OPEN-FILE REPORT 01-13

History, Geology, and Environmental Setting of Selected Mines in the Chalk Creek Mining District, Pike/San Isabel National Forest, Chaffee County, Colorado

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FOREWORD

Open-File Report 01-13 describes the history, geology, and environmental setting of several mines in the Chalk Creek mining district. All of the sites lie at least partly on U.S. Forest Service-administered land, and all are within the Chalk Creek drainage basin, a tributary to the upper Arkansas River. The sites were selected by the U.S. Forest Service based on the results of an abandoned mine inventory recently completed by the Colorado Geological Survey. This information is useful for State and Federal agencies and private owners in developing realistic and cost-effective reclamation plans for mines in the Chalk Creek watershed.

Funding for this project was provided mostly by the U.S. Forest Service (Agreement No. 1102-0007-98-035). Partial funding came through the Water Quality Data program of the Colorado Geological Survey from the Colorado Department of Natural Resources Severance Tax Operational Fund. Severance taxes are derived from the production of gas, oil, coal, and minerals.

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LIST OF ABBREVIATIONS AND SYMBOLS

AMLIP	Abandoned Mined Land Inventory Project
~	approximate value
bk.	book
cm	centimeter(s)
CBM	Colorado Bureau of Mines
CDMG	Colorado Department of Minerals and Geology
CDPHE	Colorado Department of Public Health and Environment
CGS	Colorado Geological Survey
CMA	Colorado Mining Association
cps	counts/second
°	degree
DO	dissolved oxygen
$	dollars
EDR	Environmental Degradation Rating
EPA	Environmental Protection Agency
4WD	four-wheel drive
gpm	gallons per minute
GPS	Global Positioning System
>	greater than
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS/cm	microSiemens
mg/L	milligrams per liter
NFS	National Forest System
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
lbs	pounds
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
TDS	total dissolved solids
trec	total recoverable
oz	troy ounce(s)
U.S.	United States
USFS	United States Department of Agriculture—Forest Service
BLM	United States Department of Interior—Bureau of Land Management
v.	volume

INTRODUCTION

During the summer of 1995 the Colorado Geological Survey (CGS) inventoried mines in the Chalk Creek area of the Salida Ranger District, Pike/San Isabel National Forest (Figure 1). This project was part of an eight-year, Statewide inventory of abandoned mines on U.S. Forest Service administered lands in Colorado. Not all of the mines were on National Forest System (NFS) lands; in some instances the forest boundary or mine locations were incorrectly located on Primary Base Series (PBS) maps. Some mines close to NFS lands were inventoried, and mines that potentially impacted NFS lands were included. In 1998 and 1999 the U.S. Forest Service requested more detailed studies on selected mines in 13 inventory areas in the Chalk Creek mining district. All of the selected mines had received Environmental Degradation Ratings (EDRs) of 3 (potentially significant) or worse from CGS. This study presents the results of the additional work requested on mines in the Chalk Creek mining district. The following report is organized according to inventory areas.

Many of the smaller mines in the Chalk Creek district were worked in the late 1800s. Very little historical information was available regarding these mines. Without a mine or claim name, historical research is difficult. Locating mining claims from older county records can be difficult or impossible.

METHODS OF INVESTIGATION

Patented claim ownership was determined through the Chaffee County assessor's records. Assessor's records usually referred to books and pages in the county recorder's office. In many cases the ownership history can be traced backward in time if the records were complete. In addition, mining claim indices were used to trace ownership from the original claim location forward in time. Frequently gaps in the ownership history could not be filled, especially in cases where the county acquired the property because of delinquent taxes.

Reports by the Director of the Mint, annual mineral-resources reports by the U.S. Geological Survey, and various newspapers and mining journals provided useful information for some of the mines that were active prior to 1900, which was the case for most of the mines in this study. Colorado Bureau of Mines (CBM) inspector and mine manager's reports from the early 1900s were also excellent sources for historical information. U.S. Bureau of Mines annual mineral resources reports document activity from about 1924 onward.

Frequently discrepancies occurred among county assessor's records, county recorder's records, BLM master title plats, and Forest Service PBS maps. Surveys and/or title searches are essential for some of the mine sites.

Field work for this study included a site visit to see if major changes had occurred since the 1995 inventory by Benson and others (1997). Although water samples were collected at some of the sites in 1995, additional samples and water tests were collected in 1999. In-stream samples were collected from Pomeroy Gulch and Chalk Creek in efforts to "bracket" selected mines or groups of mines and better quantify impacts to the watersheds. In addition, many waste-rock piles were sampled on a grid pattern to assess their potential environmental effects. Waste-rock samples were analyzed for numerous metallic elements, sulfate, potential acidity, and paste pH.

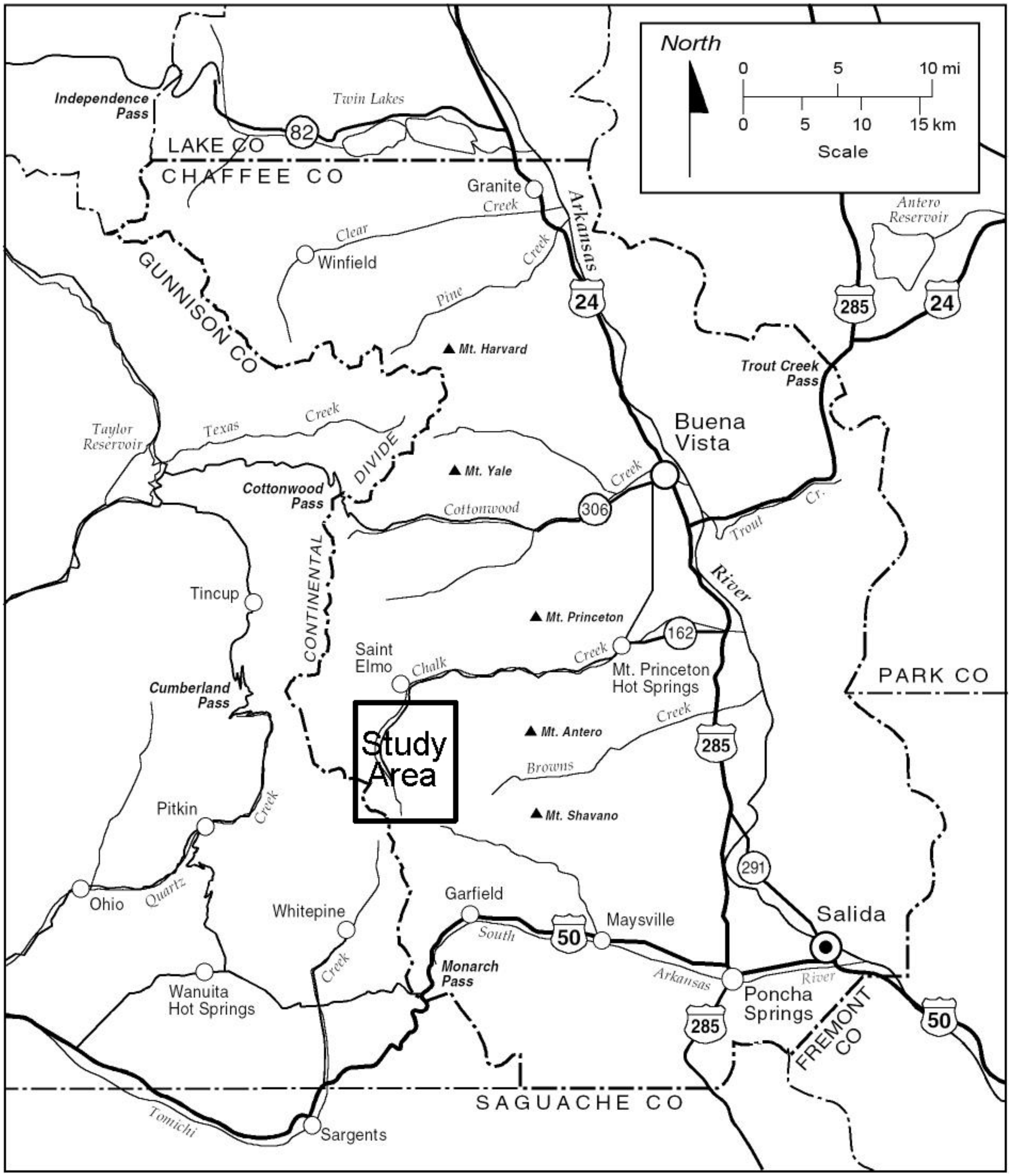


Figure 1. Index map of the approximate location of this study area.

At water sample sites, filtered (0.45 μ) and unfiltered waters were collected for laboratory analyses. Depending on a variety of factors, including weather, time of day, distance from the vehicle, etc., subsampling into the filtered and raw bottles was done on site, at the vehicle, or indoors. Samples and/or subsamples were refrigerated until delivery to the lab.

At the lab, water samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents. Analytical results are compared to standards established by the State Water Quality Control Commission. The most stringent standards are used in the tables in this text, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations. Important exceptions to these generalizations include iron and manganese. Both of these metals have aquatic-life standards of 1,000 μg/L (total recoverable). The much lower dissolved concentrations (300 μg/L for iron; 50 μg/L for manganese) shown as the standards on the tables in this report are for aesthetic purposes in drinking water.

Because of the software used for calculations and creation of the tables in this report, formats and use of significant figures do not conform to standardized methodology. Analytical values for water samples are reported in dissolved concentrations unless noted.

LOCATION AND GEOGRAPHIC SETTING

The Chalk Creek mining district is in western Chaffee County about 20 miles southwest of Buena Vista, Colorado. County Road 162 from U.S. 285 provides access to the mining district and to St. Elmo. St. Elmo is immediately north of the area included in this report (Figure 1). Various Forest Service roads, mine roads, and trails from St. Elmo access most of the mines. Elevations range from 10,200 feet to 11,800 feet above sea level.

HISTORICAL OVERVIEW

The first discoveries were made in the Chalk Creek mining district (also known as Alpine, St. Elmo, Forest City, Hancock, Romley, and Mineral Hill) in the fall of 1873. By the fall of 1874, 300 silver lodes had been located and the town of Alpine was established with a population of 109. By 1877, Kansas City Mining and Smelting Company (Colonel Chapman, president) completed a processing facility in Alpine. Development in the district was hindered by a lack of transportation and smelting facilities, but by October 1880, a concentration and smelting facility was completed, and the railroad was 7 miles from Alpine. (See *Rocky Mountain News*, September 15, 1874, p. 4; March 3, 1877, p. 4; October 19, 1880, p. 7.) Numerous discoveries were made in 1880. Most of the ore was free smelting and was composed of galena and other sulfide minerals, with values in silver. (See Burchard, 1881, p. 153.)

Alpine, St. Elmo (originally called Forest City), Romley (originally called Murphy's Switch), and Hancock were once thriving towns in the district. At one time Alpine had a population of

5,000, several restaurants and stores, five hotels, and 23 saloons (Wollie, 1953, p. 416). The initial boom subsided, and mining diminished in the late 1880's and early 1890's.

Completion of the New Morley smelter in Buena Vista revitalized the mining district in 1898. "Quite a number" of the mines shipped ore and many old mines were reopened. Several new claims were staked, and Pomeroy Mountain was completely covered by mining claims. As much as 200 tons/day of ore were shipped, mostly from the Mary Murphy Mine. (See *Mining Reporter*, October 6, 1898, v. 38, p. 12.)

The Mary Murphy Mine was the longest operating mine in the district. It was discovered in 1874 and became a major producer by 1879 (Collins, 1914, p. 64). Estimated value of ore produced from the mine through 1947 was over $10,000,000, nearly half of the value of metallic ore produced in Chaffee County (CMA, 1947, p. 93). Over 75% of the ore produced in the Chalk Creek district came from the Mary Murphy Mine (Dings and Robinson, 1957, p. 95). According to Wollie (1953, p. 420), the Mary Murphy Mine yielded a total of $14,000,000.

Production from the Chalk Creek mining district diminished after World War I. When the railroad tracks were removed in 1926, most of the smaller mines had already closed. In recent years the historic buildings in St. Elmo and Alpine and some of the abandoned mines have become popular tourist attractions. Little evidence remains of the towns of Romley and Hancock. In St. Elmo, a few cabins are inhabited year-round, but most are seasonally occupied.

GEOLOGIC SETTING

In the Chalk Creek mining district, ore zones occurred in fissure veins several feet thick hosted by Mount Princeton quartz monzonite. Iron, copper, lead, and zinc sulfides were associated with quartz and/or rhodonite. Generally, the ore was low grade, although some free gold and high-grade silver ore were mined. Highly oxidized material was produced from the upper 400 feet of veins at the Mary Murphy Mine. Most of the veins show little or no alteration in wall rocks. (See CBM, 1903, p. 31; Del Rio, 1960, p. 91–92.)

CHALK CREEK HEADWATERS

The "Chalk Creek Headwaters" inventory area (381/4275-1) is on the western side of Chalk Creek about 0.75 mile south of Hancock (Figure 2) in an area that Burchard (1883, p. 419) identified as Mineral Ridge and Adair Mountain. CGS assigned EDRs of 3 or worse to adit and associated waste-rock pile #100/200 and adit #103. Although the ore body of the Stonewall Mine was mined on private land, the Stonewall Tunnel (adit #100) was driven from NFS land to access the vein. The Kentucky Mine (adit #103) apparently produced from the same ore body as the Stonewall Mine, but lies entirely on private land.

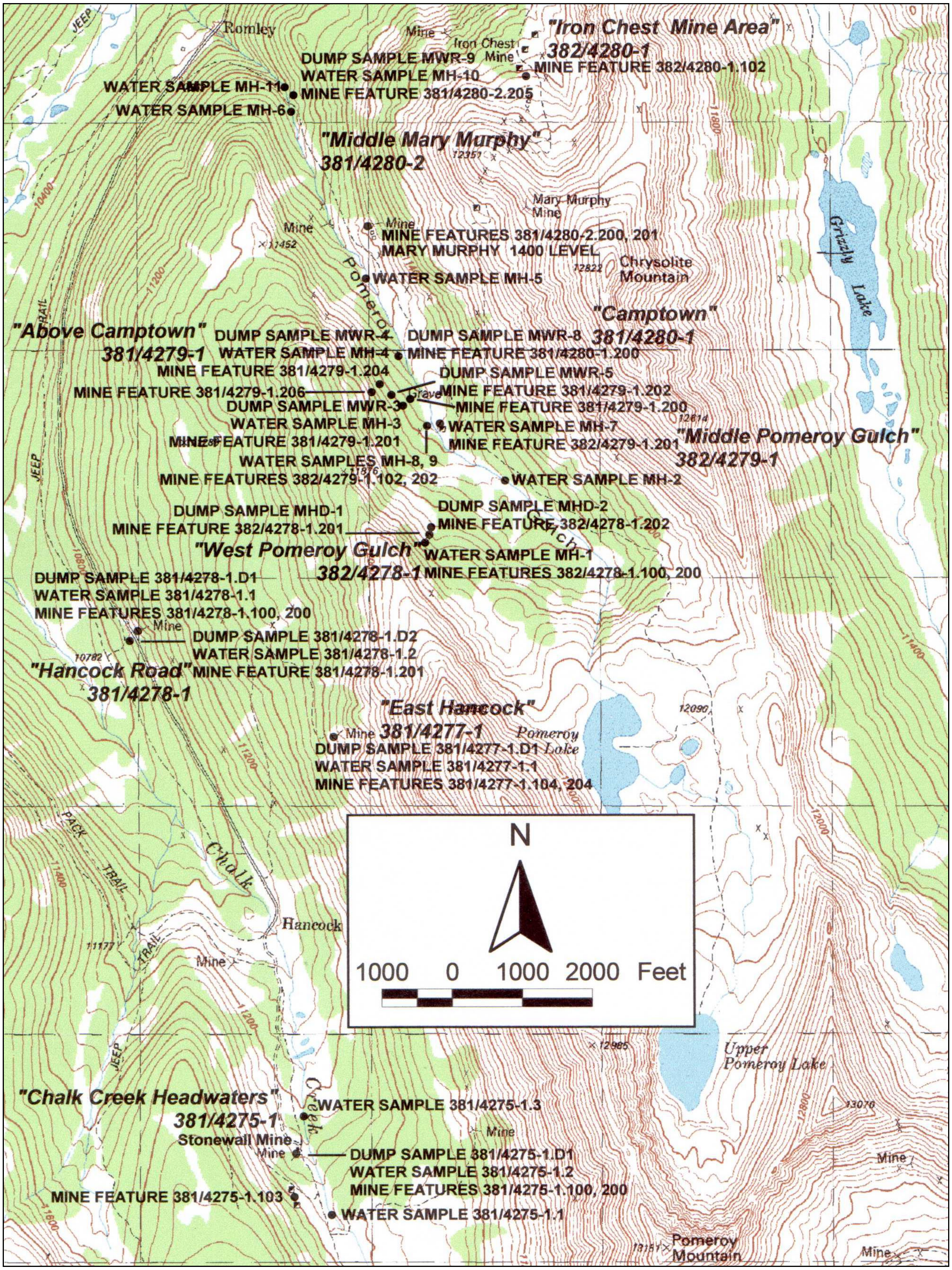


Figure 2. Map of sample sites and selected mine features in the southern part of the Chalk Creek mining district. (Italicized labels refer to the name and number of the inventory area.)

MINING HISTORY

The Stonewall Mine was started in 1879. Although the mine was included in numerous transactions in the early 1880s, only two carloads of ore were reportedly produced, and the mine was idle by 1884. The Stonewall Tunnel was not started until 1939, and the first recorded production was in 1946. Depending on the account, adit #100 is 600 to 900 feet long and was used to drain the Stonewall Shaft and serve as a haulageway for ore produced from the Stonewall vein. Various owners and companies produced ore via the adit intermittently from 1946 to 1964. The maximum reported annual production was by Cotter Corporation in 1963, when 350 tons worth about $7,000 was shipped.

The Kentucky Lode is adjacent to the Stonewall and was located at the same time. The Kentucky Shaft was driven on the Stonewall vein. Any production from the Kentucky was in the early 1880's and was not recorded. Although the mine was idle by 1884, it was patented in 1885. A small adit (#103) that is described later in this report is adjacent to the Kentucky Shaft and is not mentioned in the literature.

Stonewall Mine

1879. William Adair and William Truesdale located the Stonewall Lode in September (bk. 1, p. 569; Southworth, 1997, p. 135–136). Truesdale quitclaimed his interest in the Stonewall Lode to A.R. Adair in December (bk. 2, p. 73).

1880. A.R. Adair sold the Stonewall and part of the Kentucky to A. Arbour and Charles W. Blake for $50,000 in January (bk. 1, p. 90). Truesdale quitclaimed interest to Sadie S. Murray in April (bk. 1, p. 236). Between July 1 and July 10, Murray quitclaimed her interest to A.B. Murray, who quitclaimed it to Annie Blake, who quitclaimed it to A.R. Adair (bk. 7, p. 346, 355; bk. 3, p. 414).

1881. In June, William Adair quitclaimed interest in the Stonewall Lode to John Halsey (bk. 19, p. 34). A.R. Adair agreed to give part of the Kentucky Lode to Robert Grahm in return for developing the Stonewall Lode (bk. 20, p. 128). A.R. Adair and Halsey located the Stonewall Mill Site and Stonewall Tunnel claims in July (bk. 14, p. 150, 178). Adair and Halsey filed an amended location notice on the Stonewall Lode in August (bk. 15, p. 389). In September, Mineral Survey No. 1905 was approved for the Stonewall Lode. Two shafts and a 74-foot-long adit were surveyed on the southern part of the claim. (See Mineral Survey No. 1905, BLM files.) By October, ore was exposed in several places in the Stonewall Mine, situated on the Stonewall Nos. 1 and 2 Lodes. An "immense" vein of galena contained from 11 to 20 oz/ton silver and 62% to 72% lead. Ten miners divided into three shifts worked the mine. Six claims (Truesdale, Dan Allen, Kentucky, Stonewall, Dave Knox, and Aten) covered the 9,000-foot-long Stonewall vein, and a 28-foot-thick vein was exposed in the 75-foot-deep Stonewall Shaft. The hanging wall of the vein included a 10-foot-thick zone of argentiferous galena. Assays averaged $35/ton silver, $4/ton gold, and 60% lead. A 15-horsepower engine and pump was used during construction of a new shaft on the footwall of the vein. (See *Denver Republican*, October 16, p. 6; October 24, v.

3, no. 127, p. 1, 1881.) Galena ore exposed across the bottom of the shaft assayed 12 oz/ton silver and 60% to 75% lead (Burchard, 1882, p. 366).

1882. By February, the Stonewall Shaft was timbered to a depth of 115 feet. A 27-foot crosscut between the footwall and hanging wall of the vein was opened at a depth of 100 feet. Assays ranged from 0.5 to 1 oz/ton gold, $25 to $57/ton silver, and $35/ton lead. Assays from an 8-foot-wide galena vein ranged from $90 to $120/ton. (See *Denver Republican*, February 14, p. 6; February 25, p. 6, 1882.) Later in February, John Halsey quitclaimed his interest in the Stonewall Lode to Ann Halsey (bk. 21, p. 582). In March, L.W. McNabb agreed to work the Stonewall Lode for 38 days to recover $118 worth of ore (bk. 33, p. 280). Two carloads of galena-bearing ore were shipped. The coarse fraction assayed 11.5 oz/ton silver and 79% lead; the fine fraction assayed 11 oz/ton silver and 68.5% lead. In April, the Stonewall Shaft was down 158 feet and a crosscut was driven to the hanging wall of the vein. (See *Rocky Mountain News*, March 16, p. 6; April 7, p. 2, 1882.) Ann Halsey quitclaimed her interest in the Stonewall Lode back to John Halsey in May (bk. 25, p. 59). On September 26, A.R. Adair quitclaimed interest in the Stonewall Lode to F.L. Martin and J.H. Kerr. Martin and Kerr then filed a deed of trust to W.W. Hanson and H.W. Hanson (bk. 25, p. 358; bk. 28, p. 231). Kerr acquired Halsey's interest in the Stonewall Lode and Stonewall Mill Site and Martin's interest in the Stonewall Lode on September 30 (bk. 24, p. 387, 389). In a conflicting account, the *Denver Republican* (October 16, 1881, p. 6) reports that Halsey and Adair owned the Stonewall Lode. Halsey and Kerr went to China in November to obtain $100,000 in working capital for the Stonewall Mine (*Rocky Mountain News*, November 30, 1882, p. 6).

Burchard (1883, p. 419) reported that a 35-foot-wide vein with 11 feet of ore was exposed in a crosscut driven at the bottom of the 100-foot-deep Kentucky Shaft. A 28-foot-wide extension of this vein was exposed in the 140-foot-deep Stonewall Shaft and averaged $46/ton.

1883. In March, O.E. Henry, superintendent of the Stonewall and Dan Allen Mines, had five workers pumping water from the Kentucky and Stonewall shafts in preparation for development. He intended to increase the workforce to 20. A Chinese company was planning to spend $100,000 to thoroughly test the value of the mines in this area (See *Rocky Mountain News*, March 6, p. 2; March 7, 1883, p. 2.) The Stonewall Lode was patented in August. By the end of the year the Stonewall Mine consisted of a 350-foot-deep shaft with drifts at 50-foot intervals, totaling 500 feet. The 30-inch ore zone in the 30-foot-wide Stonewall vein contained 10 to 20 oz/ton silver and 50% to 66% lead. (See Burchard, 1884, p. 359–360.) Halsey, Martin, and Kerr owned the Stonewall and Kentucky Mines and two associated mill sites. The 2- to 4-foot-wide vein contained quartz, galena, and copper minerals. Mill runs of sorted ore averaged 35% lead and 20 oz/ton silver. (See Corregan and Lingane, 1883, p. 111.)

