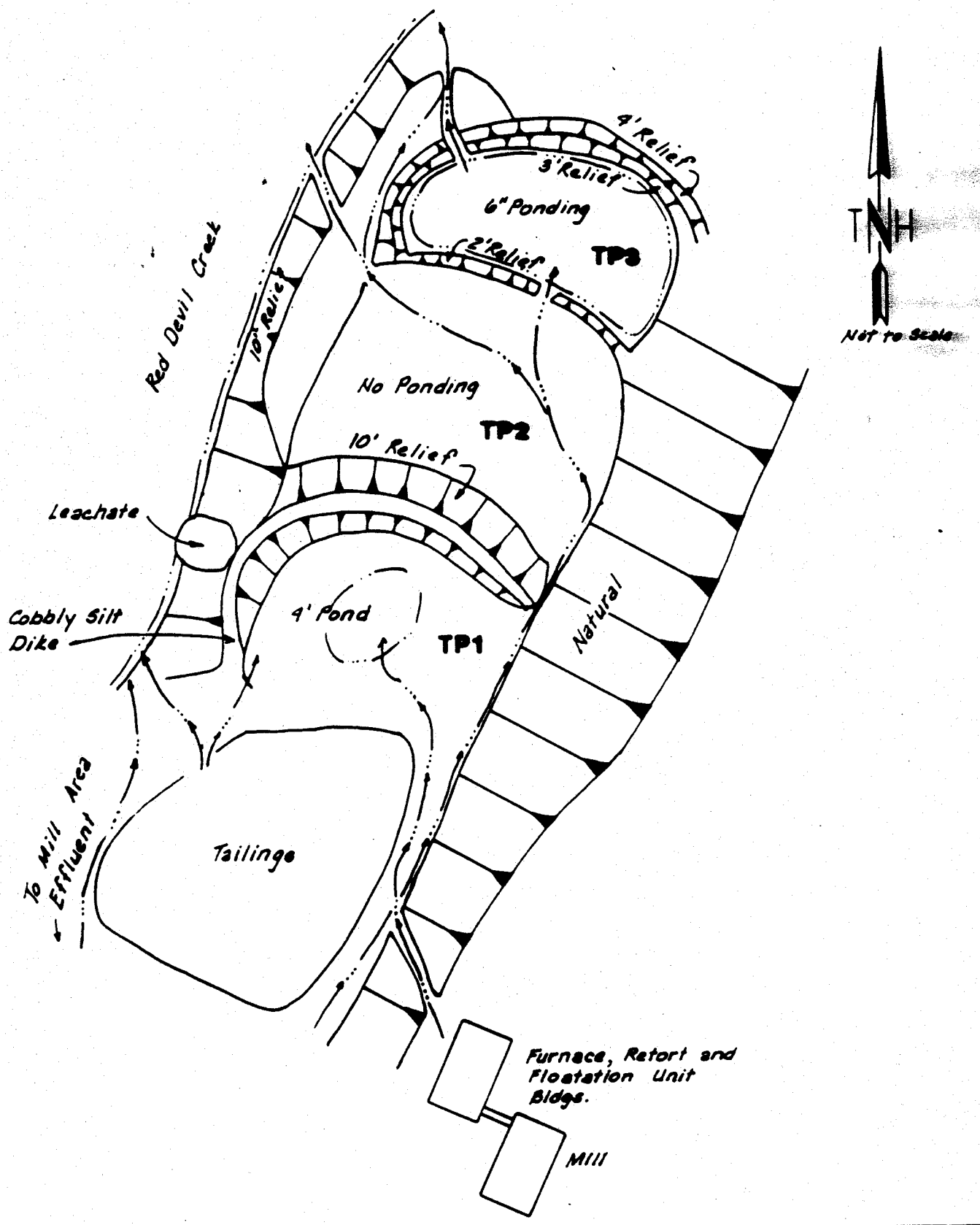
The Red Devil Mine lies in a subarctic transition area between the Continental Climate Zone of interior Alaska and the Maritime Climate Zone of the coastal regions. Figures for precipitation and evapotranspiration are those recorded at Aniak Airport located 75 miles to the west of the Red Devil Mine.