1884. Workers were pumping water from the 400-foot-deep Stonewall Shaft in May. A Chinese expert completed a thorough examination of the mine. (See *Rocky Mountain News*, May 15, 1884, p. 2.) Both the Kentucky and Stonewall Mines were idle by the end of the year (Burchard, 1885, p. 190).

1885. Virgill B. Reed quitclaimed his interest in the Stonewall Lode to Stonewall Mining and Milling Company in June (bk. 1, p. 103). J.S. Sallec quitclaimed interest in the claim to Reed in July (bk. 1, p. 61).

1886. Stonewall Mining and Milling Company redeemed the Stonewall Lode from a sheriff's sale (bk. 38, p. 556).

1897. F.L. Martin sold interest in the Stonewall Lode to A. Sutton (bk. 100, p. 139).

1910. Sutton quitclaimed her share of the claim to Acacia Park Land Company (bk. 143, p. 236).

1917. In August, Acacia Park Land Company made an agreement with S.L. Taber to lease the Stonewall Lode. Royalties would be applied toward purchasing the property (bk. 184, p. 1). Taber sold a lease on the Stonewall Lode to Stonewall Independent Mining Company in November (bk. 184, p. 3).

1928. In July, Acacia Park Land Company was dissolved by its directors (Willard N. Burgress, Mary M. Burgress, Elizabeth M. Jones), and Taber acquired the Stonewall and Stonewall No. 2 claims (bk. 185, p. 443). S.L. Taber deeded the Stonewall Lode to Hugh Brodie in December (bk. 152, p. 361). At some point, Brodie apparently willed the Stonewall Lode to the University of Michigan.

1936. Regents of the University of Michigan sold the Stonewall Lode to George S. Daniel (bk. 229, p. 59). Perhaps the will was contested, because it was 1940 when the court recognized Daniel as the owner (bk. 152, p. 505; bk. 238, p. 240).

1939. In July, Stonewall Leasing Company began driving a 600-foot-long crosscut (adit #100) intended to access the Stonewall vein and dewater the shaft and associated workings. The inclined Stonewall Shaft had been inactive for several years and was completely flooded. By November, nine employees had driven the adit 325 feet. (See R.J. Murray, Mine Inspector reports—Stonewall Mine, July 24, November 1, 1939, CBM.)

1940. By July, the 610-foot-long Stonewall Tunnel was about 30 feet from the ore body. The crosscut would dewater the shaft to a depth of 100 feet. (See R.J. Murray, Mine Inspector report, July 12, 1940.) Four employees drove the adit 306 feet. Carl West was contracted to drive the crosscut for $9.00/foot from June to November. Patented claims in the group included the Stonewall, Stonewall No.2, and Dave Knox. Unpatented claims were the Stonewall Mill Site and Stonewall Tunnel Site. The Stonewall Mine and associated claims were owned by George Daniel and leased to Stonewall Leasing Company (Roy S. Johnson, chairman; C. Firm Moore, secretary/treasurer). (See Operators Annual Report for 1940—Stonewall Tunnel, April 28, 1941, CBM.)

1943. Daniel leased (with a purchase to buy) the Stonewall, Stonewall No. 2, Dave Knox, Stonewall Mill Site, Stonewall Tunnel Site, and the Dave Knox Mining Company co-partnership to C. Firm Moore and Julius W. Masters. The lease was with Stonewall Leasing Company, the successor to Dave Knox Mining Company. (See bk. 245, p. 11.)

1946. Ten oz of silver, 1,100 lbs of lead, and 1,100 lbs of zinc (total value of $262) were recovered from 6 tons of ore shipped from the Stonewall Mine (Gustavson, 1948, p. 1397–1398).

1948. Daniel made a 10-year lease agreement for the Stonewall Mine with Steven Rutstrom and William Kowaluk (bk. 255, p. 400). A small tonnage of ore was shipped (Martin, 1950, p. 1456).

1949. Rutstrom operated the mine early in the year, then subleased it to Joe Adamick for the remainder of the year. Up to three miners worked through the Stonewall Tunnel. In June, the adit was 700 feet long and streaks of ore were showing. At the end of the crosscut, an inclined raise and a large open stope exposed ore. During September, workers were driving a crosscut around a caved area in the main adit. About 205 tons of ore with a value of $3,900 were shipped. (See John Doyle, Mine Inspector reports, June 10, September 20, September 23, 1949; Operators Annual Report for 1949—Stonewall Mine, March 7, 1950, CBM). Martin (1951, p. 1430) reported that 231 tons were shipped.

Dings and Robinson (1957, p. 103–104) reported that 267 tons of ore were shipped from the Stonewall Mine between 1946 and 1949. About 17 oz of gold, 590 oz of silver, 37 lbs of copper, 40,770 lbs of lead, and 13,264 lbs of zinc were recovered from the ore.

1950. By September, the Stonewall Tunnel was caved 900 feet from the portal. Workers were driving a 25-foot-long crosscut around the caved area. Ore had been stoped the entire distance (114 feet) between the caved area and the face. Daniel leased the mine to Carl McMullen through November. Ellis Webster and others leased the property after November. (See John Doyle, Mine Inspector report, September 23, 1950; Operators Annual Report for 1950—Stonewall Mine, December 1, 1950, CBM.) The Mining Yearbook (CMA, 1950, p. 75) reported that the Stonewall Mine was leased by Joe Adamick and was worked by three employees. Several shipments of lead-zinc ore were sent to Leadville. The Rutstrom and Kowaluk lease on the Stonewall Mine was canceled in August (bk. 255, p. 400; bk. 264, p. 48). Martin (1953, p. 1452) reports that zinc-lead-silver ore was shipped from the Stonewall group. The names of lessees in 1950 conflicts in the various records, and the total production and the amount of production from each lease is not well documented.

The Stonewall Shaft was caved by 1950, but the adit was 600-foot-long and provided access to 150 feet of drifts along the vein (Dings and Robinson, 1957, p. 103–104). The 600-foot adit length reported by Dings and Robinson is considerably shorter than the 900-foot length reported by the mine inspector in 1949 and 1950.

1951. Ellis Webster and Associates of Leadville reactivated the Stonewall Mine under a lease agreement with Daniel (Burleson, 1951, p. 82).

1952. A small tonnage of lead-silver-zinc ore was mined (Burleson, 1952, p. 98).

1954. H.F. Kane leased the Stonewall Mine from Daniel. The snowshed around the portal was caved, and a cabin had been rehabilitated into living quarters. Plans included sinking a 20- to 25-foot-deep shaft on a vein exposed in a bulldozer cut "some distance" from the Stonewall Shaft. If proven economic, the vein would be mined from the Stonewall Tunnel. Two employees shipped 10,659 lbs of ore valued at $220 and 8,936 lbs valued at $160. (See John Doyle, Information report, August 7, 1954; Operators Annual Report for 1954—Stonewall Mine, February 24, 1955, CBM.)

1956–1957. Daniel leased the Stonewall to Nelville and Randall Easton of Big Timber, Montana. The Eastons did extensive development work and shipped a moderate amount of ore. (See CMA, 1956, p. 157; 1957, p. 146.)

1958. Daniel leased the Stonewall Mine to Harry Nylene. Three miners operated the mine for 60 days. Ore was valued at $32/ton, although no shipments were made. (See Operators Annual Report for 1958—Stonewall Mine, January 8, 1959, CBM.)

1959. Ralph (Arky) Russel operated the mine (John Doyle, Information report—Stonewall Mine, December 4, 1963, CBM). Harry Nylene shipped ore from the Stonewall Mine (Ransome, Kelly, Kerns, and Mullen, 1960, p. 228). Perhaps Russel was subleasing the mine from Nylene.

1963. Daniel leased the Stonewall Mine to Cotter Corporation. Cotter Corporation shipped 350 tons of ore valued at $7,000. (See Operators Annual Report for 1963—Stonewall Mine, February 3, 1964, CBM.)

1964. Cotter Corporation shipped some ore and did diamond core drilling and drifting. The mine closed down in November. (See John Doyle, Information report—Stonewall Mine, December 7, 1964, CBM.) Cotter also mapped the Stonewall Tunnel (Figure 3). About 300 feet of underground workings were excavated between 1963 and 1964. (See docket 403773—Stonewall Mine, mine map repository report, Office of Surface Mining, Pittsburgh, Pennsylvania.)

1976. Daniel sold the Stonewall Lode to Silver Cross Enterprises, Inc. (Duane Cross—owner). Silver Cross was the owner of record in May 1999 (bk. 404, p. 201).

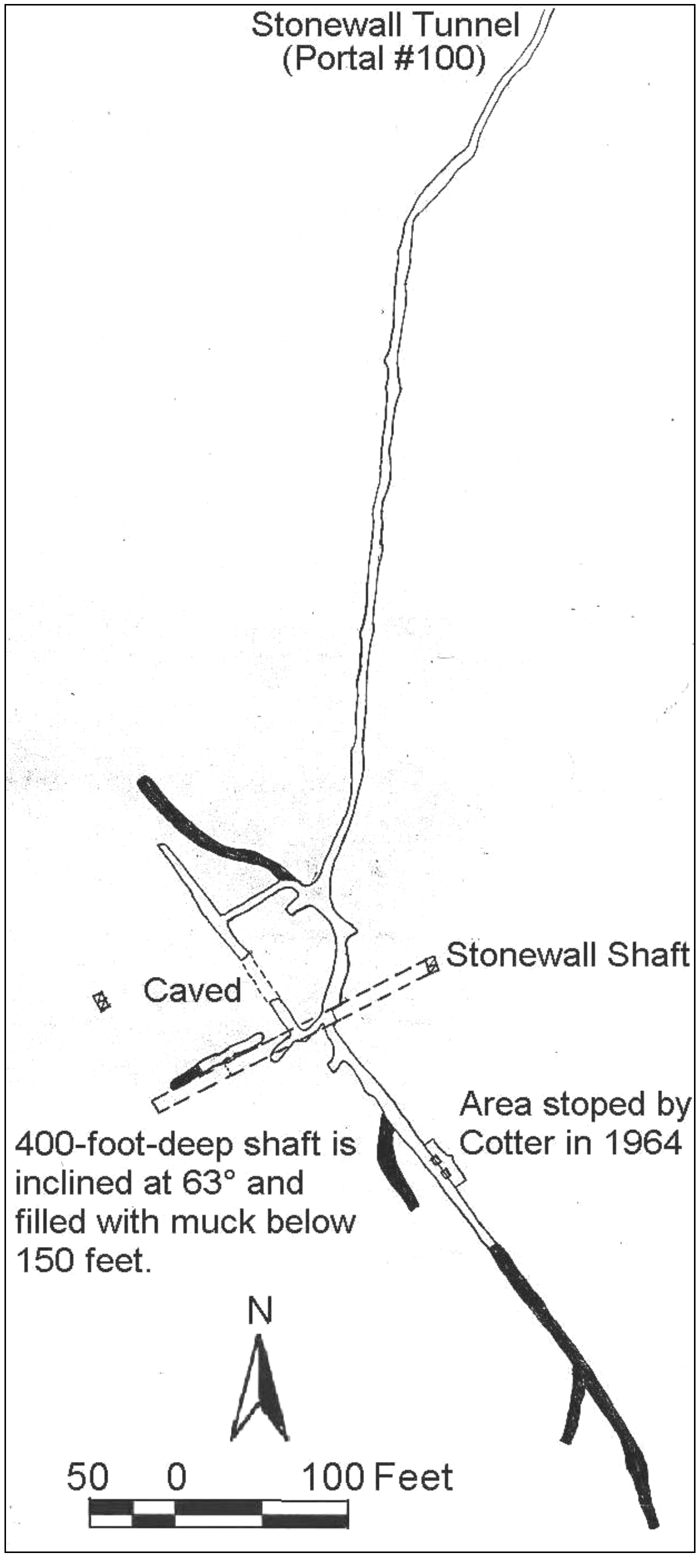


Figure 3. Map of the Stonewall Tunnel. (Modified from docket 403773–Stonewall Mine, mine map repository report, Office of Surface Mining, Pittsburgh, Pennsylvania; scale is approximate; areas in black were mined by Cotter Corporation in 1963–1964.)

Kentucky Mine

1879. William Adair and William Truesdale located the Kentucky Lode (bk. 8, p 135).

1880. Truesdale, Adair, A.R. Adair, A.B. Steinburger, Minnie Arbour, Albert Arbour, and Charles Blake were listed as owners (bk. 4, p. 121, 253).

1881. Burchard (1882, p. 366) reports that the Kentucky Mine was opened. A.R. Adair, Steinburger, Thomas E. Barrett, M.M. Stanfield, Thomas Bell, B.S. Hall, William Toms, Benjamen H. Cramp, Henry Stanfield, and J.S. Halsey were listed as owners at some time during the year (bk. 7, p. 121). In June, A.R. Adair agreed to give an interest in the Kentucky Lode to Robert Grahm in exchange for developing the Stonewall Lode (bk. 20, p. 128). In December, A.R. Adair made an agreement for Stanfield to timber 100 feet of the shaft for joint ownership in the Kentucky Lode (bk. 20, p. 562).

1882. A.B. Steinberger (superintendent) managed a large work force at the Kentucky Mine in May. In July, a 36-foot-wide vein was exposed in a crosscut at the bottom of a 112-foot-deep shaft. A 7.5-foot-wide galena vein assayed 70% to 80% lead and 35 oz/ton silver. (See *Denver Republican*, May 31, p. 6; July 16, p. 8, 1882.) Later in the year, the exposed vein was 26-feet-wide and contained 30 oz/ton silver and 25% lead (see *Rocky Mountain News*, September 13, 1882, p. 1). William Adair and Truesdale filed an amended location notice on the Kentucky Lode in September (bk. 16, p. 419). A.R. Adair, M.M. Stanfield, and R. Grahm filed a relocation notice in December (bk. 16, p. 528), and Mineral Survey No. 3049 was conducted on December 19. Two shafts were surveyed on the claim (Figure 4). The shaft shown at the north end of the claim, adjacent to the Stonewall Lode, is probably the large shaft that is adjacent to adit #103 of inventory area 381/4275-1. Truesdale, William Adair, A.R. Adair, Stanfield, Grahm, Halsey, and the Kentucky Silver Mining Company all had interest in the Kentucky Lode sometime during the year (bk. 7, p. 116).

Burchard (1883, p. 419) reported that a 35-foot-wide vein containing 11 feet of ore was exposed in a crosscut driven at the bottom of the 100-foot-deep Kentucky Shaft. The vein was an extension of the Stonewall vein and averaged $46/ton.

1883. Minnie Arbour sold her interest in the Kentucky Lode to Stanfield, Grahm, and Steinberger in February (bk. 24, p. 568). In March, O.E. Henry, superintendent, was pumping water from the Kentucky and Stonewall shafts. By April, the Kentucky Shaft included at least 175 feet of workings. Zinc no longer occurred in the vein, and the ore consisted of chalcopyrite and galena. (See *Rocky Mountain News*, March 6. p. 2; April 25, p. 2, 1883.) Development on the Kentucky included a 115-foot-deep shaft and about 60 feet of drifts by the end of the year (Burchard, 1884, p. 359–360). A.R. Adair and Steinberger (Alexander Bliley, agent) owned the mine. The vein contained a 12-inch-wide “crevice” with quartz and galena. Mill runs of sorted ore averaged 30% lead and 15 oz/ton silver. Development included a 130-foot-deep shaft with drifts and a 36-foot-long crosscut. (See Corregan and Lingane, 1883, p. 99.) Reports by Corregan and Lingane (1883) and Burchard (1884) have minor discrepancies in the length of the workings.

1884. By the end of the year the Kentucky Mine was idle (Burchard, 1885, p. 190).

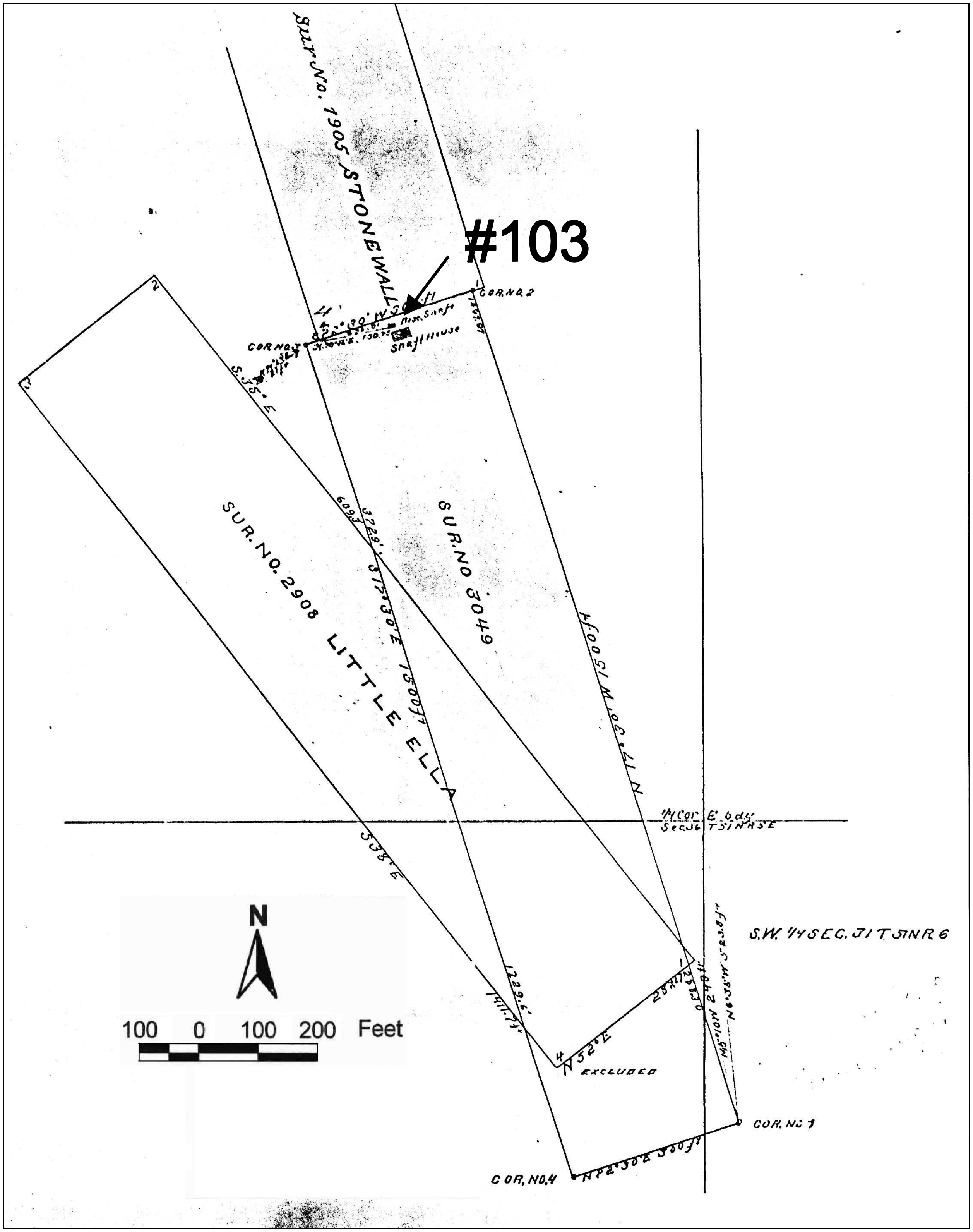


Figure 4. Mineral Survey No. 3049 of the Kentucky Lode (modified; scale is approximate).

1885. A.R. Adair, Stanfield, and Grahm received a patent for the Kentucky Lode (bk. 46, p. 108).

1899. Chaffee County sold the Kentucky Lode to C.A. Niles, Napolian P. Jones, and Dora C. Sindlinger for taxes (bk. 102, p. 43). Kentucky Silver Mining Company failed in an attempt to regain their interest in the claim (bk. 125, p. 224).

1914. Jones sold his interest in the Kentucky Lode to Niles and Sindlinger (bk. 152, p. 116).

1930. Bell M. Niles sold her interest in the Kentucky Lode to Sindlinger (bk. 210, p. 301).

1937. C.R. Sindlinger sold the claim to Dora A. Sindlinger (bk. 221, p. 483).

1950. The Kentucky Shaft was caved (Dings and Robinson, 1957, p. 102).

1975. Greeley National Bank, guardian of the estate of Dora Whitney (formerly Dora Sindlinger), sold the Kentucky Lode to Janis Harris North, the owner of record in May 1999 (bk. 399, p. 491).

Claim Blocks

Silver Cross Enterprises located the Stonewall claim block in the vicinity of the Stonewall and Kentucky Mines in 1959. BLM closed the case on the claim block in April 1989. Silver Cross Enterprises relocated the Stonewall claim block in June 1989, but BLM closed the case in 1993. (See mining claim files, BLM.)

Neil Jackson, Jim Hess, Randall Eaton, Randy Eaton Jr., Ronald Eaton, and Jim Eaton located the Silver Saddle claims (Figure 5) in the area of the Kentucky and Stonewall Mines in 1979. BLM closed the case on the Silver Saddle claims in 1993. (See mining claim files, BLM).

GEOLOGY

The Kentucky and Stonewall Shafts are on a north-trending quartz vein in Mount Princeton quartz monzonite (Figure 6). Up to 30 feet in width, the Stonewall vein strikes from north to N. 30° W., dips 40°–80° W., and was reportedly traceable at the surface for about 2,000 feet. Pyrite, galena, sphalerite, chalcopyrite, calcite, and brecciated, altered Mount Princeton quartz monzonite were on the dumps. (See Dings and Robinson, 1957, plate 1, p. 102–104.)

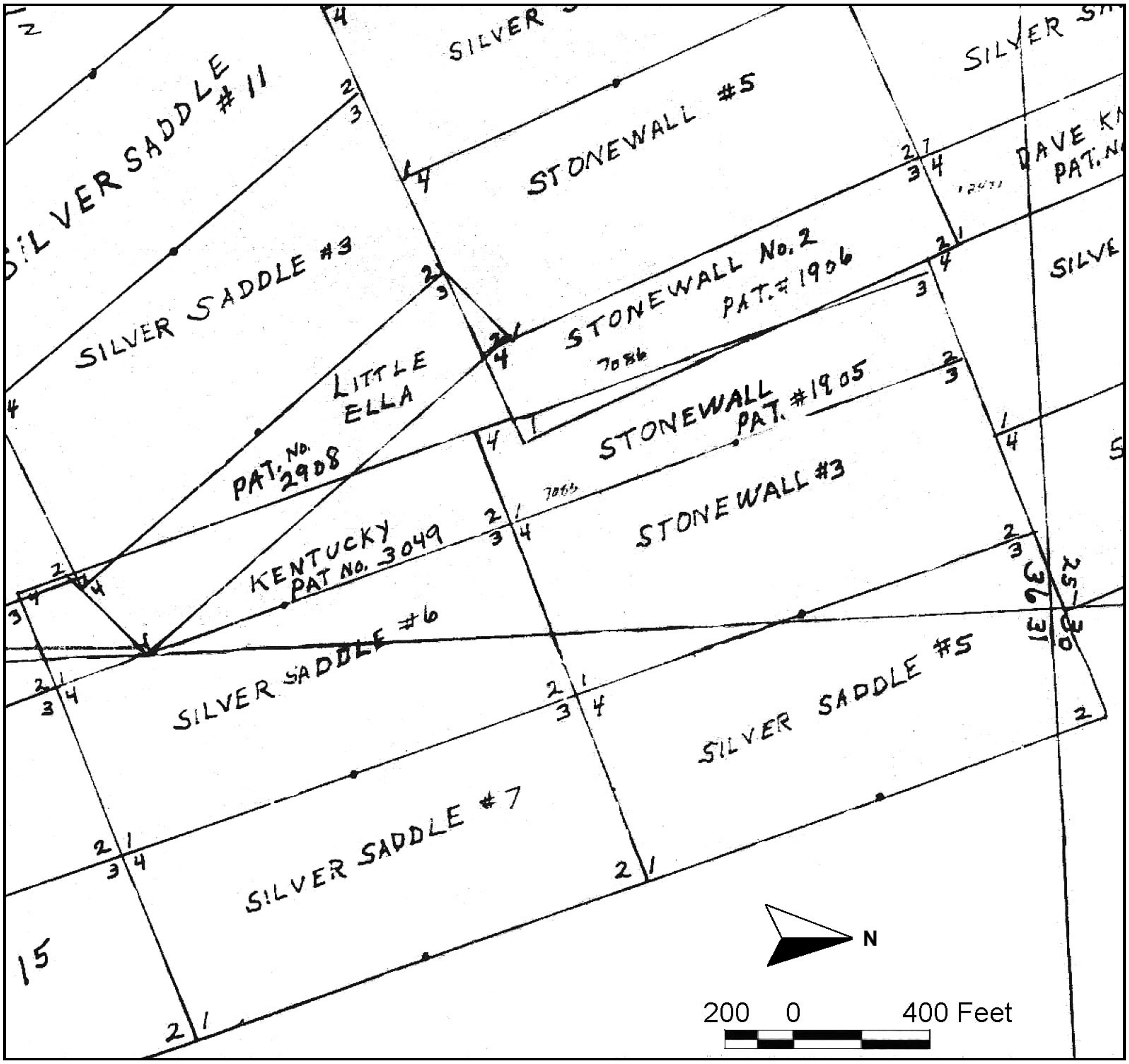
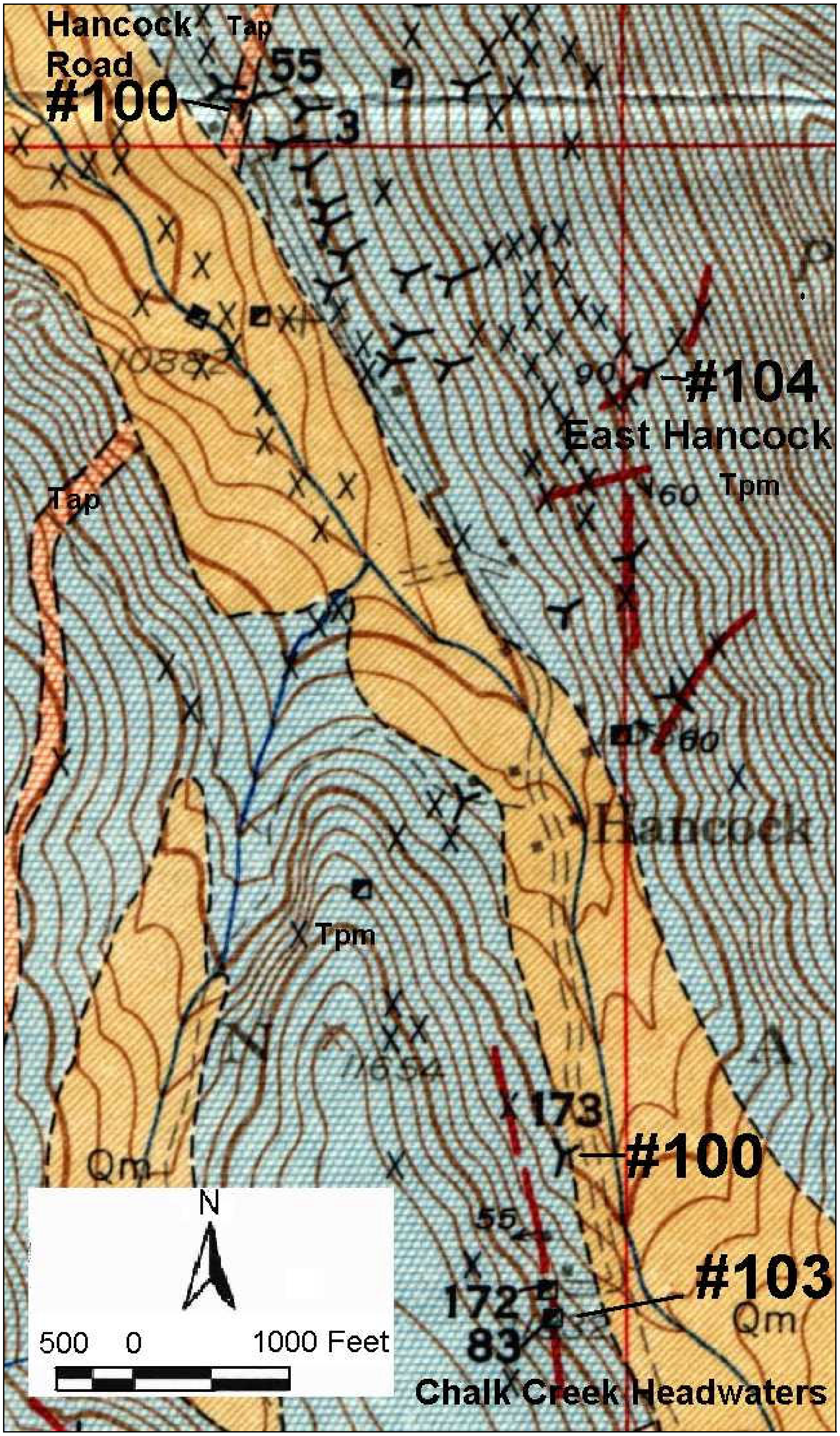


Figure 5. Location map of part of the Silver Saddle claim block (from BLM mining claim files; scale is approximate).

SITE DESCRIPTION

This is the southernmost and most upstream site of the Chalk Creek mine sites described in this report (Figure 2). Features #100/200 are the Stonewall adit and waste-rock pile (Figure 7). In June 1999, the portal of the adit was open, but had a grate preventing easy access (Figure 8). The effluent stream from adit #100 split about 30 feet from the portal. The western branch of the mine drainage completely disappeared behind cabin ruins. The eastern branch carried the bulk of the flow and crossed the main access road before splitting. The northern of these branches flowed adjacent to the southeastern part of dump #200 before reaching Chalk Creek (Figure 9). The southern branch flowed through a small swampy area and entered Chalk Creek.



EXPLANATION

Qm—Quaternary glacial moraine

Tpm—Tertiary Mt. Princeton quartz monzonite

Tap—Tertiary Mt. Aetna quartz monzonite

Red lines represent veins.

Smaller numbers refer to named mines.
3—Allie Bell
55—Flora Bell
83—Kentucky
172—Stonewall Shaft
173—Stonewall Tunnel

Larger numbers with # refer to features described in this report.

Figure 6. Geologic map of the southern part of the Chalk Creek area. [Modified from Dings and Robinson (1957, plate 1); scale is approximate.]

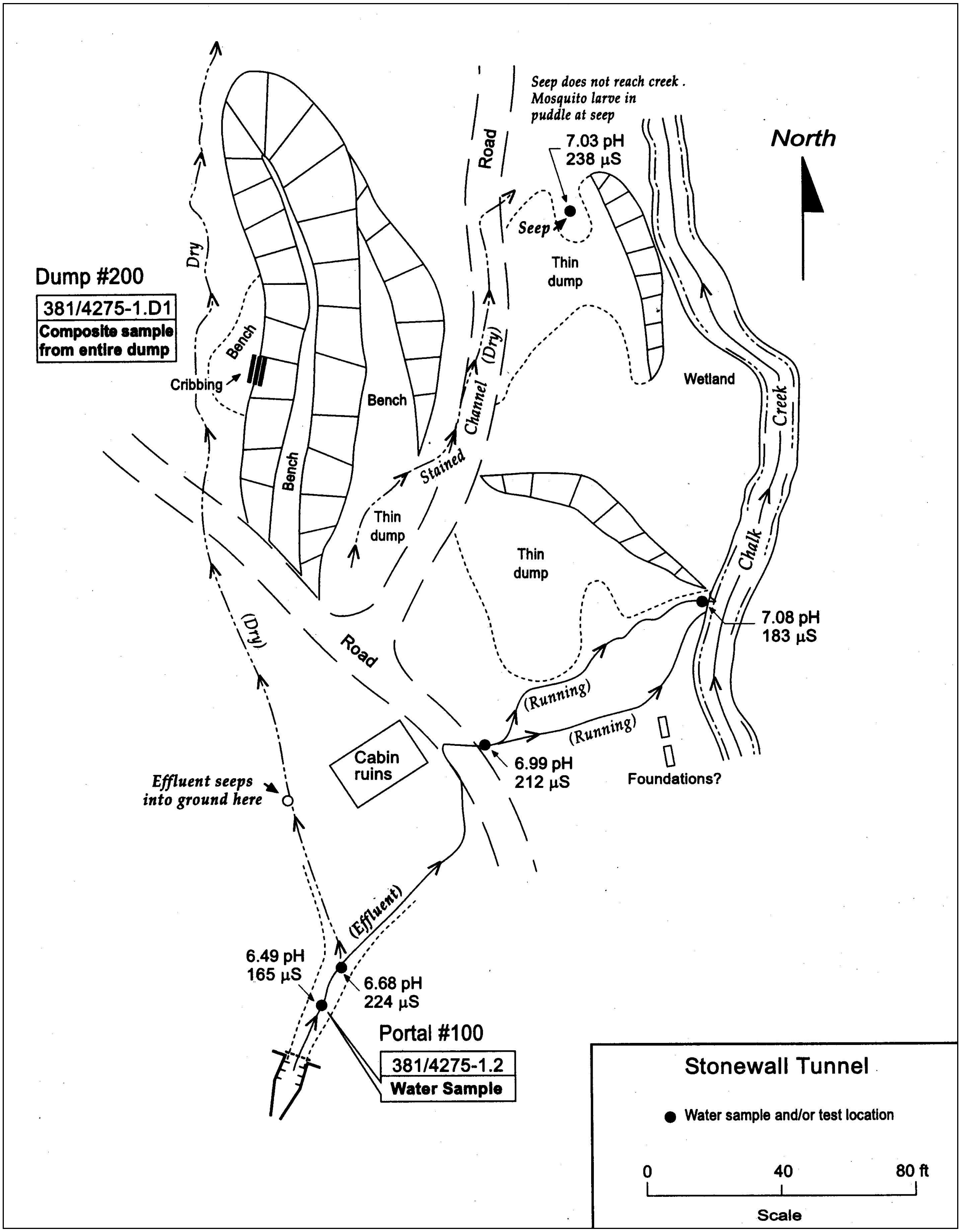


Figure 7. Map of the Stonewall Mine area and related sample sites.

Figure 8. Effluent near the portal of the Stonewall Mine.

Figure 9. Photograph of effluent along southern toe of Stonewall waste-rock pile.

Waste-rock pile #200 was spread over a large area, but in general was relatively thin. Virtually all of the waste rock was piled on the northeast side of the main access road. A seldom-used 4WD road bisected the pile, and the thickest accumulation of waste rock lay to the west of this road (Figure 10). Two thin waste-rock piles were east of this road, and the northern of the thin piles toed into Chalk Creek for a short distance. A small seep emerged near the northeastern toe, but the water did not reach Chalk Creek at the surface (Figure 11). A dry, iron-stained channel ran along and close to the seldom-used 4WD road.

Feature #103 was a caved adit that drains small volumes of water intermittently. When inventoried by CGS in early August 1995 after an unusually wet winter, the adit was discharging a small volume of water that seeped into the ground before reaching the waste-rock pile (Benson and others, 1997, p. 17). In June 1999, no water was discharging, and a snowbank filled the portal area.

Figure 10. Largest lobe of the Stonewall waste-rock pile, west of the road.

Figure 11. Seep on north end of Stonewall waste-rock pile.

WASTE AND HAZARD CHARACTERISTICS

Water samples were collected near the portal of the Stonewall Tunnel during the abandoned mine inventory in 1995 and for this investigation in 1999. In 1995, flow was estimated at 20 gpm, pH was 6.1 and conductivity was 100 µS/cm. This water exceeded State standards in concentrations of manganese (2,600 µg/L), zinc (2,400 µg/L), cadmium (12 µg/L), copper (12 µg/L), and total iron (2,000 µg/L). (See Benson and others, 1997, p. 16–17.) In June 1999, the effluent was flowing at a measured rate of 36 gpm and had pH of 6.49 and conductivity of 165 µS/cm. Moderate amounts of red-brown precipitate lined the channel, and grass was growing in the shallow areas. This water also exceeded standards in manganese, zinc, cadmium, copper and iron (sample 381/4275-1.2, Table 1).

After crossing the main 4WD road near the cabin ruins the effluent had 6.99 pH and 212 µS/cm conductivity. After splitting again, the effluent was tested in the channel that flowed adjacent to the southeastern part of the waste-rock pile. The test showed that pH had risen to 7.08, and conductivity remained about constant at 183 µS/cm (Figure 7).

Waste-rock pile #200 associated with the Stonewall adit was estimated to contain 1,300 cubic yards of material (Benson and others, 1997, p. 17). A small portion of the northern part of the dump bordered on Chalk Creek, and some mine effluent flowed along the toe of the southeastern part of the pile. In addition, a seep with pH of 7.03 and 238 µS/cm conductivity emerged near the north end of the Stonewall dump. Gravel-size and finer materials composed the bulk of the pile. Iron- and manganese-stained monzonite was the predominant rock type. Sparse quartz, and minor pyrite, galena, and calcite also occurred. A composite dump sample was collected (Table 2). Results showed high concentrations of lead, zinc, and manganese. Although the sample had moderately high potential acidity, it contained almost 5% CaO and had unusually high neutralization potential. The net acid-base potential was about +77 tons $CaCO_3$/1,000 tons, and the paste pH was 7.66.

Water samples were collected from Chalk Creek upstream and downstream of this site (samples 381/4275-1.1 and 381/4275-1.3, respectively). The upstream sample met State standards for all of the tested parameters (Table 1). Zinc concentration exceeded standards, and zinc load approximately quadrupled at the downstream site, increasing from 0.3 lb/day to 1.3 lb/day. Although within standards, manganese concentration increased in the downstream sample. Effluent from the Stonewall adit is probably the source of those metals.

When tested by CGS in August 1995, adit #103 was discharging an estimated 2 gpm with <50 µS/cm conductivity and 5.7 pH (Benson and others, 1997, p. 17). In June 1999, no water was draining, and a snowbank filled the portal area. This feature is located entirely on private land and does not appear to be a serious environmental problem in the Chalk Creek drainage basin.

Table 1. Analytical data for water samples collected near the headwaters of Chalk Creek.

Sample	12-02-381/4275-1.1, CHALK CREEK HEADWATERS (6/5/99)				12-02-381/4275-1.2, CHALK CREEK HEADWATERS (6/5/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	1,800.0				36.0			
pH (standard units)	6.45				6.49			
Conductivity (µS/cm)	47.0				165.0			
Alkalinity (mg/L $CaCO_3$)	13.00				15.00			
Hardness (mg/L $CaCO_3$)	20	None	N/A		60	None	N/A	
Aluminum (trec) (µg/L)	< 10	None	N/A	N/A	650	None	N/A	127.6
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	77	1,000.0	Below standard	755.5	3,100	1,000.0	3.1	608.3
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	11	2,000.0	Below standard	107.9	3,300	2,000.0	1.7	647.6
Aluminum (µg/L)	< 50	87.0	Below standard	N/A	69	87.0	Below standard	13.5
Cadmium (µg/L)	< 0.3	0.3	Below standard	N/A	20.0	0.8	26.3	3.9
Calcium (mg/L $CaCO_3$)	18	None	N/A	176,612.4	54	None	N/A	10,596.7
Chloride (mg/L)	< 20.0	250.0	Below standard	N/A	< 1.0	250.0	Below standard	N/A
Chromium (µg/L)	< 10	11.0	Below standard	N/A	< 10	11.0	Below standard	N/A
Copper (µg/L)	< 4.0	3.0	Not detected	N/A	31.0	7.7	4.0	6.1
Fluoride (mg/L)	< 0.10	2.0	Below standard	N/A	0.49	2.0	Below standard	96.2
Iron (µg/L)	40	300.0	Below standard	392.5	490	300.0	1.6	96.2
Lead (µg/L)	< 1.0	0.4	Not detected	N/A	3.0	1.9	1.6	0.6
Magnesium (mg/L)	0.54	None	N/A	5,298.4	1.50	None	N/A	294.4
Manganese (µg/L)	< 4	50.0	Below standard	N/A	1,800	50.0	36.0	353.2
Nickel (µg/L)	< 20	28.4	Below standard	N/A	< 20	64.9	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A	< 1.0	None	N/A	N/A
Silicon (mg/L)	1.6	None	N/A	15,698.9	3.6	None	N/A	706.4
Silver (µg/L)	< 0.2	0.0	Not detected	N/A	< 0.2	0.0	Not detected	N/A
Sodium (mg/L)	0.74	None	N/A	7,260.7	2.10	None	N/A	412.1
Sulfate (mg/L)	7	250.0	Below standard	68,682.6	50	250.0	Below standard	9,811.8
Zinc (µg/L)	13	27.3	Below standard	127.6	3,200	68.9	46.4	628.0

Table 1. Analytical data for water samples collected near the headwaters of Chalk Creek—continued.

Sample	12-02-381/4275-1.3, CHALK CREEK HEADWATERS (6/5/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	2,000.0			
pH (standard units)	7.17			
Conductivity (µS/cm)	49.0			
Alkalinity (mg/L $CaCO_3$)	15.00			
Hardness (mg/L $CaCO_3$)	20	None	N/A	
Aluminum (trec) (µg/L)	< 50	None	N/A	N/A
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	94	1,000.0	Below standard	1,024.8
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	55	2,000.0	Below standard	599.6
Aluminum (µg/L)	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	< 0.3	0.3	Below standard	N/A
Calcium (mg/L $CaCO_3$)	18	None	N/A	196,236.0
Chloride (mg/L)	< 20.0	250.0	Below standard	N/A
Chromium (µg/L)	< 10	11.0	Below standard	N/A
Copper (µg/L)	< 4.0	3.0	Not detected	N/A
Fluoride (mg/L)	< 0.10	2.0	Below standard	N/A
Iron (µg/L)	42	300.0	Below standard	457.9
Lead (µg/L)	< 1.0	0.4	Not detected	N/A
Magnesium (mg/L)	0.54	None	N/A	5,887.1
Manganese (µg/L)	16	50.0	Below standard	174.4
Nickel (µg/L)	< 20	28.4	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A
Silicon (mg/L)	1.6	None	N/A	17,443.2
Silver (µg/L)	< 0.2	0.0	Not detected	N/A
Sodium (mg/L)	0.67	None	N/A	7,304.3
Sulfate (mg/L)	7	250.0	Below standard	76,314.0
Zinc (µg/L)	55	27.3	2.0	599.6

EAST HANCOCK

The “East Hancock” inventory area (381/4277-1) is on the western side of Pomeroy Mountain about 0.5 mile north of the townsite of Hancock (Figure 2). A 4WD road off County Road 295 (the old railroad grade) accesses the mine features described in this area. CGS assigned EDRs of 3 to caved adit #104 and associated dump #204. The adit, waste rock, and mine effluent are entirely on the patented Old Quail Lode claim. Little information was available regarding the Old Quail Lode; perhaps the mine operated under a different name.

Table 2. Analytical data for waste-rock samples from the upper Chalk Creek watershed, upstream of Pomeroy Gulch. [Blank spaces indicate the parameter was not analyzed.]

Parameter	Chalk Creek Headwaters—Stonewall (381/4275-1.D1)	East Hancock-381/4277-1.204 (381/4277-1.D1)	Hancock Road-upper (381/4278-1.D1)	Hancock Road-lower (381/4278-1.D2)
pH	7.66	5.17	5.09	5.36
Neutralization potential (tons $CaCO_3$/1,000 tons)	94.9	3.0	4.0	4.1
Potential acidity (tons $CaCO_3$/1,000 tons)	17.7	6.0	7.4	8.4
Net acid-base potential (tons $CaCO_3$/1,000 tons)	77.2	-3.0	-3.4	-4.2
Al_2O_3 (%)	6.93			
CaO (%)	4.91	0.09	0.08	0.14
Fe_2O_3 (%)	2.82	2.34	1.90	3.13
K_2O (%)	2.02			
MgO (%)	0.56			
Na_2O (%)	0.41			
Sulfur (%)	1.04	0.63	0.46	0.69
Sulfate as SO_4 (acid soluble) (%)		0.77	0.57	0.85
Antimony (ppm)	1	2	5	3
Arsenic (ppm)	24	5	3	9
Beryllium (ppm)	2			
Boron (ppm)	<1			
Cadmium (ppm)	21.6	17.6	2.0	4.1
Cobalt (ppm)	6			
Copper (ppm)	91	193	28	71
Gold (ppm)	0.150	0.043	0.033	0.119
Lead (ppm)	7,030	6,590	630	1,730
Lithium (ppm)	22			
Manganese (ppm)	1,574	49	370	400
Mercury (ppm)	0.19	0.53	0.36	0.45
Molybdenum (ppm)	24	13	7	6
Nickel (ppm)	6			
Phosphorus (ppm)	257			
Silver (ppm)	6.8	5.5	17.5	73.9
Strontium (ppm)	95			
Vanadium (ppm)	36			
Zinc (ppm)	5,188	4,620	606	1,250

MINING HISTORY

The mine on the Old Quail Lode claim has no recorded production. The size of the workings suggests that any production would have been small.

1915. Daniel Clark located the Old Quail Lode (bk. 147, p. 328). This may have been a location over an older unpatented claim.

1922. A mineral survey was conducted on the Old Quail Lode. Two open cuts, two drifts, a shaft, and an adit were surveyed on the claim (Figure 12). Clark or his grantors excavated the workings (Mineral Survey No. 20164, BLM files).