Mean annual precipitation in the form of snow and rain is relatively low in the Aniak area at 18.41 inches per year (AEIDC, 1976). Information on the evaporation rate is scarce. Perhaps the best source is provided by Patric & Black (1968) who studied evapotranspiration at sites throughout Alaska. The value for mean annual evapotranspiration in Aniak is 17.17 inches. Data on lake evaporation needed for the HRS scoring is not available. Using the value of 17.17 inches for evapotranspiration and a precipitation value of 18.41 inches (AEIDC, 1976), the estimated net precipitation is 1.24 inches. Lake evaporation is probably less than evapotranspiration. Therefore, "actual" net precipitation is probably greater than 1.24 inches.

3.2 Topography and Surface Water Characteristics

Topographic and surface water information is useful in assessing the potential for contaminant migration via surface waters. Following is information concerning these characteristics for the Red Devil Mine site.

3.2.1 Topography The Red Devil Mine is located on Red Devil Creek, upstream of the Kuskokwim River on rolling terrain. Topography was observed during the site visit of June 1986. Slopes adjacent to the mine



TRYCK NYMAN & HAYES

ALASKA HAZARDOUS WASTE PROGRAM

RED DEVIL MINE

SETTLING PONDS

FIGURE 6

RED DEVIL MINE

TABLE 1

SETTLING POND DIMENSIONS AND VOLUMES

Settling Pond #1 (TP1)	10 feet deep 200 feet wide 200 feet long
Settling Pond #2 (TP2)	10 feet deep 200 feet wide 100 feet long
Settling Pond #3 (TP3)	10 feet deep 100 feet wide 100 feet long

Source: Site Visit, June 1986.

Settling ponds were constructed of tailings deposited at their present location. The ponds were used to settle solids from the flotation process. About 2500 tons of ore were processed while the flotation unit was in operation.

pers. comm., 6-27-86). Bedrock consists of sandstone interbedded with shale. Bedding is nearly vertical with its strike perpendicular to Red Devil Creek.

Lode and placer mercury deposits are widespread in Alaska with occurrences being most abundant over an area about five hundred miles long and two hundred miles wide, extending from the Yukon River to Dillingham. The area is drained by the Kuskokwim River which empties into Kuskokwim Bay. This area contains many mercury mines and probably has the potential to become a major producing district. Most of the mercury was probably deposited in the Tertiary period about twenty million years ago. Cinnabar, or crystalline mercuric sulfide (HgS), could have been transported to form the deposits in an alkaline sodium sulfide solution, as mercury vapor, as a supersaturated solution of mercury sulfide, or as an organic complex. It is possible that minor amounts of mercury are now being deposited by hot springs (Maloney, 1971).

The general geology at Red Devil Mine has been described by Wright (1947):

> Underground workings at the Red Devil mine expose alternate layers of blocky graywacke and thin-bedded dark gray shales. The strikes of the sediments throughout most of the mine range from N 32 W to N 40 W; likewise, the dips cover a narrow range of 55 to 62 degrees southwest. In the Red Devil workings, cinnabar and stibnite occur at or near the andesite-graywacke, or andesite-shale contacts. The two metallic minerals occur as nearly massive lenses along the contacts, and as blebs in the andesite and sediments. Surface trenching by the Bureau of Mines and underground mining by the operators have disclosed an ore zone at least 1,050 feet long, trending N60 W and ranging in width from 30 to 100 feet. The intrusive bodies often parallel the bedding, but in many places the andesite ends abruptly and reappears along another bedding plane, or cuts across the sedimentary layers. This tendency of the intrusive bodies to be offset at irregular intervals and the close association of the metallic minerals with the andesite has resulted in the ore lenses being arranged in a somewhat echelon pattern.