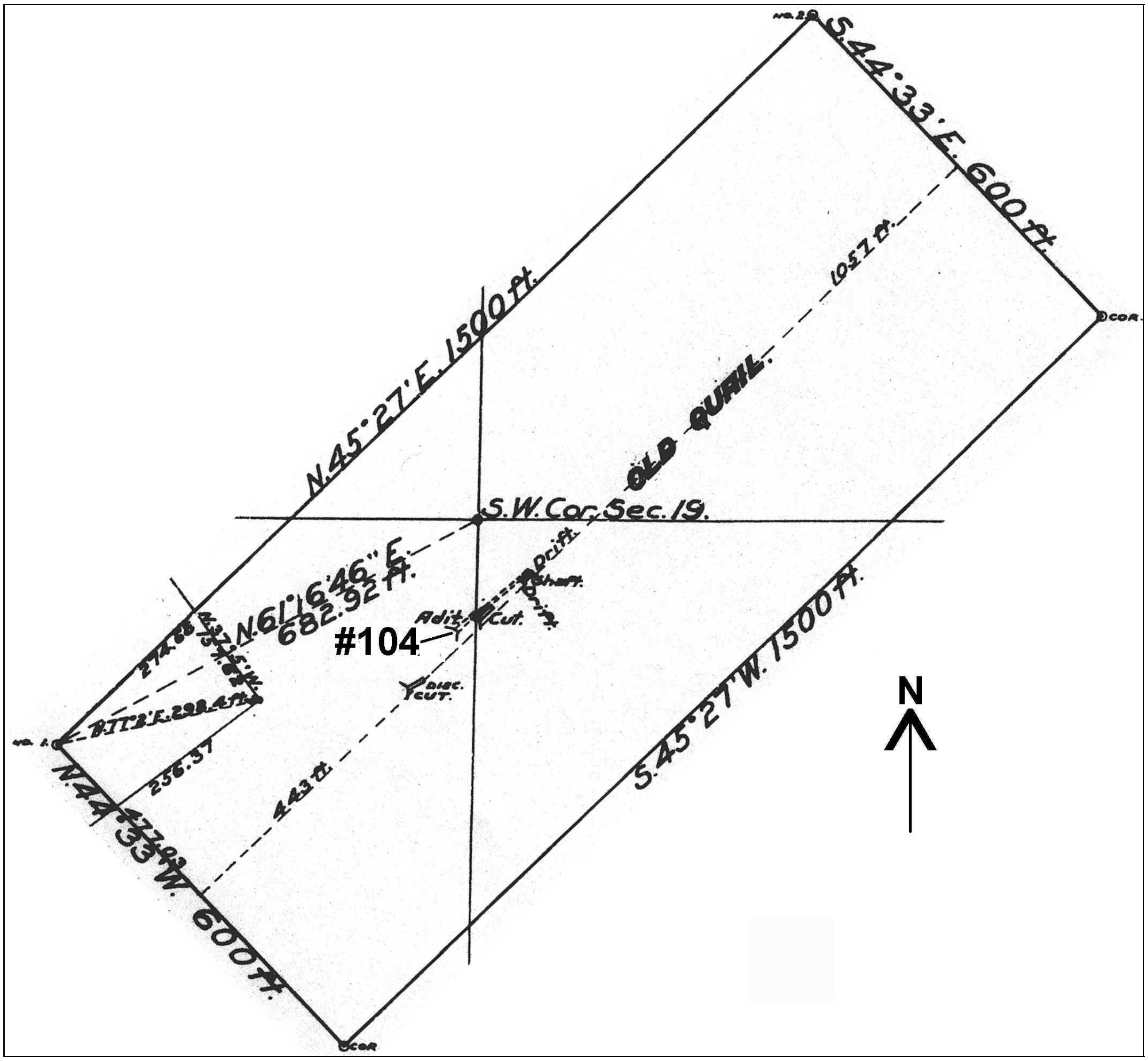


Figure 12. Mineral Survey No. 20164 of the Old Quail Lode (modified).

1923. The U.S. Government issued a patent for the Old Quail to Clark in February. In April, he sold the claim to A.A. Stark. (See bk. 184, p. 404; bk. 197, p. 111.)

1938. A.A. Stark sold the claim to A.J. and R.A. Stark (bk. 228, p. 18).

1944. Chaffee County acquired the Old Quail Lode for unpaid 1937 taxes (bk. 237, p. 217).

1959. Chaffee County sold the claim to H.G. Kramer (bk. 307, p. 406).

1968. G. Payton sold the Old Quail to Texota (bk. 363, p. 747). It is not clear when Payton acquired the claim from Kramer.

1971. North American Resources (formerly Texota; bk. 364, p. 477) sold the Old Quail to Joseph Dodge in 1971 (bk. 384, p. 707). Dodge was the listed owner in July 2000.

GEOLOGY

Adit #104 was driven on a northeast-trending, vertically dipping vein in Mount Princeton quartz monzonite (Figure 6). Vein material on the dump contained quartz, pyrite, sphalerite, and galena.

SITE DESCRIPTION

The site lies northeast of the ghost town of Hancock, on the western slope of the ridge trending north-northwest from Pomeroy Mountain (Figure 2). Adit #104 and associated waste-rock pile #204 are the features of concern at this site. In October 1999, the portal of adit #104 was nearly completely caved, but the interior of the mine was accessible via open stope #105 on the slope immediately above the portal. Effluent emerged from adit #104 and flowed through a trench that led from the portal (Figure 13). At the mouth of the trench the effluent channel split. Both channels flowed southward, but the larger stream crossed part of the bench of dump #204 and flowed adjacent to the eastern toe of the dump. In October 1999 both streams of effluent disappeared completely into the grassy alpine meadow to the south of the site within about 20 feet of the waste-rock pile (Figure 14). A third, minor trickle of effluent flowed westward onto the bench of dump #204 before quickly disappearing.

Dump #204 had two tiers (Figure 15). The lower, smaller tier had a narrow bench with a boiler on it, and may represent waste rock from a small mine working that was subsequently covered by material from adit #104. A small seep at the toe of the lower tier moistened the ground.

WASTE AND HAZARD CHARACTERISTICS

Effluent from adit #104 was tested during the inventory in July 1995. Flow was estimated at 5 gpm, and it had a pH of 6.3 and conductivity of 300 µS/cm. After an unusually wet winter and spring preceding the field examination of 1995, part of the effluent reached an intermittent stream that flowed at 5 to 10 gpm through the meadow about 40 feet south of the site. Water tests upstream and downstream of the confluence with the effluent both showed pH of 6.1. Conductivity was 100 µS/cm upstream and <50 µS/cm downstream, suggesting no significant water quality difference. The volume of seepage at the toe of dump #204 was slightly greater in 1995 than in 1999. In 1995 the seep had conductivity of 100 µS/cm and pH of 5.4. (See Benson and others, 1997, p. 17–18; USFS-AMLIP inventory form 381/4277-1.) Because of its low volume, toe seepage could not be tested in 1999.

A water sample was collected near the portal in October 1999. Dendritic algae and thick green moss was in the channel and along the banks of the effluent stream. A moderate amount of light-brown precipitate lined the channel and was caught in the algae. Flow was too small and dispersed to accurately measure and was estimated at about 1 gpm. Conductivity was 613 µS/cm, and pH was 7.03. This water exceeded State standards in lead and zinc concentrations. Sulfate and copper values were moderately high, but within standards (Table 3). Metal loading from the site is negligible because of the low volume of effluent that is only slightly degraded.

Figure 13. Portal, open stope, and mossy effluent channel at the "East Hancock" site.

Figure 14. Photograph of the bench of dump #204 and the meadow to the south.

Figure 15. Dump #204 and its two tiers.

Table 3. Analytical data for the water sample from the "East Hancock" site.

Sample	381/4277-1.1, EAST HANCOCK (10/13/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	1.0			
pH (standard units)	7.03			
Conductivity (µS/cm)	613.0			
Alkalinity (mg/L $CaCO_3$)	50.00			
Hardness (mg/L $CaCO_3$)	268	None	N/A	
Aluminum (trec) (µg/L)	< 50	None	N/A	N/A
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	< 10	1,000.0	Below standard	N/A
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	370	2,000.0	Below standard	2.0
Aluminum (µg/L)	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	2.4	2.5	Below standard	0.0
Calcium (mg/L $CaCO_3$)	250	None	N/A	1,362.8
Chloride (mg/L)	< 20.0	250.0	Below standard	N/A
Chromium (µg/L)	< 10	11.0	Below standard	N/A
Copper (µg/L)	9.0	27.5	Below standard	0.0
Fluoride (mg/L)	0.28	2.0	Below standard	1.5
Iron (µg/L)	< 10	300.0	Below standard	N/A
Lead (µg/L)	46.0	15.8	2.9	0.3
Magnesium (mg/L)	4.50	None	N/A	24.5
Manganese (µg/L)	7	50.0	Below standard	0.0
Nickel (µg/L)	< 20	202.4	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A
Silicon (mg/L)	5.1	None	N/A	27.8
Silver (µg/L)	< 0.2	0.4	Below standard	N/A
Sodium (mg/L)	3.10	None	N/A	16.9
Sulfate (mg/L)	200	250.0	Below standard	1,090.2
Zinc (µg/L)	370	244.7	1.5	2.0

Waste-rock pile #204 contained an estimated 250 to 500 cubic yards of mostly fine- and sand-size material. Weakly iron-stained monzonite was the predominant rock type. Moderate amounts of quartz, and minor pyrite, sphalerite, and galena also occurred. A small area of weathered, gray, sulfide-rich material was on the northern part of the bench. A composite dump sample contained high concentrations of lead and zinc, and the sample was weakly acidic. Net acid-base potential was -3.0 tons $CaCO_3$/1,000 tons, and paste pH was 5.17 (sample 381/4277-1.204, Table 2).

HANCOCK ROAD

The “Hancock Road” inventory area (381/4278-1) straddles the old railroad grade between the abandoned townsites of Romley and Hancock, about 3.5 miles south of St. Elmo (Figure 2). CGS assigned EDRs of 3 to caved adit #100 and associated waste-rock piles #200 and #201. Most of the waste rock and the adit are apparently on NFS land, although a survey is necessary because numerous patented claims are in the area.

Dings and Robinson (1957, plate 1) show the Flora Bell adit at the approximate location of adit #100 of the “Hancock Road” inventory area. The Flora Bell adit was a crosscut that was driven to intersect a vein on the patented Flora Bell Lode claim higher on the mountain. The portal of adit #100 was probably on the unpatented Flora Bell Tunnel Site claim, between the Eclipse and Drummer Lodes. The crosscut probably extended through the Drummer and Iron Reef Lode claims to reach the Flora Bell Lode (Figure 16).

A mine inspector report from 1968 refers to a possible connection between adit #100 and the lower adit of the nearby Allie Bell Mine. A map of the lower adit of the Allie Bell Mine showed no connection with the Flora Bell workings, although part of the Allie Bell was caved (Dings and Robinson, 1957, plate 1, p. 96–97, 102.)

MINING HISTORY

The Flora Bell Lode was located in 1880 and patented in 1883. Initially the mine was operated through shafts on the slope above adit #100. Adit #100 was started in 1907 and connected to the main shaft prior to 1916. Although the reported length of the adit is variable, depending on the source, it probably extends at least 1,500 feet.

At least 15 tons of ore worth \$60/ton was produced from the main shaft during the 1880’s. Dings and Robinson (1957, p. 102) reported that recorded production from the Flora Bell from 1901 to 1950 (mostly 1910–1919) was 406 tons containing 13 oz gold, 6,757 oz silver, 206 lbs copper, and 9,863 lbs lead. Small production was also reported in 1939.

Sparse information was available regarding the Eclipse, Drummer, and Iron Reef Lodes. Any production from them was not recorded and was probably small.

Flora Bell Mine

1880–1881. According to P.J. Buckel (Inspector report-Flora Bell Mining Company, September 27, 1908, v. 10, p. 12, CBM), the Flora Bell “property was located in 1880 and opened in 1881.” G. Fenton, Drach, Shodl, and J. Emerson located the Flora Bell Lode claim in August 1881. In September, Ridenour and Baker purchased interest in the claim. (See bk. 3, p. 419; 459; bk. 14, p. 296; bk. 21, p. 322.)

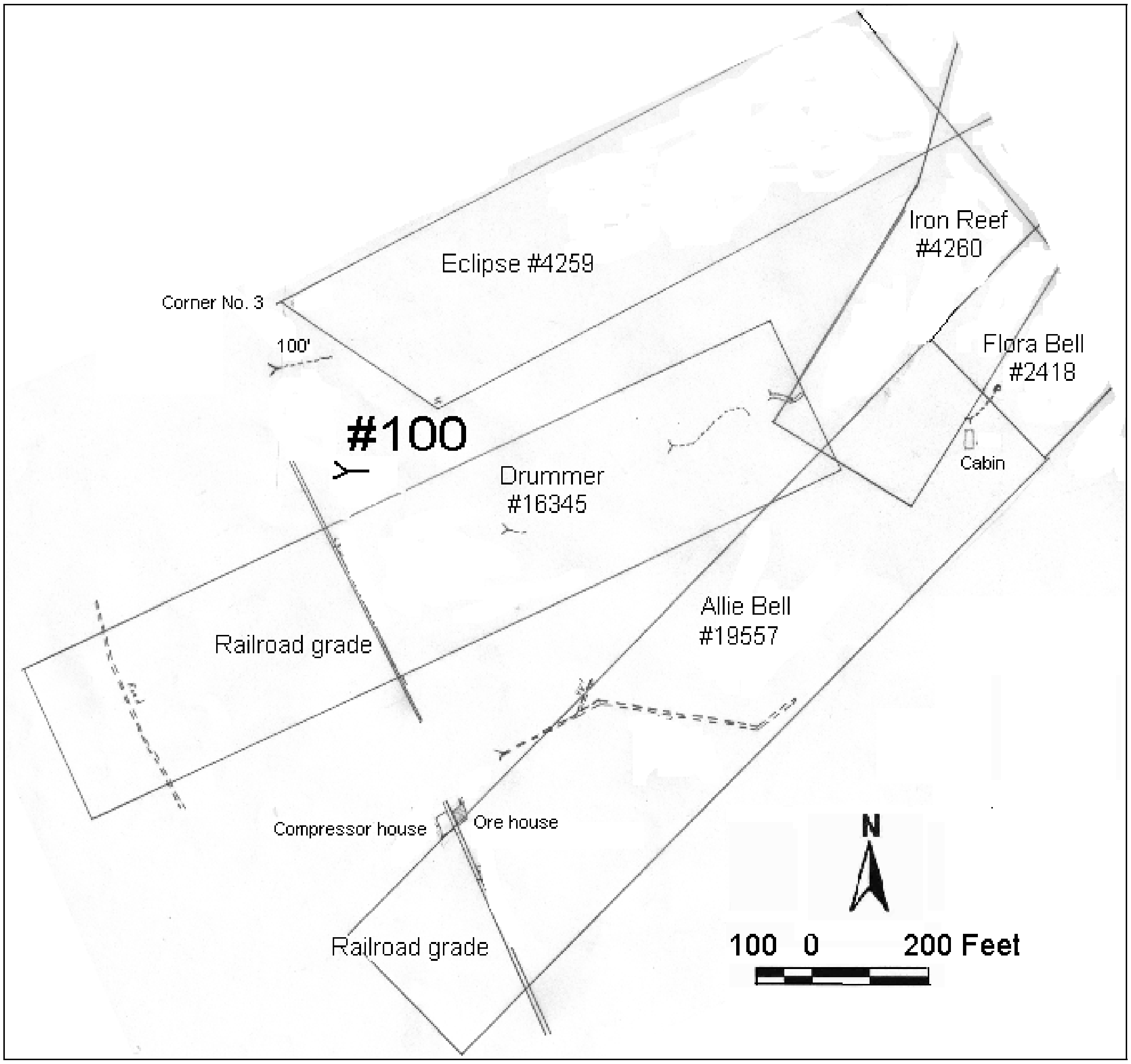


Figure 16. Map of the approximate locations of some patented mining claims near adit #100 of the "Hancock Road" inventory area. (Modified from Mineral Survey Nos. 2418, 4259, 4260, 16345, 19557, and 19751; scale is approximate.)

1882. The Flora Bell Mine was active early in the year (*Denver Republican*, March 14, 1882, p. 3). In March, Mineral Survey No. 2418 was completed on the Flora Bell Lode. Two shafts (30 and 10 feet deep) were surveyed on the claim. (See Mineral Survey No. 2418, BLM files.) Adit #100, which did not exist in 1882, eventually connected with one of these early shafts. Reportedly, the ore zone widened with depth and contained silver sulfide, silver chloride, and argentiferous galena. In September, half a carload of ore was shipped, and specimens were displayed at the Denver National Mining Exposition. In November, two shifts of miners removed a large quantity of rich ore from the Flora Bell. A high-grade ore zone more than a foot wide and containing 2,900 oz/ton silver was exposed at the bottom of an 85-foot-deep shaft. It was speculated that the Flora Bell and Allie Bell Mines were producing from the same vein. (See *Rocky Mountain News*, September 11, p. 3; September 13, p. 1; September 28, p. 6; November 29, p. 2; November 30, p. 6, 1882; Burchard, 1883, p. 419.)

1883. Corregan and Lingane (1883, p. 92) reported that the Flora Bell Lode claim was patented in 1882, however, the U.S. Government did not issue a patent for the claim to Shodl, Drach, Ridenour, Emerson, and Baker until January 1883 (bk. 121, p. 120). Quartz, galena, pyrite, and chalcopyrite occurred in a 6-foot-wide "crevice" in the fissure vein. Mill runs of sorted ore averaged 30% lead and 42 oz/ton silver. (See Corregan and Lingane, 1883, p. 92.) Reported production was 15 tons of ore worth $60/ton. After deductions the smelter paid $550 for the ore. Copper, galena, native silver, and silver glance (argentite) were exposed in a 17-inch-wide mineralized zone in a 87-foot-deep shaft. (See Burchard, 1884, p. 259.)

1884. W.Q. Hawley and P.T Seiter acquired an 18-month lease on the Flora Bell Mine in June. Vein samples assayed as high as $3,000/ton. (See *Rocky Mountain News*, June 28, 1884, p. 6.) In July, Lone Star Silver Mining Company purchased 2 acres of the Flora Bell Lode (bk. 36, p. 55; bk. 40, p. 306).

1902–1905. W. Shultz leased the Flora Bell Lode (bk. 133, p. 309), but no production was reported. Any production was probably small.

1906. In March, Shultz purchased interest in the Flora Bell Lode from numerous individuals including Ridenour's heirs (bk. 139, p. 1; bk. 154, p. 308). Flora Bell Mining Company reopened the mine (Buckel, P.J., Inspector report—Flora Bell Mining Company, September 27, 1908, v. 10, p. 12, CBM). Shultz may have been an owner of Flora Bell Mining Company.

1907. Flora Bell Mining Company (W.H. Jenkins, president) shipped silver ore. The mine comprised a 100-foot inclined shaft and 200 feet of drifts. In September, the company located the Flora Bell Tunnel and Tunnel Site claim and started work on a crosscut adit. The adit portal was near and on the east side of the Colorado & Southern Railroad, north of Hancock. Corner No. 3 of the Eclipse Lode (Mineral Survey No. 4259) was N. 22° W., 362.35 feet from the portal. The tunnel site claim was 3,000 feet long and trended N. 75° E. (See Naraome, 1908, p. 247; bk. 106, p. 395.) Presumably, the Flora Bell Tunnel is adit #100 of the "Hancock Road" inventory area.

1908. Flora Bell Mining Company (Jenkins, president/general manager, R.D. Brooks-vice president, S.E. Taber-secretary/treasurer) owned the Flora Bell claim group. The company incorporated in Colorado with 200,000 shares of stock worth $1 each. The claim group included the Flora Bell, Keokuk, and "tunnel site" (probably adit #100) and consisted of ten patented acres (probably the Flora Bell Lode) and 210 acres of unpatented mining claims. Although no production was reported, lead and silver sulfide minerals occurred in a 5-foot-wide quartz vein. The vein was exposed to a depth of 100 feet and over a length of 150 feet. Ore contained gold, silver, lead, and zinc. Developments included a 100-foot-deep, two-compartment shaft with a 150-foot-long level 80 feet below the collar, and a 600-foot-long crosscut tunnel (adit #100). The company expected the crosscut to intersect the Flora Bell vein in about 200 feet, then planned to drive a raise connecting with the shaft. Water was flowing from the adit at a rate of 20 gpm. Seven workers and a supervisor worked in the crosscut. (See P.J. Buckel, Inspector report-Flora Bell Mining Company, September 27, 1908, v. 10, p. 12, CBM.) Henderson (1909, p. 373) reported that Flora Bell Mining Company extended the crosscut adit about 850 feet.

1910. Small quantities of gold-silver-lead ore were shipped from the Flora Bell Mine (Henderson, 1911b, p. 402).

1911–1912. Development included 1,500 feet of tunnel, 255 feet of upraise, 350 feet of drift on the vein, and a 100-foot-deep inclined shaft. Ore was valued at $35/ton. Four workers and a superintendent worked the mine for 6 months, but mining stopped in March 1912. (See Mine Managers reports for 1911and 1912—Flora Bell Mining Company, p. 13, 51, CBM.) Large-scale prospecting and development work was done in 1911 and early 1912, and the company expected to ship ore by the end of 1912. (See CBM, 1913, p. 35–36.) Henderson (1912, p. 534; 1913, p. 669) reported that gold-silver-lead ore was shipped from the mine both years.

1913. A little work was done early in the year, but the mine closed by August. Flora Bell Mining Company owned 50% of the Flora Bell Lode and 20 acres of unpatented claims (probably two claims). T. Shodl and E. Drach owned 50% of the Flora Bell and leased their interest to the company. Development included 1,500 feet of crosscuts, 500 feet of drifts, and 425 feet of shafts. Ore had an average value of $30/ton. (See Mine Managers report for 1913—Flora Bell Mining Company, p. 61, CBM.)

1914. Adit #100 was 1,450 feet long and was the main access to the mine by June. A few small, mineralized "streaks" were exposed 75 feet from the end of the crosscut. (See J.R. Curley, Inspector report—Flora Bell Mining Company, v. 16, p. 24, CBM.) Development included 1,690 feet of crosscuts, 100 feet of shafts, 465 feet of drifts, and 265 and 60 feet of upraises. Flora Bell Mining Company employed three workers, but lack of capital restricted operations. (See Mine Managers report for 1914—Flora Bell Mining Company, p. 56, CBM.) A mineralized vein was exposed, but no ore was shipped (CBM, 1914, p. 32).

1915. In July, Flora Bell Mining Company acquired a $50,000 bond from Continental Trust Company for the Flora Bell Tunnel Site claim (bk. 107, p. 235). The mine had minor production (Henderson, 1917, p. 440).

1916. Flora Bell Mining Company owned 75% of one patented claim (probably the Flora Bell) and two unpatented claims (probably including adit #100). Drach owned 25% of the patented claim and leased it to Flora Bell Mining Company. Taber managed the mine and three workers. Developments included a 1,300-foot-long adit with a raise about 1,200 feet from the portal. The raise connected with a shaft sunk on the vein at the top of the hill. "Almost no work" was done during the year. Some ore was stoped on the 140-foot level, located about 265 feet above the tunnel. Although no shipments were made, ore averaged 20 oz/ton gold, 4 oz/ton silver, 1% copper, and 7% zinc. (See A.E. Moynahan, Mine Inspector report, August 19, 1916; Operators Annual Report for 1916—Flora Bell Mining Co., January 1, 1917, CBM.) The mine only operated during the summer months (CBM, 1916, p. 63).

1917. The Flora Bell produced small quantities of ore (Henderson, 1920, p. 814).

1918. Flora Bell Mining Company operated with a small workforce and shipped some ore (CBM, 1919, p. 68; Henderson, 1921, p. 835).

1919. Flora Bell Mining Company (D.B. Davis, president; Taber, manager) operated the mine for 255 days with four employees. Crude ore averaged 0.275 oz/ton gold, 76.3 oz/ton silver, 9.25% lead, 15.25% zinc, 1.6% manganese, 24.8% iron, and 30.4% sulfur. Although no crude ore was sold, 28,654 lbs of concentrate were sold. (See Operators Annual Report for 1919—Flora Bell Mining Co., March 8, 1920, CBM.) Paramount Reduction Company built a 75-ton mill designed to concentrate ore stockpiled at the Flora Bell Mine. Following a 2.5 month trial period with unacceptable results, the mill was closed. An aerial tram and a 400-foot-long crosscut were completed during the year. (See Henderson, 1922a, p. 764.)

1920. Flora Bell Mining Company operated the mine for 90 days with three employees (Operators Annual Report for 1920—Flora Bell Mining Co., April 8, 1921, CBM). No ore was shipped during the year (CBM, 1921, p. 28).

1939. A small quantity of ore was shipped to the smelter (Henderson and Martin, 1940, p. 264).

1943. Chaffee County acquired the Flora Bell Lode for unpaid 1937 taxes (bk. 237, p. 169).

1950. The Flora Bell adit was caved by 1950 (Dings and Robinson, 1957, p. 96, 102).

1958. Chaffee County sold the Flora Bell Lode to John Amrine, Charles Huston, and Wayne Glover (bk. 286, p. 117).

1968. Glover acquired Amrine's interest in the Flora Bell (bk. 263, p. 898). Bullock Engineering opened the Flora Bell Mine and adjacent Allie Bell Mine (owned by Roy Smith) for exploration purposes. A front-end loader was used to clean out the portals. Twelve sets of steel and liner plate were installed beginning at the portal of the Flora Bell adit, which was caved 175 feet from the entrance. In the past, a raise in the Flora Bell Tunnel reportedly connected to the Allie Bell Mine. Bullock Engineering did not reach the raise. (See John Doyle, Information Report—Allie Bell Mine, November 1, 1968, CBM.)

1969. Bullock Engineering operated the Flora Bell Mine, but work was limited to surveying. The Flora Bell Tunnel remained caved after 175 feet. (See John Doyle, Information Report—Flora Bell Mine, October 10, 1969, CBM.)

1974. Glover acquired Huston's interest in the Flora Bell Lode (bk. 416, p. 928). Stephen and Sherlyn Glover owned the Flora Bell Lode as of July 2000.

Drummer Lode

1880. J. Woodbury, C. Brown, W. Miller, F. Shodl, and J. Drach located the Drummer Lode in October. W. Rigney and J. Evans acquired Brown's interest later in October. (See bk. 10, p. 541; bk. 3, p. 12.)

1881. In April, Rigney acquired Evans' interest in the Drummer Lode, then sold it to I. Nurse in May (bk. 3, p. 419; 459; bk. 14, p. 296; bk. 21, p. 322).

1884. Rigney and Nurse sold the claim to Woodbury (bk. 36, p. 55; bk. 40, p. 306).

1886. Woodbury sold the Drummer to Behrens (bk. 36, p. 473).

1902. In December, Mineral Survey No. 16345 was completed on the Drummer Lode, owned by Shodl and others. A 19-foot-long open cut with a 26-foot-long drift, a 37-foot-long adit, and a 30-foot-long adit were surveyed on the claim. (See Mineral Survey No. 16345, BLM files.) The portal of adit #100 probably lies about 100 feet north of the Drummer Lode, but the adit did not exist at the time of the survey.

1904. Shodl, Behrens, Woodbury, and Drach received a patent for the Drummer (bk. 121, p. 24).

1906. In February, Drach acquired Shodl's interest in the claim (bk. 139, p. 1; bk. 154, p. 308).

1932. B. Drach sold interest in the Drummer Lode to Mary Heald. She still owned part of the claim as of July 2000 (bk. 210, p. 491; bk. 391, p. 931).

1934. Chaffee County sold interest in the Drummer to Taber for 1912 taxes (bk. 188, p. 314).

1940. Taber relinquished his interest in the claim back to Chaffee County (bk. 228, p. 162).

1947. The county sold interest in the claim to C. Hill (bk. 254, p. 263). It is not certain, but Hill's heirs may still own interest in the Drummer Lode.

Iron Reef Lode

1880. O. Fadden and J. Chapman located the Iron Reef Lode (bk. 13, p. 69; Mineral Survey No. 4259, BLM files)

1881. The Iron Reef Lode was actively developed (Burchard, 1882, p. 366). In October, the location was amended (bk. 22, p. 148).

1882. Chapman sold interest in the Iron Reef to W. McGuire in January (bk. 23, p. 49). McGuire sold his interest in the claim to Baker, Ridenour, and Emerson in August (bk. 25, p. 280). A 4-foot-wide vein with a 16-inch-wide pay zone was exposed in a 25-foot-deep shaft, and in September specimens from the mine were displayed at the Denver National Mining Exposition (*Rocky Mountain News*, May 8, p. 3; September 13, p. 1, 1882).

1886. In February, Mineral Survey No. 4260 was conducted on the Iron Reef Lode, owned by P.D. Ridenour and others. Two shafts (40 and 15 feet deep) and two open cuts (20 and 10 feet long) were surveyed on the claim. (See Mineral Survey No. 4260, BLM files.)

1888. Ridenour and Baker acquired J.R. Emerson's interest in the Iron Reef (bk. 58, p. 352).

1889. The Iron Reef Lode claim was patented (USFS records).

1940. Chaffee County acquired the Iron Reef Lode for non-payment of 1924–1925 taxes (bk. 237, p. 119).

1947. The county sold the claim to Carlyle Hill Jr. (bk. 254, p. 263).

1996. Hill's heirs sold the claim to Steven Scott (bk. 287, p. 299). Scott was the owner in July 2000 (bk. 287, p. 299).

GEOLOGY

The Flora Bell Mine lies near the contact of Mount Princeton quartz monzonite with a dike(?) of Mount Aetna quartz monzonite (Figure 6). Pyrite, sphalerite, galena, chalcopyrite, quartz, and silicified Mount Princeton quartz monzonite were on the dump. (See Dings and Robinson, 1957, p. 102.) The Flora Bell vein is not well described in the literature and is not shown on the geologic map. The alignment of claims and mine workings in this area suggests that the vein trends east-northeast. In addition to the minerals identified on the waste-rock pile, the vein contained argentite and free gold.

SITE DESCRIPTION

This site is between the ghost towns of Hancock and Romley and straddles the old railroad grade that is now a 4WD road (Figures 2, 17). Adit #100 and associated waste-rock piles #200 and #201 are the features of concern. In October 1999, the adit had a culvert entrance with a locked grate (Figure 18). Effluent flowed from the adit and was joined by a small volume of red water emerging at a seep on the south side of the trench leading to the portal. The effluent stream flowed across the eastern edge of the bench of dump #200 for about 40 feet, then merged with an intermittent stream channel and drained south of the toes of both waste-rock piles into the forest below. The effluent seeped into the ground within the forested area, never reaching Chalk Creek at the surface.

Flow in the intermittent stream channel fluctuates seasonally. In July 1995 this stream was flowing at about 40 gpm. Two weeks later in early August, the channel was only damp upstream of the mine. (See Benson and others, 1997, p. 18.) In October 1999 the intermittent stream channel upstream of the confluence with effluent was completely dry.

Waste-rock pile #200 was adjacent to the portal and east of the railroad grade. Part of the face was oversteepened and was supported by decaying timbers that were probably part of a load-out structure (Figure 19).

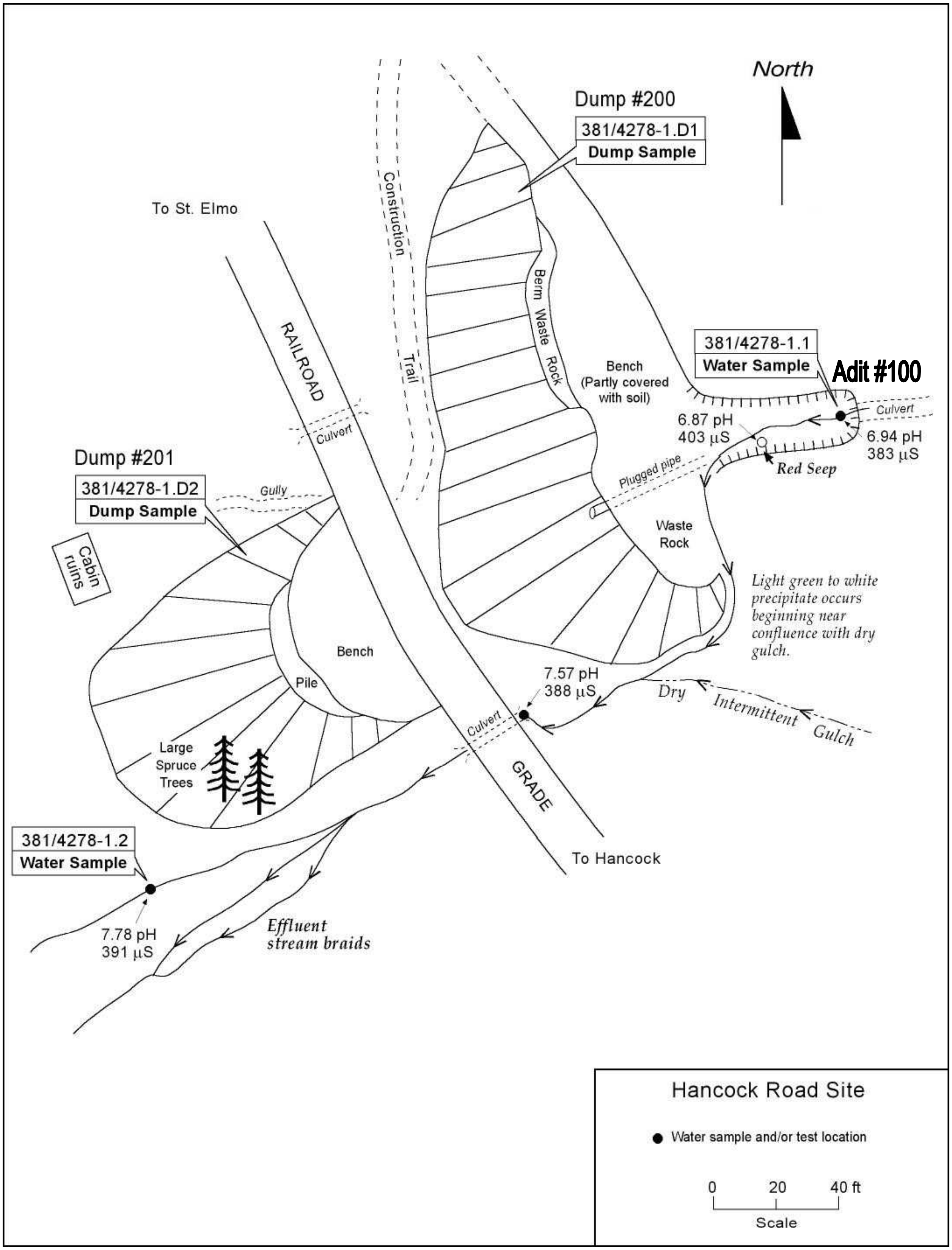


Figure 17. Map of features #100/200/201 of the "Hancock Road" inventory area.

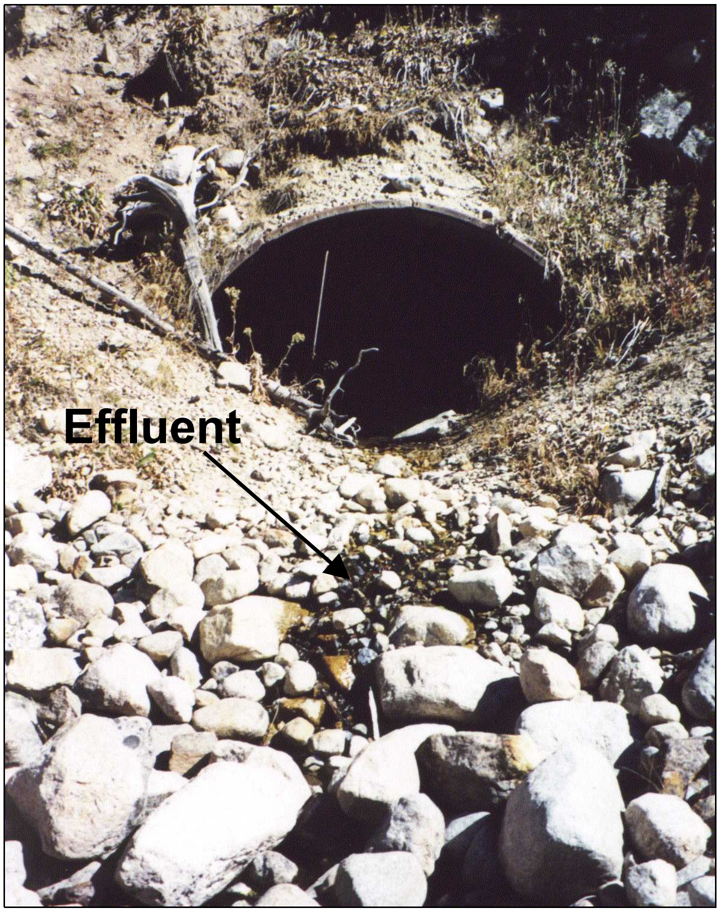


Figure 18. Culvert at the portal of adit #100.

Figure 19. Dump #200 at the "Hancock Road" inventory area.

Waste-rock pile #201 was on the western side of the railroad grade and was probably a continuation of dump #200. Perhaps a shed or roof covered the railroad tracks, allowing waste rock from adit #100 to accumulate on the opposite side of the tracks, because the top of dump #201 is higher that the railroad grade and lower than the bench of dump #200 (Figures 20, 21). A bench between the crest of dump #201 and the railroad grade, and at the elevation of the grade, appears relatively young (within 10–15 years?). The removed material may have been used for road fill in this general area. Cabin ruins are in the forest to the northwest and near the base of dump #201.

Figure 20. Dump #201 at the "Hancock Road" inventory area.

WASTE AND HAZARD CHARACTERISTICS

In July 1995 effluent from adit #100 flowed at an estimated rate of 20 gpm and had pH of 5.4 and conductivity of 300 µS/cm. The receiving intermittent stream had pH of 4.9 and 6.2 and conductivities of <50 and 100 µS/cm upstream and downstream of its confluence with the effluent, respectively. In August 1995 the effluent was sampled and exceeded State standards in manganese concentration (450 µg/L). Zinc and sulfate were elevated but within standards. (See Benson and others, 1997, p. 18–19; USFS-AMLIP inventory form 381/4278-1.)

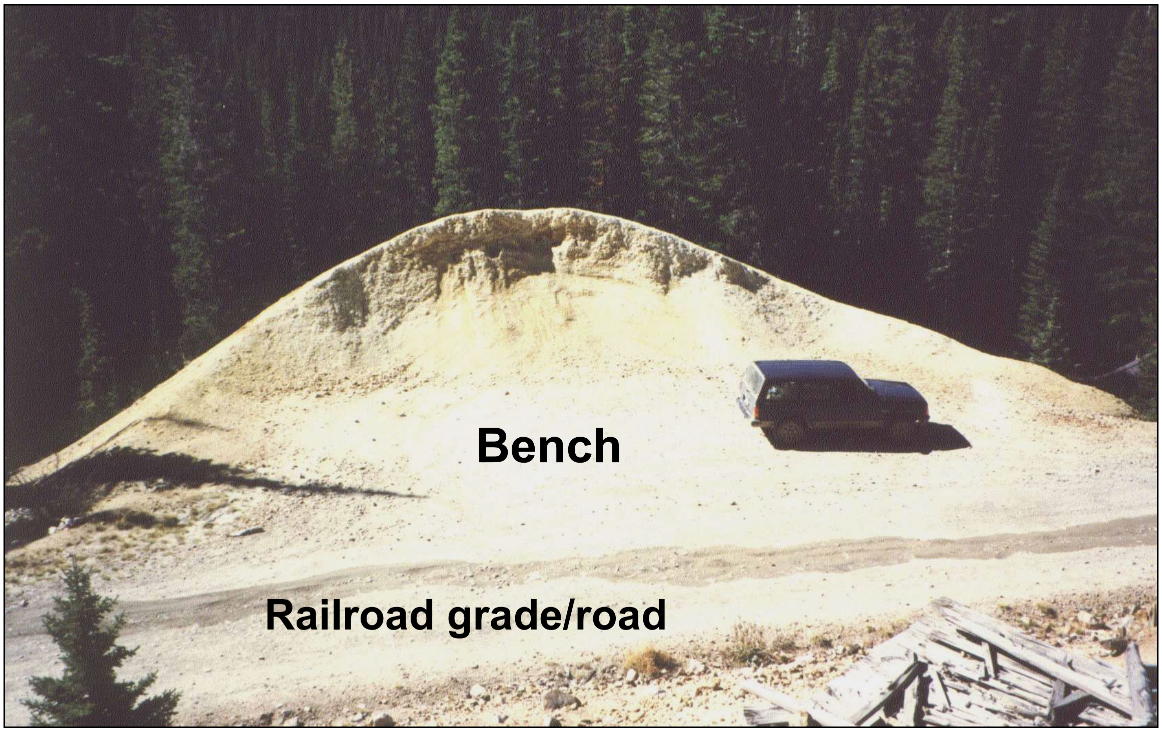


Figure 21. Top of dump #201 at the "Hancock Road" inventory area.

In 1999 the effluent was sampled near the portal of adit #100 and below the toe of dump #201. At the portal, flow was measured at 58.3 gpm, and the effluent had pH of 6.94 and conductivity of 383 µS/cm. This water was clear, showed no obvious indications of toxicity, and was chemically similar to the sample collected in 1995, exceeding standards only in manganese (sample 381/4278-1.1, Table 4).

About 20 feet downstream of the portal sample site, the effluent was joined by a minor volume of red water with 6.87 pH and conductivity of 403 µS/cm emerging from a seep described previously. Beginning near the confluence of the effluent with the dry intermittent stream, light-green to white precipitate occurred in the effluent channel and continued downstream to a culvert that crossed beneath the railroad grade (Figure 22). On the upstream side of this culvert, effluent had pH of 7.57 and conductivity of 388 µS/cm (Figure 17).

Water sample 381/4278-1.2 was collected from the closest braid of the effluent channel below the toe of dump #201. Flow was measured at 10 gpm, and the water had 7.78 pH and 391 µS/cm conductivity. Manganese still exceeded standards, but the concentration was reduced about 50% compared to the sample at the portal. Zinc was also reduced, but sulfate concentration remained about constant (Table 4).

Table 4. Analytical data for water samples collected from the "Hancock Road" inventory area.

Sample	381/4278-1.1, HANCOCK ROAD PORTAL (10/13/99)				381/4278-1.2, HANCOCK ROAD BELOW (10/13/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	58.3				10.0			
pH (standard units)	6.94				6.78			
Conductivity (µS/cm)	383.0				391.0			
Alkalinity (mg/L $CaCO_3$)	55.00				50.00			
Hardness (mg/L $CaCO_3$)	157	None	N/A		158	None	N/A	
Aluminum (trec) (µg/L)	< 50	None	N/A	N/A	< 50	None	N/A	N/A
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	48	1,000.0	Below standard	15.3	20	1,000.0	Below standard	1.1
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	67	2,000.0	Below standard	21.3	48	2,000.0	Below standard	2.6
Aluminum (µg/L)	< 50	87.0	Below standard	N/A	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	< 0.3	1.6	Below standard	N/A	< 0.3	1.6	Below standard	N/A
Calcium (mg/L $CaCO_3$)	140	None	N/A	44,491.1	140	None	N/A	7,631.4
Chloride (mg/L)	< 20.0	250.0	Below standard	N/A	< 20.0	250.0	Below standard	N/A
Chromium (µg/L)	< 10	11.0	Below standard	N/A	< 10	11.0	Below standard	N/A
Copper (µg/L)	< 4.0	17.4	Below standard	N/A	< 4.0	17.4	Below standard	N/A
Fluoride (mg/L)	1.80	2.0	Below standard	572.0	1.90	2.0	Below standard	103.6
Iron (µg/L)	41	300.0	Below standard	13.0	< 10	300.0	Below standard	N/A
Lead (µg/L)	< 1.0	7.4	Below standard	N/A	< 1.0	7.4	Below standard	N/A
Magnesium (mg/L)	4.20	None	N/A	1,334.7	4.30	None	N/A	234.4
Manganese (µg/L)	350	50.0	7.0	111.2	170	50.0	3.4	9.3
Nickel (µg/L)	< 20	134.8	Below standard	N/A	< 20	135.1	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A	1.1	None	N/A	60.0
Silicon (mg/L)	8.6	None	N/A	2,733.0	8.7	None	N/A	474.2
Silver (µg/L)	< 0.2	0.2	Not detected	N/A	< 0.2	0.2	Not detected	N/A
Sodium (mg/L)	4.80	None	N/A	1,525.4	5.50	None	N/A	299.8
Sulfate (mg/L)	100	250.0	Below standard	31,779.3	100	250.0	Below standard	5,451.0
Zinc (µg/L)	64	155.5	Below standard	20.3	48	155.9	Below standard	2.6

Figure 22. Effluent channel upstream of the railroad grade at the "Hancock Road"site.

Waste-rock pile #200 adjacent to the portal was estimated to contain 15,000 cubic yards by Benson and others (1997, p. 18). During this investigation, dump size was estimated at about 2,500 cubic yards. Part of the bench and face of the waste-rock pile was covered with unmineralized soil and colluvium excavated during installation of the culvert at the portal of adit #100. Fines and sand-size material composed about 60% of the pile; and the remainder comprised gravel-size and larger fragments. Gray, yellow, and red-brown clay was common. Rock fragments consisted of deeply weathered to fresh monzonite, some with disseminated pyrite. Fragments of quartz vein were rare. Sphalerite was identified during the inventory (Benson and others, 1997, p. 18) but was not seen in 1999. A composite dump sample was collected (sample 381/4278-1.D1, Table 2). Efforts were made to exclude the soil that covered parts of the dump. Results show moderate concentrations of lead, zinc, and manganese. Net acid-base potential was -3.4 tons $CaCO_3$/1,000 tons, and paste pH was 5.09.

Waste-rock pile #201 adjacent and on the west side of the railroad grade/access road was estimated to contain 11,000 cubic yards by Benson and others (1997, p. 18). During this investigation, dump size was estimated at about 2,000 cubic yards. Numerous rills and a large gully cut the face of the dump, which was also affected by sheetwash erosion. Gray, yellow, and red-brown clay composed most of the pile. Rock fragments consisted of monzonite. Visible pyrite was rare. Although sphalerite was identified during the inventory (Benson and others, 1997, p. 18), none was seen in 1999. A composite dump sample contained moderately high concentrations of lead, zinc, and manganese. Net acid-base potential was -4.2 tons $CaCO_3$/1,000 tons, and paste pH was 5.36 (sample 381/4278-1.D2, Table 2).

WEST POMEROY GULCH

The “West Pomeroy Gulch” inventory area (382/ 4278-1) is about 3.5 miles south of St. Elmo and 1.5 miles from the mouth of Pomeroy Gulch and the abandoned townsite of Romley (Figure 2). CGS assigned EDRs of 3 to open adit #100 and associated waste-rock pile #200 and to waste-rock piles #201 and 202 associated with caved adits #101 and 102. All these mine features are on NFS land on the west side of Pomeroy Gulch and were probably dug on or near the unpatented Robert Morris Lode claim.

MINING HISTORY

Information regarding this part of Pomeroy Gulch is sparse. Most of the mining activity was probably prior to 1900, and no production was recorded. In 1912 this area came under control of the same group that owned the Iron Chest Mine, but no mining activity is recorded after 1912.

Robert Morris Lode

1880. B. Davis located the Robert Morris Lode (bk. 10, p. 555)

1883. In July, Davis sold the claim to C. Brown, and Brown sold interest to J. Walters in September (bk. 34, p. 286).

1885. In July, Charley and Henry Brown were driving a crosscut to intersect veins on the Nellie B., Jennie Lind, and Robert Morris Lodes. The crosscut was 60 feet long, and a 3-foot-wide vein was intersected on the Nellie B. (See *Rocky Mountain News*, July 29, 1885, p. 6.) C. Colgrove and F. Colgrove had located the Jenne Lind Lode in July 1880, and M. Gill had located the Nellie B. Lode in July 1883 (bk. 13, p. 421; bk. 26, p. 86). Beginning in 1886, historical information on the Nellie B. Lode coincides with the Robert Morris Lode (bk. 8, p. 94).