4.0 FIELD PROGRAM

4.1 Program Summary

The study of the Red Devil mine site included a file search by TNH personnel, the site visit of the mine site by TNH in June, 1986, and interviews with local residents. All information needed to compute an HRS score is available. The file search, site visit and interviews completed Phase I activities for the site. Phase II activities consisted of final document review, final HRS scoring and the writing of this report. Two previous field investigations conducted in 1971, one previous field investigation conducted in 1979 and the site visit by Mr. Tim Terry in June, 1986, provided necessary information to substantiate the release of hazardous wastes from Red Devil Mine to the environment. No new samples were collected in the 1986 site visit. The sampling investigation conducted in 1971 by EPA personnel showed the release of mercury and arsenic to Red Devil Creek, and that analytical quality control was sufficient to have confidence in the results. This section of the report describes the TNH site visit and the previous sampling investigations.

4.2 Previous Field Investigations

On March 22, 1971, Steve Provant from the EPA, Alaska Operations Office collected water and sediment samples for mercury and arsenic analyses. There was deep snow on the ground at the time of the investigation. Water was observed flowing from the mine entrance. A water sample which also contained an unknown amount of sediment, taken from Red Devil Creek below the discharge from Settling Pond #1 had 9,000 ug/l of mercury. An upstream, background sample could not be taken because a thawed part of the Creek could not be found. A water sample taken from nearby McCally Creek (Figure 2) had 3 ug/l of

On July 31, 1979, Ray Morris of the EPA, Alaska Operations Office, collected water samples from five sites at the Red Devil Mine. Sample locations are referenced on Figure 3. Sample results are also listed in Table 2. There was no runoff from the mine settling ponds and no water was being pumped from the mine at the time of the Morris visit. Red Devil Mine had been inactive since 1971. All water samples had less than 0.3 ug/l mercury. A soil sample was skimmed from the moist silt in the bottom of TP1. The test results indicated 216 ppm of mercury wet weight. Soil moisture content was not determined on these samples and therefore no conclusions can be reached on the dry weight mercury concentration. Morris did not sample sediments in Red Devil Creek.

4.3 Recent Site Visit A site visit was made by Tim Terry, of the TNH team, on June 26, 1986 as part of this investigation. He visited the mine, settling ponds and tailing piles, and Red Devil Creek and prepared the drawings shown in Figures 5 and 6. He also interviewed local residents including Dan and Elvina Herman, Gail Baird, and Robert and Gail Vanderpool. Information from these interviews has been incorporated into earlier sections of this report. The Hermans reported that a geologist had recently panned elemental mercury from creeks in the Red Devil Village area although not from Red Devil Creek. Mr. Gail Baird said that he obtained his drinking water from McCally Creek and knows that mercury is present.

The Department of Environmental Conservation tested well water from two residences in the area on October 2, 1985 according to Jim Patterson, DEC employee. The identity of the residences is confidential because of the desires of the owners. The results of the well sampling are provided in Appendix A. Both mercury and arsenic were below detection limits in both samples.

5.0 FINDINGS AND CONCLUSIONS

As stated in the introduction, the purpose of this investigation was to 1) assess the extent of hazardous waste problems at the Red Devil Mine site, including the potential for off-site migration, and 2) to apply EPA's Hazardous Ranking System (HRS) to the site. In this section, the results of the four site visits conducted since 1971 are evaluated. An Alaska Site Investigation Score, which is related to the HRS, is calculated and conclusions about the site are presented.

5.1 Evaluation Results

The sampling investigation conducted by Provant and Sceva in May, 1971 clearly demonstrates the release of mercury and arsenic to Red Devil Creek. Background levels above the mine were established. A discharge to the creek containing mercury and arsenic was observed. High levels of these metals were measured in the mixed water and sediments of the creek downstream of the discharge point. Based on the results of the Provant and Sceva investigation and data collected as part of this investigation, all necessary data needed to score this site appears to be available.