1886. Walters sold his interest in the Robert Morris Lode to Moore and Nye, who subsequently sold it to W. Curtis (bk. 5, p. 307).

1887. Brown sold his interest in the claim to several individuals. In July, Pomeroy Mountain Consolidated Mining Company purchased the claim from Curtis and others. (See bk. 5, p. 307; bk. 53, p. 298.)

1888. A mineral survey was conducted on the Empire Lode claim owned by William B. Bishop and others. The survey showed the Robert Morris Lode along part of the eastern side of the Empire Lode (Figure 23). (See Mineral Survey No. 3315, BLM files.)

1891. Pomeroy Mountain Consolidated Mining Company sold the Robert Morris Lode to Marietta Mining Company (bk. 76, p. 18).

1899. Red Raven and Marietta Company (Dr. C.H. Smith, president; A.E. Ackerson, superintendent; J.F. Gooding, superintendent in charge of work) owned the Red Raven, Empire, and six other claims in a group. The company had a 600-foot-long tunnel on the Robert Morris claim. (See Mine Managers report for 1899—Red Raven, December 29, 1899, p. 127, CBM.)

1902. Independence Consolidated Mining Company recorded $3,000 of annual assessment work on the Robert Morris Lode (bk. 35, p. 530).

1908. St. Elmo Consolidated Mines Company performed the annual assessment work on the Robert Morris Lode (bk. 91, p. 303).

1909. The Robert Morris Lode and several other claims, including the Iron Chest Mine, were subleased to M. Hannan from St. Elmo Consolidated Mines.

1909–1912. Assessment work on the Robert Morris, Red Raven, and Little Mamie claims was done by St. Elmo Consolidated Mines Company and H. Stanley (courthouse records). After 1912 the ownership of this claim group is the same as for the Iron Chest Mine, described later in this report. No mining or production activity is specifically tied to the Robert Morris Lode after 1912.

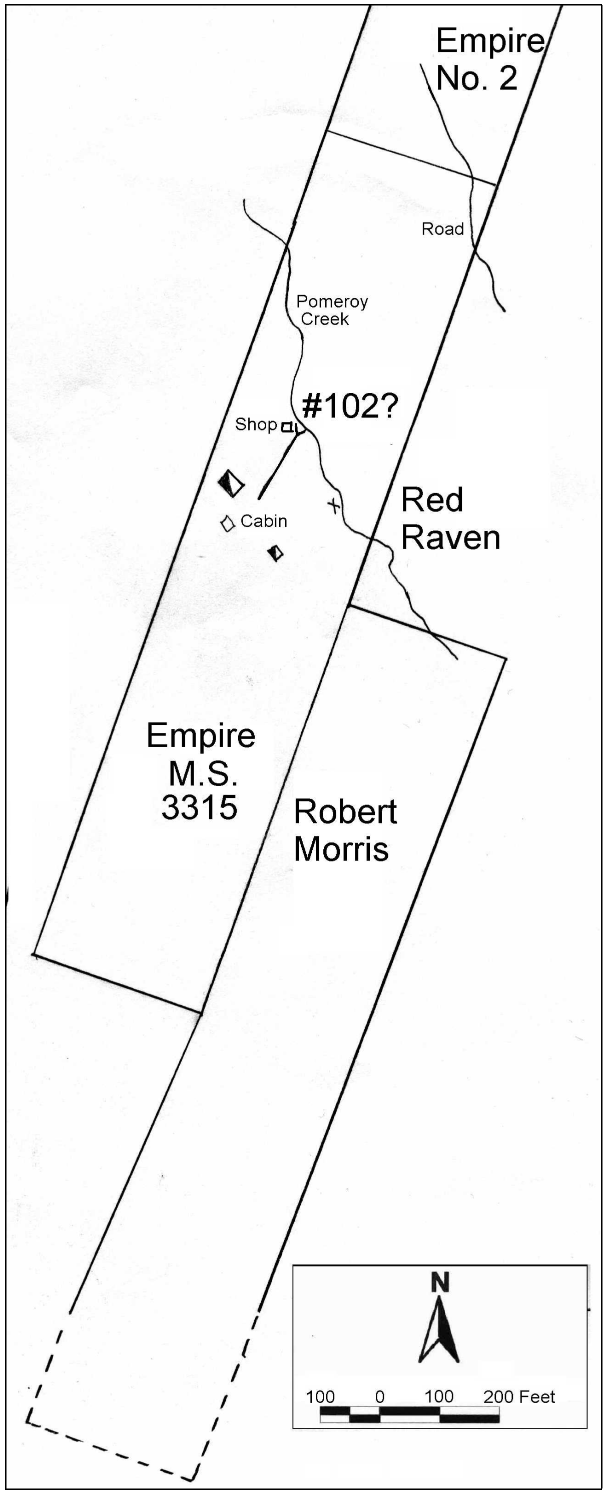


Figure 23. Compilation of mineral surveys in the middle portion of Pomeroy Gulch. (Relative positions of the claims are not exact and sometimes are contradictory from one survey to another; scale is approx-imate; labeled adit #102 is in the "Middle Pomeroy" inventory area.)

Jeanne Marie Claims

Chalk Creek Mining Company located the Jeanne Marie unpatented claim group in September 1981. Inglesrud Corporation relocated the Jeanne Marie unpatented claim group in July 1983. (See bk. 496, p. 287–309; bk. 458, p. 609–630; BLM records.) Although no maps were available, the descriptions of the claims suggest that some of the Jeanne Marie group are close to this inventory area. No mining activity or production is associated with this claim group.

GEOLOGY

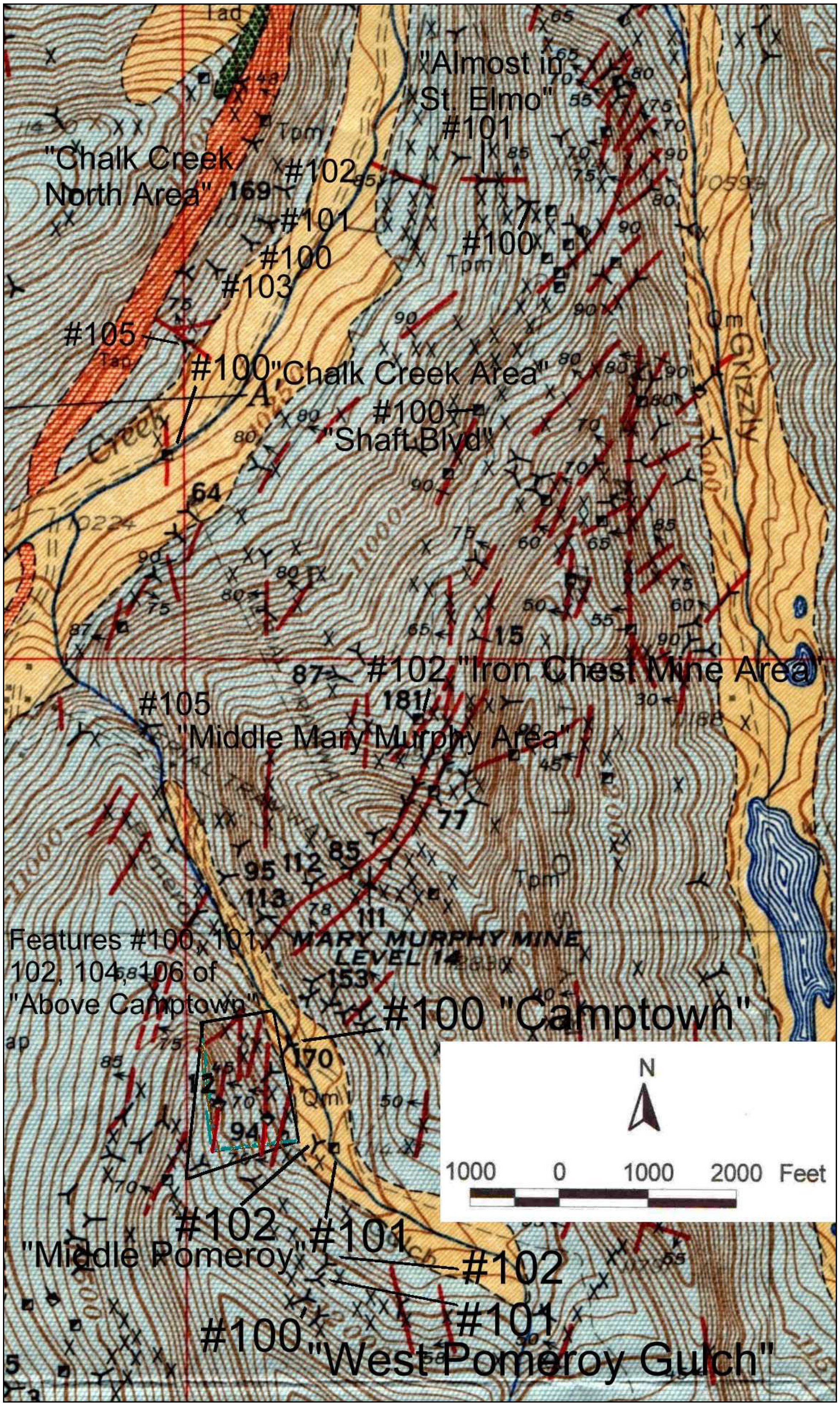
The adits were driven in Mount Princeton quartz monzonite (Figure 24). Fragments of mineralized quartz vein are on the dumps. Pyrite, galena, and sphalerite are common; traces of chalcopyrite and oxidized copper minerals also occur. Tests using hydrochloric acid indicate that microcrystalline calcite is along fractures in the waste rock. Although no vein is shown by Dings and Robinson (1957, plate 1), the northeast alignment of these mines is parallel to many of the mapped veins in the district, suggesting that these workings were driven on the same northeast-trending vein.

SITE DESCRIPTION

This is the most upstream site in the Pomeroy Gulch watershed that is described in this report. Caved adit #100 and associated dump #200, and waste-rock piles #201 and 202 are the features of concern in this inventory area (Figure 2). In October 1999 the portal of adit #100 was mostly caved (Figure 25). No water was discharging, but standing water was inside the adit, dammed behind debris at the portal.

Associated waste-rock pile #200 contained about 80 cubic yards of dry and weakly mineralized monzonite (Figure 26). Because of its small size, low volume of mineralized rock, and its high and dry position on the side of the mountain slope, no samples were collected from this dump. No remediation efforts are recommended for this dump.

Features #201 and #202 are the dumps of caved adits that lie in a meadow below adit #100 (Figure 27). Dump #201 has two distinct lobes, and dump #202 has three lobes. Both of these piles are in a meadow described as a riparian area by Benson and others (1997, p. 23). During this investigation in October 1999, the meadow was dry, but it had the appearance of an intermittent wetland.



EXPLANATION

Qm—Quaternary glacial moraine

Tpm—Tertiary Mt. Princeton quartz monzonite

Tap—Tertiary Mt. Aetna quartz monzonite

Tad—Tertiary granite aplite

Red lines represent veins.

Smaller numbers refer to named mines.
12—Big Bonanza
15—Blackhawk
64—Golf Tunnel
77—Iron Chest
85—Lady Catherine
87—Mary Murphy Level 11 (Lady Murphy)
94—Little Bonanza
95—Little Jessie
111—Mary Murphy Level 4
112—Mary Murphy Level 7
113—Mary Murphy Level 14
153—Portland
169—St. Elmo Queen
170—Stanley
181—Tressa C.

Larger numbers with # refer to features described in this report.

Figure 24. Geologic map of Pomeroy Gulch and the St. Elmo area. [Modified from Dings and Robinson (1957 plate 1); scale is approximate.]

Figure 25. Nearly completely caved adit #100 in the "West Pomeroy Gulch" inventory area.

Figure 26. Dump #200 of the "West Pomeroy Gulch" inventory area.

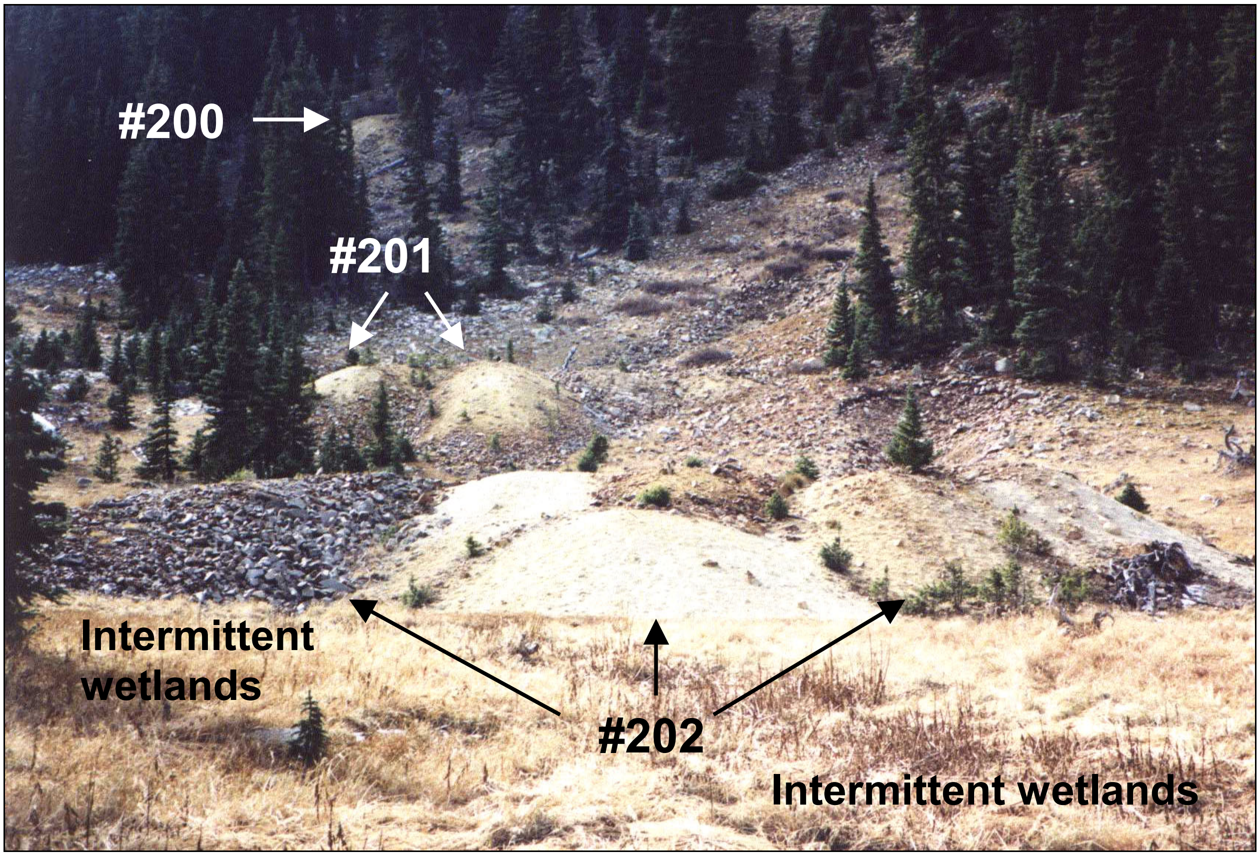


Figure 27. Dumps #200, 201, and 202 of the "West Pomeroy Gulch" inventory area.

WASTE AND HAZARD CHARACTERISTICS

Standing water in adit #100 had pH of 6.40, conductivity of 203 µS/cm, and did not exceed State standards in any of the analyzed parameters (sample MH-1, Table 5). The standing water had similar trace metal concentrations as water sampled in Pomeroy Gulch upstream of the influence of all the mines included in this investigation (sample MH-2, Figure 2).

Waste-rock pile #201 contained about 250 cubic yards (Benson and others, 1997, p. 23). Gravel-size and coarser fragments of monzonite composed the bulk of the pile. Some coarse quartz vein fragments up to an inch wide contained sulfides. Galena, sphalerite, and pyrite were identified. Most of the finer material was oxidized and weathered to yellow and gray clay and sand. Composite dump sample MHD-1 (Table 6) contained high zinc concentration and a small net acid-generating potential of -3.4 tons $CaCO_3$/1,000 tons. The sample had a slightly acidic paste pH of 6.10.

Waste-rock pile #202 was estimated to contain about 1,000 cubic yards in 1999 and 1,500 cubic yards by Benson and others (1997, p. 23). About one-third of the dump appeared to be barren, weakly iron-stained monzonite on the southeastern lobe (Figures 27, 28). Some of the monzonite fizzed with hydrochloric acid, indicating the presence of calcite. The remaining portion of the pile consisted mostly of highly oxidized clay and sand-size material, with lesser amounts of gravel and cobbles. Galena, sphalerite, pyrite, and traces of chalcopyrite, oxidized copper minerals, and calcite were identified. Composite dump sample MHD-2 (Table 6) excluded the southeastern lobe of apparently barren monzonite. Results suggest weakly mineralized waste rock containing moderate concentrations of lead and zinc. The sample had a small net acid-generating potential of -1.8 tons $CaCO_3$/1,000 tons and paste pH of 5.88.

Water was emerging along the entire toe of dump #202 during the inventory in August 1995. Three tests of the water showed pH ranging from 4.8 to 5.8 and conductivities of <50 to 100 µS/cm (Benson and others, 1997, p. 23). In October 1999 this area was dry and was not sampled.

Figure 28. Dump #202 in the "West Pomeroy Gulch" inventory area.

Table 5. Analytical data for water samples collected in the Pomeroy Gulch watershed.

Sample	MH-1, WEST POMEROY #100 (10/28/99)				MH-2, UPPER POMEROY (10/28/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	0.0				200.0			
pH (standard units)	6.40				6.51			
Conductivity (µS/cm)	203.0				98.0			
Alkalinity (mg/L CaCO3)	29.00				24.00			
Hardness (mg/L CaCO3)	73	None	N/A		36	None	N/A	
Aluminum (trec) (µg/L)	54	None	N/A	0.0	100	None	N/A	109.0
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	22	1,000.0	Below standard	0.0	15	1,000.0	Below standard	16.4
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	19	2,000.0	Below standard	0.0	17	2,000.0	Below standard	18.5
Aluminum (µg/L)	< 50	87.0	Below standard	N/A	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	< 0.3	0.9	Below standard	N/A	< 0.3	0.5	Below standard	N/A
Calcium (mg/L CaCO3)	61	None	N/A	0.0	33	None	N/A	35,976.6
Chloride (mg/L)	19.0	250.0	Below standard	0.0	< 10.0	250.0	Below standard	N/A
Chromium (µg/L)	< 10	11.0	Below standard	N/A	< 10	11.0	Below standard	N/A
Copper (µg/L)	< 4.0	9.1	Below standard	N/A	< 4.0	4.9	Below standard	N/A
Fluoride (mg/L)	1.50	2.0	Below standard	0.0	0.50	2.0	Below standard	545.1
Iron (µg/L)	< 10	300.0	Below standard	N/A	< 10	300.0	Below standard	N/A
Lead (µg/L)	< 1.0	2.5	Below standard	N/A	< 1.0	0.9	Not detected	N/A
Magnesium (mg/L)	3.00	None	N/A	0.0	0.64	None	N/A	697.7
Manganese (µg/L)	32	50.0	Below standard	0.0	< 4	50.0	Below standard	N/A
Nickel (µg/L)	< 20	75.5	Below standard	N/A	< 20	43.6	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A	< 1.0	None	N/A	N/A
Silicon (mg/L)	9.4	None	N/A	0.0	2.1	None	N/A	2,289.4
Silver (µg/L)	< 0.2	0.0	Not detected	N/A	< 0.2	0.0	Not detected	N/A
Sodium (mg/L)	3.30	None	N/A	0.0	1.00	None	N/A	1,090.2
Sulfate (mg/L)	51	250.0	Below standard	0.0	13	250.0	Below standard	14,172.6
Zinc (µg/L)	17	81.5	Below standard	0.0	16	44.2	Below standard	17.4

Table 5. Analytical data for water samples collected in the Pomeroy Gulch watershed—continued.

Sample	MH-3, ABOVE CAMPTOWN #101 (10/28/99)				MH-4, ABOVE CAMPTOWN #104 (10/28/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	0.0				0.0			
pH (standard units)	6.12				7.10			
Conductivity (µS/cm)	471.0				325.0			
Alkalinity (mg/L CaCO3)	33.00				55.00			
Hardness (mg/L CaCO3)	66	None	N/A		143	None	N/A	
Aluminum (trec) (µg/L)	< 50	None	N/A	N/A	< 50	None	N/A	N/A
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	130	1,000.0	Below standard	0.0	130	1,000.0	Below standard	0.0
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	250	2,000.0	Below standard	0.0	37	2,000.0	Below standard	0.0
Aluminum (µg/L)	< 50	87.0	Below standard	N/A	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	0.6	0.8	Below standard	0.0	< 0.3	1.5	Below standard	N/A
Calcium (mg/L CaCO3)	58	None	N/A	0.0	130	None	N/A	0.0
Chloride (mg/L)	< 10.0	250.0	Below standard	N/A	< 10.0	250.0	Below standard	N/A
Chromium (µg/L)	< 10	11.0	Below standard	N/A	< 10	11.0	Below standard	N/A
Copper (µg/L)	< 4.0	8.3	Below standard	N/A	< 4.0	16.0	Below standard	N/A
Fluoride (mg/L)	1.60	2.0	Below standard	0.0	0.27	2.0	Below standard	0.0
Iron (µg/L)	< 10	300.0	Below standard	N/A	< 10	300.0	Below standard	N/A
Lead (µg/L)	4.0	2.1	1.9	0.0	< 1.0	6.4	Below standard	N/A
Magnesium (mg/L)	1.90	None	N/A	0.0	3.10	None	N/A	0.0
Manganese (µg/L)	350	50.0	7.0	0.0	1,400	50.0	28.0	0.0
Nickel (µg/L)	< 20	69.5	Below standard	N/A	< 20	125.2	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A	< 1.0	None	N/A	N/A
Silicon (mg/L)	5.3	None	N/A	0.0	6.7	None	N/A	0.0
Silver (µg/L)	< 0.2	0.0	Not detected	N/A	< 0.2	0.1	Not detected	N/A
Sodium (mg/L)	2.40	None	N/A	0.0	2.70	None	N/A	0.0
Sulfate (mg/L)	22	250.0	Below standard	0.0	64	250.0	Below standard	0.0
Zinc (µg/L)	250	74.3	3.4	0.0	28	143.3	Below standard	0.0

Table 5. Analytical data for water samples collected in the Pomeroy Gulch watershed—continued.