5.2 Alaska Site Investigation Score

An Alaska Site Investigation (ASI) score was developed for the site to allow the Alaska Department of Environmental Conservation to compare this site with other potential hazardous waste sites in Alaska. The ASI score for the Red Devil Mine is Sm = 15.75, (Sgw = 16.33; Ssw = 21.82; Sa = 0), based on the release of mercury and arsenic to Red Devil Creek. The direct contact score is 12.50.

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APPENDIX A

LABORATORY DATA SHEETS

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

EPA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
AK	D48049561 8

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER				
RED DEVIL MINE	On Red Devil Creek				
03 CITY	**04 STATE**	**05 ZIP CODE**	**06 COUNTY**	**07 COUNTY CODE**	**08 CONG DIST**
Red Devil, Alaska	AK	99656			

09 COORDINATES LATITUDE 61 45 18.1 LONGITUDE 157 18 45.1

10 TYPE OF OWNERSHIP (Check one)
☐ A. PRIVATE ☐ B. FEDERAL _____ ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☐ F. OTHER _____ ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION	02 SITE STATUS	03 YEARS OF OPERATION
6 26 86 (MONTH DAY YEAR)	☐ ACTIVE ☒ INACTIVE	1944 (BEGINNING YEAR) 1971 (ENDING YEAR) ___ UNKNOWN

04 AGENCY PERFORMING INSPECTION (Check all that apply)
☐ A. EPA ☐ B. EPA CONTRACTOR _____ (Name of firm) ☐ C. MUNICIPAL ☐ D. MUNICIPAL CONTRACTOR _____ (Name of firm)
☐ E. STATE ☒ F. STATE CONTRACTOR _____ (Name of firm) ☐ G. OTHER _____ (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO.
TIM TERRY	Proj. Geologist/Hydrologist	Shannon & Wilson	(907) 561-2120
09 OTHER INSPECTORS	**10 TITLE**	**11 ORGANIZATION**	**12 TELEPHONE NO.**
			( )
			( )
			( )
			( )
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO
None			( )
			( )
			( )
			( )
			( )
			( )
			( )

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
☐ PERMISSION ☐ WARRANT		Partly cloudy to sunny

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO.
Carl Reller	AK Dept. of Environmental Conservation	(907) 465-2666
04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	**05 AGENCY**	**06 ORGANIZATION**	**07 TELEPHONE NO.**	**08 DATE**
Dan Crevensten	--	TNH	907 279-0543	08 10 86 (MONTH DAY YEAR)

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
AK	D980495618

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
☐ A. NPDES				
☐ B. UIC				
☐ C. AIR				
☐ D. RCRA	NONE. SITE IS A CLOSED MINE. NPDES PERMIT WAS			
☐ E. RCRA INTERIM STATUS	NEVER ISSUED.			
☐ F. SPCC PLAN				
☐ G. STATE (Specify)				
☐ H. LOCAL (Specify)				
☐ I. OTHER (Specify)				
☐ J. NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☐ A. SURFACE IMPOUNDMENT		
☒ B. PILES		
☐ C. DRUMS, ABOVE GROUND		
☐ D. TANK, ABOVE GROUND		
☐ E. TANK, BELOW GROUND		
☐ F. LANDFILL		
☐ G. LANDFARM		
☐ H. OPEN DUMP		
☐ I. OTHER (Specify)		

04 TREATMENT (Check all that apply)

- ☐ A. INCINERATION
- ☐ B. UNDERGROUND INJECTION
- ☐ C. CHEMICAL PHYSICAL
- ☐ D. BIOLOGICAL
- ☐ E. WASTE OIL PROCESSING
- ☐ F. SOLVENT RECOVERY
- ☐ G. OTHER RECYCLING/RECOVERY
- ☐ H. OTHER (Specify) None

05 OTHER

XXXA. BUILDINGS ON SITE

06 AREA OF SITE

10 (Acres)

07 COMMENTS

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

☐ A. ADEQUATE, SECURE ☐ B. MODERATE XXC. INADEQUATE, POOR ☐ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

Diking around the three settling ponds consists of 6"-Ø cobbles in a silt matrix. Pond dikes show erosion ruts that allow runoff water to flow to Red Devil Creek.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: ☒ YES ☐ NO

02 COMMENTS

Access road leads from Red Devil Mine to Red Devil Village. No fences.

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

File search.
Site visit: 6/86

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE: AK | 02 SITE NUMBER: D980495618

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one) (Sowers, 1979)

☐ A. 10^{-6} – 10^{-8} cm/sec ☐ B. 10^{-4} – 10^{-6} cm/sec XX C. 10^{-4} – 10^{-3} cm/sec ☐ D. GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one) (Sowers, 1979)

☐ A. IMPERMEABLE (Less than 10^{-6} cm/sec) ☐ B. RELATIVELY IMPERMEABLE (10^{-4} – 10^{-6} cm/sec) Σ C. RELATIVELY PERMEABLE (10^{-2} – 10^{-4} cm/sec) ☐ D. VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK	04 DEPTH OF CONTAMINATED SOIL ZONE	05 SOIL pH	
0-40 (ft)	Unknown (ft)	--	

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE: SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
1.24 (in)	1.5 (in)	0 to 5 %	North	7.5 % (USGS Quad Map)

09 FLOOD POTENTIAL: SITE IS IN 50 yr. YEAR FLOODPLAIN

10 No ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum)

ESTUARINE: A. None (mi)

OTHER: B. 0 (mi) Site is adjacent to wetland.

12 DISTANCE TO CRITICAL HABITAT (of endangered species): None (Ruson) (mi)

ENDANGERED SPECIES:

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS, NATIONAL STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS: PRIME AG LAND	AG LAND
A. on-site (mi)	B. 1.3 (mi)	C. None (mi)	D. (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

Red Devil Mine is situated in a valley above Red Devil Creek at an elevation of approximately 300 feet. The valley floor is approximately 200 feet wide at the mine and slopes downward toward the northeast at an approximate 7.5% grade. Mine tailings have been placed on the valley floor to an estimated height of about 30 feet to provide a level work pad for mine operations. Four of these level pads have been constructed on the east side of the valley at elevations of about 30, 60, 100 and 150 feet above the creek. The upper three pads were excavated into the side hill. On the fill pad at 30 feet above the creek bed tailings, stockpiles have been placed 15 feet high in an area approximately 50 by 200 feet. North of the stockpiles are three settling ponds at heights approximately 15 to 25 feet above the creek. Dikes have been constructed to enclose the settling ponds and provide a barrier to surface water runoff. However, the settling ponds have been filled with silt to elevations ranging from 4 feet below the dike to overtopping the dike.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

EPA FORM 2070-13(7-81)

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
AK	D980495618

II. CURRENT OWNER(S)				PARENT COMPANY (if applicable)			
01 NAME: US Bureau of Land Management		02 D+B NUMBER		08 NAME		09 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.): 701 C Street		04 SIC CODE		10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE	
05 CITY: Anchorage	06 STATE: AK	07 ZIP CODE: 99501		12 CITY	13 STATE	14 ZIP CODE	
01 NAME		02 D+B NUMBER		08 NAME		09 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE		10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE	
05 CITY	06 STATE	07 ZIP CODE		12 CITY	13 STATE	14 ZIP CODE	
01 NAME		02 D+B NUMBER		08 NAME		09 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE		10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE	
05 CITY	06 STATE	07 ZIP CODE		12 CITY	13 STATE	14 ZIP CODE	
01 NAME		02 D+B NUMBER		08 NAME		09 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE		10 STREET ADDRESS (P.O. Box, RFD #, etc.)		11 SIC CODE	
05 CITY	06 STATE	07 ZIP CODE		12 CITY	13 STATE	14 ZIP CODE	

III. PREVIOUS OWNER(S) (List most recent first)			IV. REALTY OWNER(S) (If applicable; list most recent first)		
01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE
01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE
01 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)		04 SIC CODE
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

The mining claim was never patented. Current lease rights are held by the Estate of Hans Halversen, c/o Edward Dodd. Mr. Dodd's most recent known address is now the site of a parking garage.