Sample	MH-5, MIDDLE POMEROY (10/28/99)				MH-6, LOWER POMEROY (10/28/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	300.0				250.0			
pH (standard units)	6.37				6.43			
Conductivity (µS/cm)	118.0				132.0			
Alkalinity (mg/L CaCO3)	18.00				15.00			
Hardness (mg/L CaCO3)	45	None	N/A		61	None	N/A	
Aluminum (trec) (µg/L)	< 50	None	N/A	N/A	< 50	None	N/A	N/A
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	< 10	1,000.0	Below standard	N/A	< 10	1,000.0	Below standard	N/A
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	45	2,000.0	Below standard	73.6	320	2,000.0	Below standard	436.1
Aluminum (µg/L)	< 50	87.0	Below standard	N/A	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	< 0.3	0.6	Below standard	N/A	1.2	0.8	1.6	1.6
Calcium (mg/L CaCO3)	41	None	N/A	67,047.3	53	None	N/A	72,225.8
Chloride (mg/L)	< 20.0	250.0	Below standard	N/A	< 10.0	250.0	Below standard	N/A
Chromium (µg/L)	< 10	11.0	Below standard	N/A	< 10	11.0	Below standard	N/A
Copper (µg/L)	< 4.0	6.0	Below standard	N/A	< 4.0	7.7	Below standard	N/A
Fluoride (mg/L)	0.28	2.0	Below standard	457.9	0.34	2.0	Below standard	463.3
Iron (µg/L)	< 10	300.0	Below standard	N/A	< 10	300.0	Below standard	N/A
Lead (µg/L)	< 1.0	1.3	Below standard	N/A	< 1.0	1.9	Below standard	N/A
Magnesium (mg/L)	1.00	None	N/A	1,635.3	1.90	None	N/A	2,589.2
Manganese (µg/L)	< 4	50.0	Below standard	N/A	< 4	50.0	Below standard	N/A
Nickel (µg/L)	< 20	52.2	Below standard	N/A	< 20	65.5	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A	< 1.0	None	N/A	N/A
Silicon (mg/L)	2.7	None	N/A	4,415.3	3.2	None	N/A	4,360.8
Silver (µg/L)	< 0.2	0.0	Not detected	N/A	< 0.2	0.0	Not detected	N/A
Sodium (mg/L)	1.30	None	N/A	2,125.9	1.70	None	N/A	2,316.7
Sulfate (mg/L)	24	250.0	Below standard	39,247.2	37	250.0	Below standard	50,421.8
Zinc (µg/L)	44	54.0	Below standard	72.0	320	69.5	4.6	436.1

Table 5. Analytical data for water samples collected in the Pomeroy Gulch watershed—continued.

Sample	MH-7, MIDDLE POMEROY #201 (10/29/99)				MH-8, MIDDLE POMEROY #102 (10/29/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	2.0				1.3			
pH (standard units)	6.02				6.32			
Conductivity (µS/cm)	185.0				132.0			
Alkalinity (mg/L CaCO3)	17.00				24.00			
Hardness (mg/L CaCO3)	76	None	N/A		52	None	N/A	
Aluminum (trec) (µg/L)	75	None	N/A	0.8	65	None	N/A	0.4
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	190	1,000.0	Below standard	2.1	79	1,000.0	Below standard	0.5
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	24	2,000.0	Below standard	0.3	45	2,000.0	Below standard	0.3
Aluminum (µg/L)	51	87.0	Below standard	0.6	62	87.0	Below standard	0.4
Cadmium (µg/L)	< 0.3	0.9	Below standard	N/A	< 0.3	0.7	Below standard	N/A
Calcium (mg/L CaCO3)	69	None	N/A	752.2	47	None	N/A	320.2
Chloride (mg/L)	< 10.0	250.0	Below standard	N/A	13.0	250.0	Below standard	88.6
Chromium (µg/L)	< 10	11.0	Below standard	N/A	< 10	11.0	Below standard	N/A
Copper (µg/L)	< 4.0	9.3	Below standard	N/A	< 4.0	6.8	Below standard	N/A
Fluoride (mg/L)	0.54	2.0	Below standard	5.9	0.40	2.0	Below standard	2.7
Iron (µg/L)	130	300.0	Below standard	1.4	< 10	300.0	Below standard	N/A
Lead (µg/L)	< 1.0	2.6	Below standard	N/A	< 1.0	1.6	Below standard	N/A
Magnesium (mg/L)	1.70	None	N/A	18.5	1.30	None	N/A	8.9
Manganese (µg/L)	14	50.0	Below standard	0.2	83	50.0	1.7	0.6
Nickel (µg/L)	< 20	77.6	Below standard	N/A	< 20	58.4	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A	< 1.0	None	N/A	N/A
Silicon (mg/L)	2.3	None	N/A	25.1	5.1	None	N/A	34.8
Silver (µg/L)	< 0.2	0.0	Not detected	N/A	< 0.2	0.0	Not detected	N/A
Sodium (mg/L)	1.50	None	N/A	16.4	2.40	None	N/A	16.4
Sulfate (mg/L)	53	250.0	Below standard	577.8	27	250.0	Below standard	184.0
Zinc (µg/L)	25	84.0	Below standard	0.3	44	61.2	Below standard	0.3

Table 5. Analytical data for water samples collected in the Pomeroy Gulch watershed—continued.

Sample	MH-9, MIDDLE POMEROY #202 (10/29/99)				MH-10, MIDDLE MARY MURPHY #105 (10/29/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	2.0				10.0			
pH (standard units)	6.04				7.11			
Conductivity (µS/cm)	108.0				143.0			
Alkalinity (mg/L CaCO3)	13.00				47.00			
Hardness (mg/L CaCO3)	40	None	N/A		63	None	N/A	
Aluminum (trec) (µg/L)	68	None	N/A	0.7	< 50	None	N/A	N/A
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	150	1,000.0	Below standard	1.6	< 10	1,000.0	Below standard	N/A
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	70	2,000.0	Below standard	0.8	200	2,000.0	Below standard	10.9
Aluminum (µg/L)	72	87.0	Below standard	0.8	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	< 0.3	0.5	Below standard	N/A	1.2	0.8	1.5	0.1
Calcium (mg/L CaCO3)	35	None	N/A	381.6	58	None	N/A	3,161.6
Chloride (mg/L)	< 10.0	250.0	Below standard	N/A	< 10.0	250.0	Below standard	N/A
Chromium (µg/L)	< 10	11.0	Below standard	N/A	< 10	11.0	Below standard	N/A
Copper (µg/L)	< 4.0	5.3	Below standard	N/A	< 4.0	8.0	Below standard	N/A
Fluoride (mg/L)	0.42	2.0	Below standard	4.6	0.42	2.0	Below standard	22.9
Iron (µg/L)	72	300.0	Below standard	0.8	< 10	300.0	Below standard	N/A
Lead (µg/L)	< 1.0	1.0	Below standard	N/A	< 1.0	2.0	Below standard	N/A
Magnesium (mg/L)	1.10	None	N/A	12.0	1.20	None	N/A	65.4
Manganese (µg/L)	29	50.0	Below standard	0.3	< 4	50.0	Below standard	N/A
Nickel (µg/L)	< 20	47.2	Below standard	N/A	< 20	67.2	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A	< 1.0	None	N/A	N/A
Silicon (mg/L)	4.6	None	N/A	50.1	4.6	None	N/A	250.7
Silver (µg/L)	< 0.2	0.0	Not detected	N/A	< 0.2	0.0	Not detected	N/A
Sodium (mg/L)	2.10	None	N/A	22.9	2.00	None	N/A	109.0
Sulfate (mg/L)	25	250.0	Below standard	272.6	17	250.0	Below standard	926.7
Zinc (µg/L)	70	48.3	1.5	0.8	200	71.6	2.8	10.9

Table 5. Analytical data for water samples collected in the Pomeroy Gulch watershed—continued.

Sample	MH-11, POMEROY BELOW #205 (10/29/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	250.0			
pH (standard units)	7.07			
Conductivity (µS/cm)	151.0			
Alkalinity (mg/L CaCO3)	19.00			
Hardness (mg/L CaCO3)	63	None	N/A	
Aluminum (trec) (µg/L)	< 50	None	N/A	N/A
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	36	1,000.0	Below standard	49.1
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	320	2,000.0	Below standard	436.1
Aluminum (µg/L)	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	1.2	0.8	1.5	1.6
Calcium (mg/L CaCO3)	55	None	N/A	74,951.3
Chloride (mg/L)	< 10.0	250.0	Below standard	N/A
Chromium (µg/L)	< 10	11.0	Below standard	N/A
Copper (µg/L)	< 4.0	7.9	Below standard	N/A
Fluoride (mg/L)	0.34	2.0	Below standard	463.3
Iron (µg/L)	< 10	300.0	Below standard	N/A
Lead (µg/L)	< 1.0	2.0	Below standard	N/A
Magnesium (mg/L)	1.90	None	N/A	2,589.2
Manganese (µg/L)	< 4	50.0	Below standard	N/A
Nickel (µg/L)	< 20	67.1	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A
Silicon (mg/L)	3.3	None	N/A	4,497.1
Silver (µg/L)	< 0.2	0.0	Not detected	N/A
Sodium (mg/L)	1.70	None	N/A	2,316.7
Sulfate (mg/L)	40	250.0	Below standard	54,510.0
Zinc (µg/L)	320	71.5	4.5	436.1

Table 6. Analytical data for waste-rock samples from the Pomeroy Gulch watershed.

Parameter	West Pomeroy 382/4278-1.201 (MHD-1)	West Pomeroy 382/4278-1.202 (MHD-2)	Above Camptown 381/4279-1.201 (MWR-3)	Above Camptown 381/4279-1.204 (MWR-4)	Above Camptown 381/4279-1.202 (MWR-5)	Middle Pomeroy 382/4279-1.201 (MWR-6)	Middle Pomeroy 382/4279-1.202 (MWR-7)	Camptown 381/4280-1.200 (MWR-8)	Middle Mary Murphy 381/4280-2.205 (MWR-9)
pH	6.10	5.88	5.61	5.89	6.01	5.27	6.65	7.61	6.29
Neutralization potential (tons CaCO3/1,000 tons)	4.1	1.7	27.5	4.7	12.4	2.9	31.6	18.9	10.4
Potential acidity (tons CaCO3/1,000 tons)	7.5	3.5	15.1	5.1	11.4	7.2	8.8	8.7	9.4
Net acid-base potential (tons CaCO3/1,000 tons)	-3.4	-1.8	12.4	-0.4	1.1	-4.3	22.8	10.3	1.0
CaO (%)	0.08	0.05	0.16	0.07	0.17	0.20	0.95	0.95	0.28
Fe2O3 (%)	2.59	2.07	3.51	2.76	2.21	2.47	3.26	3.44	7.00
Sulfur (%)	0.60	0.27	2.91	0.35	2.21	0.68	0.67	0.48	1.09
Sulfate as SO4 (acid soluble) (%)	0.38	0.51	0.85	0.48	0.62	1.04	0.77	0.11	1.52
Antimony (ppm)	6	1	3	2	2	<1	<1	<1	6
Arsenic (ppm)	4	5	7	7	4	1	2	3	34
Cadmium (ppm)	14.7	2.5	116	2.6	11.0	0.5	0.3	0.7	9.2
Copper (ppm)	47	69	1,040	57	543	23	24	20	345
Gold (ppm)	0.023	0.053	4.53	0.331	3.86	0.032	0.073	0.009	0.222
Lead (ppm)	280	690	22,200	1,290	9,370	330	196	480	8,080
Manganese (ppm)	93	50	3,500	1,060	260	650	860	1,150	1,040
Mercury (ppm)	0.22	0.14	2.11	0.24	1.30	0.06	0.25	0.16	0.97
Molybdenum (ppm)	6	17	7	7	16	6	6	4	31
Silver (ppm)	1.8	2.7	91.5	18.2	151	4.7	5.3	1.0	39.9
Zinc (ppm)	3,390	670	28,100	730	24,700	187	183	258	2,410

MIDDLE POMEROY GULCH

The "Middle Pomeroy Gulch" inventory area (382/4279-1) is about 3 miles south of St. Elmo and 1 mile from the mouth of Pomeroy Gulch (Figure 2). CGS assigned EDRs of 3 to waste-rock piles #201 and #202 associated with grate-covered shaft #101 and nearby caved adit #102, respectively. All of these mine features lie adjacent to the stream in Pomeroy Gulch. Mine features #101/201 probably lie on NFS land on the unpatented Red Raven Lode claim. Features #102/202 are probably on the patented Empire Lode claim. The St. Elmo PBS map shows a much shorter length for the Empire Lode than the 1,500-foot length indicated on the mineral survey. The mineral survey also shows more of the claim on the western side of the creek than the PBS map does.

MINING HISTORY

Information regarding the Empire and Red Raven Lode claims is sparse. They were located and were active in the early 1880's, but no production was recorded. The claims were also active from about 1899 to 1912, with Red Raven Mining Company, Marietta Corporation, and St. Elmo Consolidated Mines Company as the major operators. Again, no production was recorded, however any production from these claims may have been lumped with the Iron Chest Mine or other mines owned by these companies. The small size of the waste-rock piles and the lack of historical information suggests that any production from these mines was small.

1880. J. Schrock and F. Norris located the Red Raven Lode in July (bk. 10, p. 459).

1881. Schrock sold his interest to W. Ogden in May. In August, W. Bishop and R. Denham located the nearby Empire Lode. (See bk. 3, p. 474; bk. 15, p. 461.)

1882. A 5-foot-thick magnetite-bearing quartz vein was exposed on the Red Raven Lode, and samples from the Red Raven were exhibited at the Denver National Mining Exposition in September (*Rocky Mountain News*, August 16, p. 2; September 13, p. 1, 1882).

1883. In March, Bishop sold interest in the Empire Lode to W. Crutcher and E. Jones. In April, Norris sold interest in the Red Raven Lode to D. Clements. In December, Ogden sold interest in the Red Raven to O. Goose. (See bk. 34, p. 89, 175, 494.) In August, Mineral Survey No. 3315 was conducted on the Empire Lode. Two shafts (11 and 16 feet deep), a 20-foot-long open cut, and a 138-foot-long adit (feature #102) were surveyed on the claim (Figure 23). The Red Raven and Robert Morris Lodes were shown along the eastern side of the Empire claims. (See Mineral Survey No. 3315, BLM files.)

1884. In the spring, John Aich completed a contract with Denham for 50 feet of shaft (feature #101?) on the Red Raven. "Good mineral was taken out all the way down," and a "splendid" ore body was exposed at the bottom of a 71-foot-deep shaft. (See *Rocky Mountain News*, June 28, 1884, p. 6.) In September, Clements and Goose sold interest in the Red Raven Lode to W. Danforth (bk. 36, p. 488).

1885. Denham sold interest in the Empire Lode to A Lashley (bk. 36, p. 198).

1886. The U.S. Government issued a patent for the Empire Lode to W. Bishop, R. Denham, E. Jones, and W. Crutcher (bk. 201, p. 23).

1891. It is not clear when R. Roland acquired the Red Raven Lode, but he sold interest to C. Smith in September. In November, Roland sold his remaining interest in the claim to Red Raven Consolidated Mining Company. (See bk. 79, p. 49; bk. 58, p. 460.)

1892. Smith sold his interest in the Red Raven Lode to Red Raven Consolidated Mining Company (bk. 79, p. 107). Smith was probably the owner or an officer of the Red Raven Consolidated Mining Company.

1896. J. Whittemeyer purchased the Red Raven Lode at a Chaffee County Sheriff's sale following a court decision against Red Raven Consolidated Mining Company (bk. 1, p. 142).

1897. Smith and Red Raven Consolidated Mining Company bought the Red Raven Lode back from Whittemeyer (bk. 100, p. 357).

1899. In March, Chaffee County sold the Empire Lode to Red Raven Consolidated Mining Company for 1892 taxes (bk. 104, p. 46). Red Raven Company and Marietta Corporation owned the Red Raven, Empire, and six other claims in a group. Three employees worked the property in November and December. Two shafts (50 and 150 feet deep) were on the Red Raven, and a 195-foot-long tunnel (adit #102?) was also on the group, probably on the Empire Lode. Future plans included installing a 20-ton concentrator, extending the adit 300 to 1,000 feet, and running crosscuts to develop veins. About 50 tons of ore worth $10 to $50/ton were on the dumps. (See Mine Managers report for 1899—Red Raven, December 29, 1899, p. 127, CBM.)

1900. In April, a crosscut in the old abandoned Empire tunnel was used to access the Red Raven Lode claim owned by Dr. Smith of Marietta Ohio. About 200 feet underground, a 4-foot-wide ore body yielded assays of $315/ton in gold. "A compressor and drill plant" were installed in October, and a contract for 800 feet of tunnel was let. (See *Mining Reporter*, April 26, v. 41, p. 252; October 18, v. 42, p. 237, 1900.) The geometry between the Empire Lode and the Red Raven Lode would make it difficult to access the Red Raven from adit #102 (Figure 23). The location of the "old" Empire tunnel is not clear.

1902. Red Raven Mining Company operated with 10 employees. Access was through an adit, and steam was used to power equipment. (See Dunbar, 1902, p. 184.) In November, Independence Consolidated Mining Company filed annual assessment work worth $3,000 for the Red Raven Lode (bk. 35, p. 530).

1904–1908. Smith leased the Red Raven Lode to St. Elmo Consolidated Mines Company (courthouse records).

1909–1912. The Red Raven Lode was part of a transaction that included the Iron Chest Mine and was subleased by St. Elmo Consolidated Mines Company to M. Hannan. St. Elmo Consolidated Mines Company and H. Stanley performed the assessment work on the Red Raven and Little Marie Lode claims. (See courthouse records.)

1934. R. Crutcher sold the Empire Lode to R. Stark (bk. 152, p. 441). It is not clear how or when Crutcher acquired the claim.

1944. Chaffee County acquired the Empire Lode for 1937 taxes (bk. 237, p. 217).

1959. Chaffee County sold the Empire Lode to H. Kramer (bk. 307, p. 409).

1963. Glen Payton foreclosed on H. Kramer and acquired the Empire Lode (bk. 333, p. 453).

1968. Payton sold the Empire Lode to Texota Oil Company (bk. 363, p. 747).

1971. North American Resources Corporation (formerly Texota) sold the Empire Lode to the Dodge family, the owner of record in July 2000 (bk. 384, p. 707).

GEOLOGY

Dings and Robinson (1957, plate 1) showed a shaft (feature #101) and an adit (feature #102) in a glacial moraine deposit overlying the Mount Princeton quartz monzonite (Figure 24). The quartz vein exposed underground dipped 30° to the southwest and contained galena, sphalerite, and pyrite with gold and silver values (Mine Managers report for 1899—Red Raven, December 29, 1899, p. 127, CBM).

SITE DESCRIPTION

Features of environmental concern in this inventory area are waste-rock pile #202, associated with caved adit #102, and waste-rock pile #201 associated with grated shaft #101. These mines lie close to and on opposite sides of Pomeroy Gulch, about 3,000 feet upstream from the Mary Murphy 1400-level adit (Figure 2).

Shaft #101 and dump #201 are on the east side of Pomeroy Gulch. The toe of dump #201 was in a wetland within the floodplain of Pomeroy Gulch. A spring that emerged in the wetland immediately adjacent to the north side of dump #201 (Figure 29) flowed into Pomeroy Gulch.

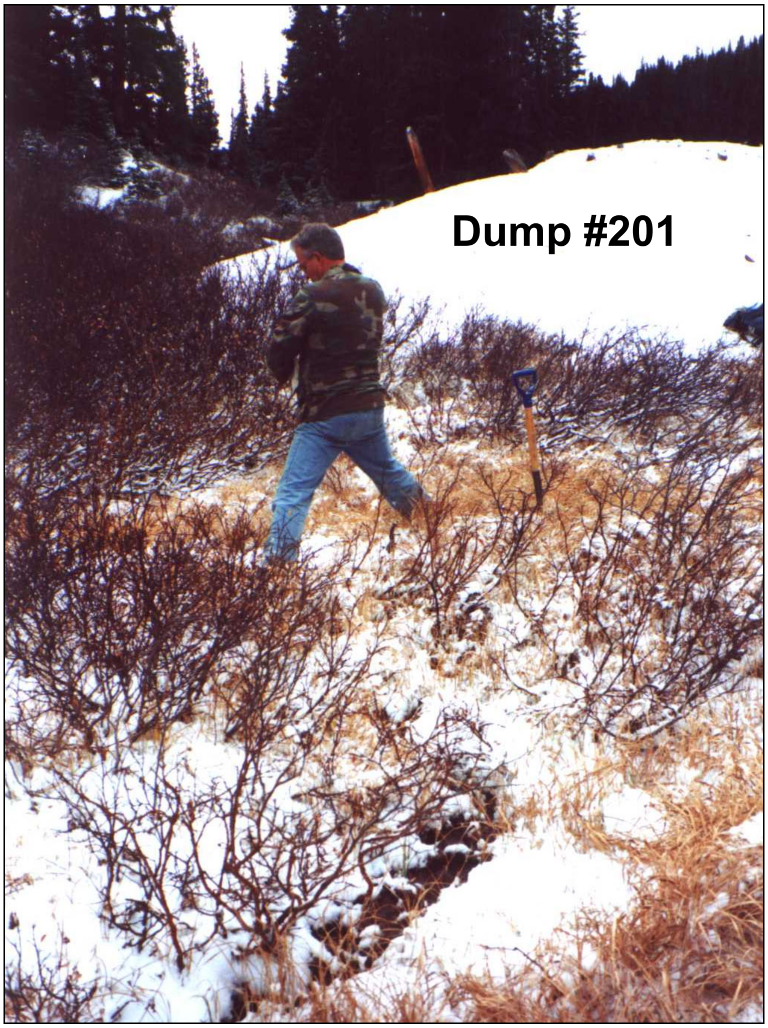


Figure 29. Sample site MH-7 from spring below snow-covered dump #201 of the "Middle Pomeroy Gulch" area.

Adit #102 and dump #202 are on the west side of Pomeroy Gulch, directly below caved shaft #103 and associated dump #203 (Figure 30). In October 1999 effluent from the adit flowed eastward directly into Pomeroy Gulch. During times of higher discharge rates from the adit, some of the effluent evidently drains to the northwest into a wetland along the western side of dump #202. A spring with associated red precipitate emerged in the wetland immediately adjacent to the northwestern toe of dump #202 (Figure 31) and discharged into Pomeroy Gulch slightly downstream. Dump #202 also lies in a wetland within the floodplain of Pomeroy Gulch. In addition, the eastern face of dump #202 toes into the stream for a length of about 100 feet.

Figure 30. Effluent from adit #102 in the "Middle Pomeroy Gulch" inventory area.

WASTE AND HAZARD CHARACTERISTICS

Waste-rock pile #201 consists of about 700 cubic yards of material that includes some quartz vein fragments with pyrite and hematite. Bleached and iron-stained clays are abundant. (See Benson and others, 1997, p. 23.) In October 1999 a composite dump sample was collected (sample MWR-6, Table 6). Results indicated weakly mineralized rock with moderate lead and manganese concentrations. The net acid-base potential was -4.3 tons $CaCO_3$/1,000 tons, and the paste pH was 5.27, indicating moderate acidity.