Source: BLM records and site investigation.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
AK	D98045618

II. CURRENT OPERATOR (Provide if different from owner)

01 NAME	02 D+B NUMBER	10 NAME	11 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	**04 SIC CODE**	**12 STREET ADDRESS** (P.O. Box, RFD #, etc.)	**13 SIC CODE**
05 CITY	**06 STATE** / **07 ZIP CODE**	**14 CITY**	**15 STATE** / **16 ZIP CODE**
08 YEARS OF OPERATION	**09 NAME OF OWNER**		

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)

PREVIOUS OPERATORS' PARENT COMPANIES (if applicable)

01 NAME	02 D+B NUMBER	10 NAME	11 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	**04 SIC CODE**	**12 STREET ADDRESS** (P.O. Box, RFD #, etc.)	**13 SIC CODE**
05 CITY	**06 STATE** / **07 ZIP CODE**	**14 CITY**	**15 STATE** / **16 ZIP CODE**
08 YEARS OF OPERATION	**09 NAME OF OWNER DURING THIS PERIOD**		
01 NAME	**02 D+B NUMBER**	**10 NAME**	**11 D+B NUMBER**
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	**04 SIC CODE**	**12 STREET ADDRESS** (P.O. Box, RFD #, etc.)	**13 SIC CODE**
05 CITY	**06 STATE** / **07 ZIP CODE**	**14 CITY**	**15 STATE** / **16 ZIP CODE**
08 YEARS OF OPERATION	**09 NAME OF OWNER DURING THIS PERIOD**		
01 NAME	**02 D+B NUMBER**	**10 NAME**	**11 D+B NUMBER**
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	**04 SIC CODE**	**12 STREET ADDRESS** (P.O. Box, RFD #, etc.)	**13 SIC CODE**
05 CITY	**06 STATE** / **07 ZIP CODE**	**14 CITY**	**15 STATE** / **16 ZIP CODE**
08 YEARS OF OPERATION	**09 NAME OF OWNER DURING THIS PERIOD**		

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

EPA FORM 2070-13 (7-81)

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POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
AK	D98045618

II. PAST RESPONSE ACTIVITIES None

01 ☐ A. WATER SUPPLY CLOSED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ C. PERMANENT WATER SUPPLY PROVIDED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ D. SPILLED MATERIAL REMOVED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ E. CONTAMINATED SOIL REMOVED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ F. WASTE REPACKAGED 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ G. WASTE DISPOSED ELSEWHERE 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ H. ON SITE BURIAL 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ I. IN SITU CHEMICAL TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ J. IN SITU BIOLOGICAL TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ K. IN SITU PHYSICAL TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ L. ENCAPSULATION 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ M. EMERGENCY WASTE TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ N. CUTOFF WALLS 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ O. EMERGENCY DIKING SURFACE WATER DIVERSION 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ P. CUTOFF TRENCHES SUMP 04 DESCRIPTION	02 DATE	03 AGENCY
01 ☐ Q. SUBSURFACE CUTOFF WALL 04 DESCRIPTION	02 DATE	03 AGENCY

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
AK	D980495618

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION ☐ YES ☐ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

NONE KNOWN

III. SOURCES OF INFORMATION Cite specific references, e.g., state files, sample analysis, reports

EPA Region X files.

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER ADEC-Village Safewater SAMPLE LOCATION: Red Devil, Alaska

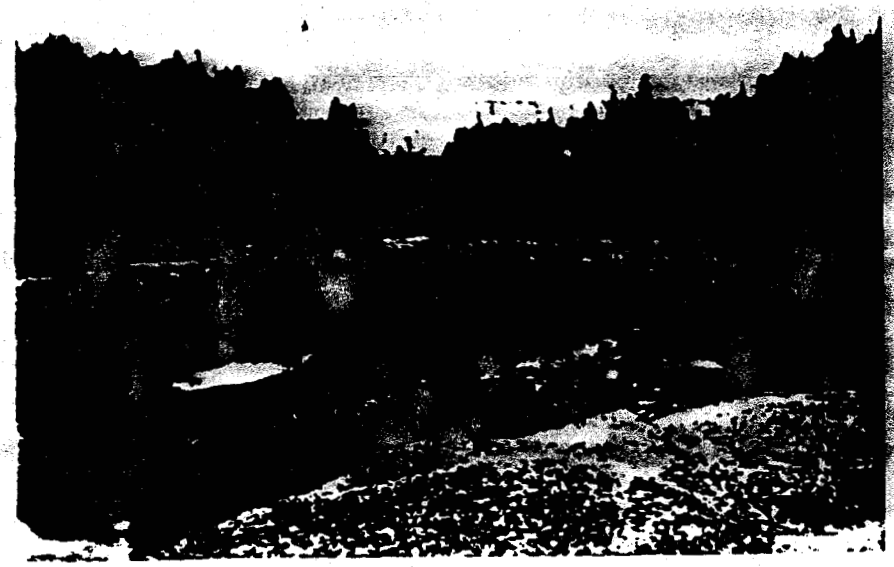
DATE COLLECTED 10-2-85 TIME COLLECTED: 10:00 a.m.

SAMPLED BY J. Patterson SOURCE Residence B

REMARKS

FOR LAB USE ONLY
RECVD. BY GY LAB # 9954-2
DATE RECEIVED 10-2-85
DATE COMPLETED 10-8-85
DATE REPORTED 10-8-85
SIGNED Stephen C. Ede

	mg/l		mg/l		mg/l
( ) ALUMINUM, Al	<0.05	( ) STRONTIUM, Sr	0.10	( ) TOTAL DISSOLVED SOLIDS	
( ) ARSENIC, As	<0.05	( ) TIN, Sn	<0.05	( ) TOTAL VOLATILE SOLIDS	
( ) BARIUM, Ba	0.05	( ) VANADIUM, V	<0.05	( ) SUSPENDED SOLIDS	
( ) BORON, B	<0.05	( ) ZINC, Zn	0.79	( ) VOLATILE SUSPENDED SOLIDS	
( ) CALCIUM, Ca	16	( ) ZIRCONIUM, Zr	<0.05	( ) HARDNESS AS $CaCO_3$	54
( ) CADMIUM, Cd	<0.01	( )		( ) ALKALINITY AS $CaCO_3$	55
( ) CHROMIUM, Cr	<0.05	( )		( )	
( ) COPPER, Cu	0.18	( )		( )	
( ) IRON, Fe	<0.05	( ) AMMONIA NITROGEN-N		( )	
( ) LEAD, Pb	<0.05	( ) KJELDAHL NITROGEN-N		**********	
( ) MAGNESIUM, Mg	3.3	( ) NITRATE-N	0.73	( ) COLOR-UNITS	
( ) MANGANESE, Mn	<0.05	( ) NITRITE-N		( ) CONDUCTIVITY, umhos/cm	110
( ) MERCURY, Hg	<0.0002	( ) CHLORIDE		( ) LANGLIER INDEX	
( ) NICKEL, Ni	<0.05	( ) CYANIDE		( ) LANGLIER INDEX	
( ) PHOSPHOROUS, P	<0.05	( ) FLUORIDE		( ) pH, UNITS	
( ) POTASSIUM, K	0.52	( ) OIL AND GREASE		( ) TURBIDITY, ntu	0.54
( ) SELENIUM, Se	<0.05	( ) PHENOL		( ) COLIFORM/100ml	
( ) SILICON, Si	9.0	( ) PHOSPHOROUS (ORTHO)-P		( )	
( ) SILVER, Ag	<0.05	( ) SULFATE		( )	
( ) SODIUM, Na	2.0	( ) SULFIDE (H_2S)		( )	



Water in Settling Pond #1 (TP1) to the South.

West side of Settling Pond #1 (TP1); leachate toward Creek.

From South, looking at the mill retort furnace and flotation unit area.

Headworks over shaft.