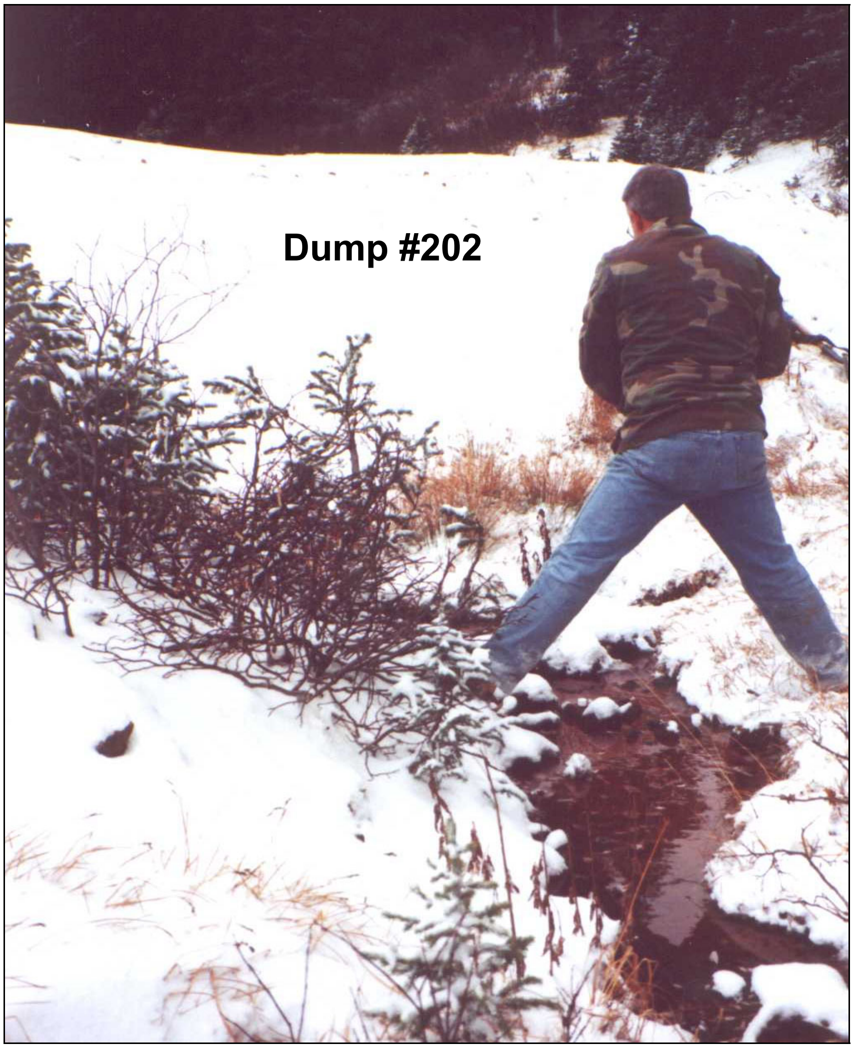


Figure 31. Sample site MH-9 and snow-covered dump #202 in the "Middle Pomeroy Gulch" inventory area.

When tested in July 1995, a small spring below and adjacent to dump #201 flowed at about 0.1 gpm and had 3.4 pH and 100 µS/cm (Benson and others, 1997, p. 23). A spring sampled in October 1999 flowed at a rate of 2 gpm and had pH of 6.02 and conductivity of 185 µS/cm (sample MH-7, Table 5). The water was clear, but the channel had moderate amounts of red-brown precipitate. This spring water met State standards for all of the tested parameters.

Effluent from caved adit #102 flowed at an estimated rate of 5 gpm and had pH of 6.1 and conductivity of <50 µS/cm during the inventory in July 1995. In October 1999 the flow was measured at 1.25 gpm, and the effluent had 6.32 pH and 132 µS/cm conductivity. The water was clear and had light-green algae in it. This mine drainage slightly exceeded the drinking-water standard for manganese, but all of the other tested parameters fell within standards (sample MH-8, Table 5). Part of the effluent may originate from shaft #103, which is on the slope slightly above adit #102 (Figure 30).

Waste-rock pile #202 contains about 1,100 cubic yards of material similar in appearance to dump #201 (Benson and others, 1997, p. 17). Hydrochloric acid tests indicated that microcrystalline calcite occurs along some fractures in the waste rock. Composite dump sample MWR-7 collected in 1999 contained weakly mineralized rock with high neutralization potential. Net acid-base potential was +22.8 tons $CaCO_3$/1,000 tons, and the paste pH was 6.65 (Table 6).

When tested in July 1995, a small spring below and adjacent to dump #202 flowed at about 2 gpm and had 6.1 pH and <50 µS/cm (Benson and others, 1997, p. 23). In October 1999 a spring sampled just below the northwestern toe of dump #202, which is probably the same spring tested in 1995, flowed at a measured rate of 2 gpm and had 6.04 pH and 108 µS/cm conductivity (sample MH-9, Table 5). The water was clear, but abundant red-brown precipitate lined the bottom of the channel and was caught in algae. With the exception of zinc, the spring water met State standards for all of the tested parameters. Zinc concentration slightly exceeded the standard, but because of the low flow, zinc load was nearly negligible.

ABOVE CAMPTOWN

The "Above Camptown" inventory area (381/4279-1) is on the west side of Pomeroy Gulch about 3 miles south of St. Elmo and 1 mile from the mouth of Pomeroy Gulch (Figure 2). This area is complexly intermingled patented land and NFS land. Mineral surveys were completed on several claims that never received patents. In addition, it appears that some mine features from the original inventory in 1995 were mislocated. Attempts were made to correct the locations of interest for this study in 1999, but an accurate survey is necessary to determine which mine features are on private and NFS land, and to determine the mineral surveys that include mine features with potential environmental impacts.

CGS assigned EDRs of 3 to five waste-rock piles (dumps #200, 201, 202, 204, 206) from two adits (#100, 106) and three shafts (#101, 102, 104) in this inventory area. In the adjacent "Camptown" inventory area, adit #100 is most likely the Stanley Tunnel that was intended to connect to the Stanley Shaft (probably shaft #101 in the "Above Camptown" inventory area). Although it is not certain, it appears that mine features examined for this study lie on the Tom Ewing (#200), Stanley (#201), Little Bonanza (#202), Big Bonanza (#204), and Parliament (#206) Lode claims (Figure 32). All of these claims received mineral surveys, but only the Parliament Lode remains private land. The other claims and their associated mines are presumably on NFS land.

MINING HISTORY

Mining activity in this area began with the location of claims about 1880. Mineral surveys were completed in the 1880's, and the Little Bonanza, Big Bonanza and Parliament Lode claims were all patented by 1891. Recorded production is limited to 3 tons worth $167/ton from the Little Bonanza in 1883 and 7 tons worth $123/ton from the Big Bonanza in 1884. No production is reported for the Parliament Lode. Additional small amounts were probably shipped, but not recorded. Literature review suggests that mining activity ceased prior to 1891.

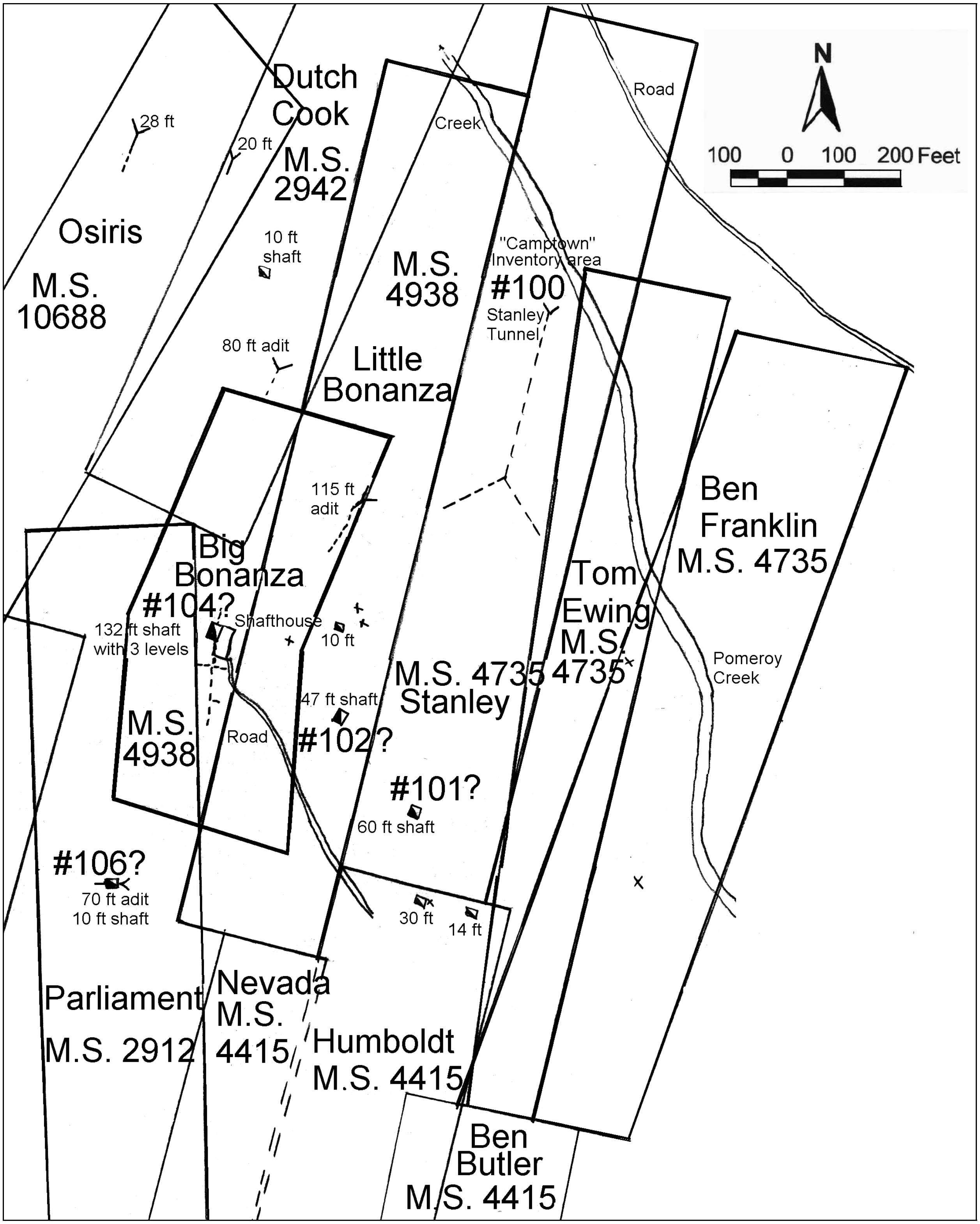


Figure 32. Mineral surveys in the "Above Camptown" and "Camptown" inventory areas. (Modified from several mineral surveys; scale is approximate; dumps #200, 201,202, 204, and 206 are associated with mine features #100, 101, 102, 104, and 106, respectively; numbered mine features are in the "Above Camptown" inventory area, except for the Stanley Tunnel.)

Although shaft #101 of this inventory area is probably on the Stanley claim, the most extensive working on this claim is adit #100 (Stanley Tunnel) of the “Camptown” inventory area. The history of the Stanley Mine is described in detail in the “Camptown” section of this report.

Little Bonanza Mine

1880. A.E. Wright Jr., A.E. Wright Sr., David Jamison, and Louis Davis located the Little Bonanza Lode (bk. 13, p. 127). Shaft #102 is probably on this claim.

1882. In May, the Wrights and Jamison quitclaimed interest in the Little Bonanza Lode to Henry Brown. On June 12, Brown quitclaimed interest to Robert Raw. On June 29, Davis quitclaimed interest to Henry Brown. Brown and Raw amended the location of the claim on June 30. Brown, Raw, J.P. Richards, S.T. Conery, and H.W. Mountain amended the location in October. (See bk. 23, p. 494; bk.25, p.177, 179; bk. 16, p. 208; bk. 41, p. 69.) During December, Doc Conery was working two shifts of miners in the shaft (*Rocky Mountain News*, December 28, 1882, p. 3).

1883. Abundant publicity and many transactions, but little production, were associated with the Little Bonanza. In January, numerous pockets of argentite and wire silver were exposed in a 6-inch zone at the bottom of the 40-foot-deep shaft. Doc Conery completed contract work in the beginning of February. (See *Rocky Mountain News*, January 26, p. 3; February 9, p. 3, 1883.) Also in February, Brown quitclaimed interest to S.T. Conery; and in March, Brown deeded interest to Augustus Warren (bk. 34, p. 151; bk. 28, p. 351).

In April, a wire silver specimen was displayed at the St. Elmo Post Office. Improvements in the quality of the ore led to speculation that the mine would be worth a million dollars. A large, rich ore shoot was exposed at the bottom of the 65-foot-deep shaft. The vein ranged from 10 to 20 inches wide. (See *Rocky Mountain News*, April 9, p. 3; April 12, p. 3; April 25, p. 2, 1883.)

In May, silver glance (argentite) and ruby silver (pyrargyrite and proustite) were revealed in a quartz vein that was previously assumed to be the footwall of the mineralized zone. An 18-inch-thick vein of nearly solid native silver and gray copper (tetrahedrite) was exposed at the bottom of a 70-foot-deep shaft. (See *Rocky Mountain News*, May 5, p. 2; May 10, p. 3, 1883.) Brown deeded interest to R.M. Francis (bk. 11, p. 176), and Conery quitclaimed interest in the claim to Richards in late May (bk. 34, p. 153).

Two new workings were opened in August, and 30 tons of ore were stockpiled at the shaft. In September, the 70-foot-long Little Bonanza adit was following a “good vein of pay ore.” (See *Rocky Mountain News*, August 11, p. 3; September 24, p. 7, 1883.) Also in September, Brown quitclaimed interest in the claim to H.W. Mountain (bk. 34, p. 282). In December, Doc Conery operated the mine under contract, and the adit was 120 feet long (*Rocky Mountain News*, December 6, 1883, p. 2).

By the end of 1883, development included a 72-foot-deep inclined shaft and a 120-foot-long adit. A 20-inch-wide ore zone was within a 5-foot-wide vein. A small amount of ore was sold for an average of $60/ton. (See Burchard, 1884, p. 259.)

1884. Several transactions were made, but records of mine operations are lacking. In February, Warren relinquished interest to Brown (bk. 12, p. 111). In April, Francis relinquished his interest back to Brown who quitclaimed interest to H. Mountain (bk. 12, p. 110; bk. 34, p. 564). In August, Conery quitclaimed interest to Richards (bk. 36, p. 82).

1885. A crosscut was started at a depth of 60 feet (*Rocky Mountain News*, January 15, 1885, p. 6).

1886. In January, Henry Brown quitclaimed interest in the Little Bonanza Lode to Mary Brown. Frink, Raw, Hall, Neff, Richards, Nobel, Mountain, and Mary and Henry Brown received a trust deed on the Little Bonanza and Big Bonanza Lodes. In September, T.M.S. Rheth relinquished interest to Romley Mining Company. (See bk. 36, p. 309; bk. 43, p. 272; bk. 46, p. 423.)

1887. Romley Mining Company amended the location of the Little Bonanza Lode in August (bk. 32, p. 28). In October, Mineral Survey No. 4938 was conducted on the Little Bonanza and Big Bonanza Lode claims. A 47-foot-deep shaft (#102?) was surveyed on the Little Bonanza (Figure 32). (See Mineral Survey No. 4938, BLM files.)

1891. The U.S. Government issued a patent for the Little Bonanza and Big Bonanza Lodes to Romley Mining Company (bk. 201, p. 28).

1921. Chaffee County deeded the Little Bonanza and Big Bonanza Lodes to H.J. Van Wetering (bk. 118, p. 40).

1929. J.A. Van Iterson (trustee for the deceased Van Wetering) quitclaimed the Little Bonanza and Big Bonanza Lodes to Henry Vanderveld (bk. 205, p. 135; bk. 152, p. 391).

1931. Vanderveld obtained a deed for the claims (bk. 205, p. 135; bk. 152, p. 391).

1950. The Little Bonanza shaft had caved prior to a 1950 examination by Dings and Robinson (1957, p. 103). John V. and Henry F. Carey acquired a deed on the Little Bonanza and Big Bonanza Lodes (bk. 247, p. 101).

1961. Mary J. and G.S. Daniel, and P.J. McKenna purchased the Little Bonanza and Big Bonanza Lodes from Chaffee County (bk. 318, p. 451-452). It is not clear when Chaffee County acquired the claims.

The 1984 St. Elmo PBS map shows the area of the Little Bonanza and Big Bonanza Lodes as NFS land, and no one was paying taxes on the claims as of 1999. It is assumed that the U.S. Forest Service has acquired the claim, but the date of the transaction is not clear.

Big Bonanza Mine

1882. Henry Brown and J.P. Holtschneider located the Big Bonanza Lode in May. In October, Brown quitclaimed interest to James Bailey. (See bk. 16, p. 515; bk. 25, p. 490). By November, eight workers were employed on the claim, and ore was shipped to the Niagara smelter near St. Elmo (*Rocky Mountain News*, November 13, p. 3; November 20, p. 6, 1882.)

1883. Samples assayed in January had a value of $6,000/ton and contained 300 oz/ton in gold and 450 oz/ton in silver. Frank Collins completed contract work at the site in early February. (See *Rocky Mountain News*, January 26, p. 3; February 9, p. 3, 1883.) In March, Brown quitclaimed interest to Robert S. Raw, and Holtschneider quitclaimed interest to Charles G. Eckhardt in May. In July, Bailey quitclaimed interest to Betsy Hall. (See bk. 33, p. 170; bk. 34, p. 60, 234, 284.) A 12- to 18-inch-thick quartz vein was exposed in August (*Rocky Mountain News*, August 11, 1883, p. 3), and in September, Brown quitclaimed interest to Emmet Neff (bk. 34, p. 279). Dr. Nobel W. Mountain acquired Holtschneider's interest in October and planned large-scale development (bk. 34, p. 426; *Rocky Mountain News*, November 19, 1883, p. 6). Dr. Mountain and Mayor Brown (owners) shipped 3 tons of surface ore to the St. Elmo smelter in December. First-grade ore had a value of $202/ton and contained 138 oz/ton silver and 3.2 oz/ton gold. Second-grade ore contained 89 oz/ton silver and 2.2 oz/ton gold. Both grades of ore had a combined average value of $167.50. (See *Rocky Mountain News*, December 25, 1883, p. 7.)

In summaries of 1883, Corregan and Lingane (1883, p. 106) reported that Holtschneider, F.M. Scott, and Brown owned the Big Bonanza and Parliament Lode claims, and an 85-foot-long adit developed the vein. Burchard (1884, p. 259) described an 18-inch-wide ore zone with an average value of $50/ton exposed in the adit.

1884. Early in the year, four employees removed rich ore from "surface drifts" (open cuts?). Several tons of ore were sacked, and the operators waited for the snow to settle before shipping. In December, Holtschneider mined an ore body that assayed 266 oz/ton silver and 5 oz/ton gold. Total production for 1884 was 7 tons with a value of $854 ($123/ton). (See *Rocky Mountain News*, January 15, p. 6; December 9, p. 6, 1884; January 15, 1885, p. 6.) Holtschneider quitclaimed interest in the claim to William T. Scott, who then quitclaimed the portion of the Big Bonanza Lode that overlapped the Parliament Lode back to Holtschneider (bk. 39, p. 54, 85, 170). By the end of the year, development included a 72-foot-long inclined shaft and a 120-foot-long adit. A 20-inch-wide ore zone was enclosed in a 5-foot-wide vein. The small amount of ore that was sold averaged $60/ton. (See Burchard, 1884, p. 259.) The value of the ore reported by Burchard (1884) and the newspaper is quite different.

1886. In April, Holtschneider quitclaimed interest to Brown, Mountain, Eckhart, Neff, Raw, Hall, and Scott. In May, Eckhardt quitclaimed interest to Mountain. In June, Scott quitclaimed interest to Mountain. Mountain quitclaimed interest to Seth Frink and Romley Mining Company in July and September, respectively. (See bk. 36, p. 360, 385, 402-403; bk. 46, p. 352.)

1887. Romley Mining Company amended the location of the Big Bonanza Lode in August and October (bk. 32, p. 28, 58–59). Mineral Survey No. 4938 was conducted on October 22 on the Big Bonanza and Little Bonanza Lode claims. A three-level, 132-foot-deep shaft (feature #104?) with 200 feet of drifts and crosscuts and a 115-foot-long adit were surveyed on the Big Bonanza Lode (Figure 32). (See Mineral Survey No. 4938, BLM files.)

After 1887 the ownership history of the Big Bonanza claim coincides with the Little Bonanza, described in the previous section. No operations or production are recorded after the mineral survey, and the inclined shaft was caved by 1950 (Dings and Robinson, 1957, p. 103).

Parliament Lode

1880. Joseph Holtschneider, J. Wigginton, J. Bidwell, and Cramer located the Parliament Lode (bk. 13, p. 215).

1882. Mineral Survey No. 2912 was conducted on the Parliament Lode. A 10-foot-deep discovery shaft and 70-foot-long tunnel (adit #106?) were surveyed near the center of the claim (Figure 32). (See Mineral Survey No. 2912, BLM files.)

1883. Holtschneider, F.M. Scott, and Henry Brown owned the Big Bonanza and Parliament Lodes. The quartz-galena vein was 2.5 to 12 feet wide and averaged 1 oz/ton gold and 20 oz/ton silver. An 85-foot-long adit developed the vein. (See Corregan and Lingane, 1883, p. 106.)

1884. The U.S. Government issued a patent for the Parliament Lode to Holtschneider and W. Scott (bk. 201, p. 29).

1944. Chaffee County acquired the property for non-payment of 1939 taxes (bk. 237, p. 211).

1968. Chaffee County sold the Parliament to F. Greene (bk. 361, p. 483).

1977. F. Greene died, leaving the Parliament Lode to Lawrence Greene, the owner of record in July 2000 (bk. 433, p. 567).

GEOLOGY

Several south-trending veins are hosted by Mount Princeton quartz monzonite in the "Above Camptown" inventory area (Figure 24). Pyrite, sphalerite, galena, chalcopyrite, quartz, and silicified Mount Princeton quartz monzonite were on the dumps of the Little Bonanza Shaft and Big Bonanza Shaft. (See Dings and Robinson, 1957, plate 1, p. 101–103.) Traces of calcite were observed on the waste-rock piles during this investigation.

At the Little Bonanza Shaft, a 4- to 10-foot-wide brecciated and silicified zone contained a 4- to 18-inch-thick quartz-sulfide vein. The breccia zone trended N. 20° to 40° E., dipped 60° to 80° W., and was traceable at the surface for about 1,000 feet. (See Dings and Robinson, 1957, plate 1, p. 103.) Newspapers from the 1880's reported the occurrence of sulfosalts such as tetrahedrite and proustite/pyrargyrite in the Little Bonanza vein.

At the Big Bonanza Shaft, a silicified breccia zone in Mount Princeton quartz monzonite contained 1- to 6-inch-wide quartz-sulfide veinlets. The breccia zone trended N. 5° to 15° E., dipped 40° to 60° W., and was traceable at the surface for about 300 feet. (See Dings and Robinson, 1957, plate 1, p. 101.)

SITE DESCRIPTION

Features of environmental concern identified during the abandoned mine inventory include waste-rock piles #200, 201, 202, 204, and 206 (Benson and others, 1997, p. 19). Piles #201, 202, and 204 are associated with shafts #101, 102, and 104, respectively. Piles #200 and 206 are associated with open adits #100 and 106, respectively. These mine features lie on the western slope of Pomeroy Gulch, about 2,000 feet upstream from the Mary Murphy 1400-level adit (Figure 2).

Adit #100 and dump #200 are the lowest in elevation of the mine features of concern. The adit had standing water with 6.3 pH inside the portal during the inventory in August of 1995, but the standing water was too far underground to sample when investigated in October 1999. Dump #200 contained sparse sulfide minerals, including pyrite, but was only about 100 cubic yards and was partly revegetated (Figure 33). Dump #200 is not an apparent environmental threat, and no samples were collected. Any reclamation efforts at this feature would probably do more harm than good, because this site is small, weakly mineralized, and naturally revegetating.

Figure 33. Dump #200 of the "Above Camptown" inventory area.

Dump #201 is slightly larger and its toe nearly overlaps dump #200. Associated shaft #101 was filled with water and coated with a layer of ice in October 1999 (Figures 34, 35).

Figure 34. Dump #201 of the "Above Camptown" inventory area.

Figure 35. Ice-capped shaft #101 of the "Above Camptown" inventory area.

Although depicted on the inventory map as lying almost directly up the slope from shaft #101, partly flooded shaft #102 and associated dump #202 are only slightly higher than shaft #101, lying about 200 feet to the northwest. Dump #202 has a small "stockpile" of sulfide-rich material on the south side of the bench (Figure 36).

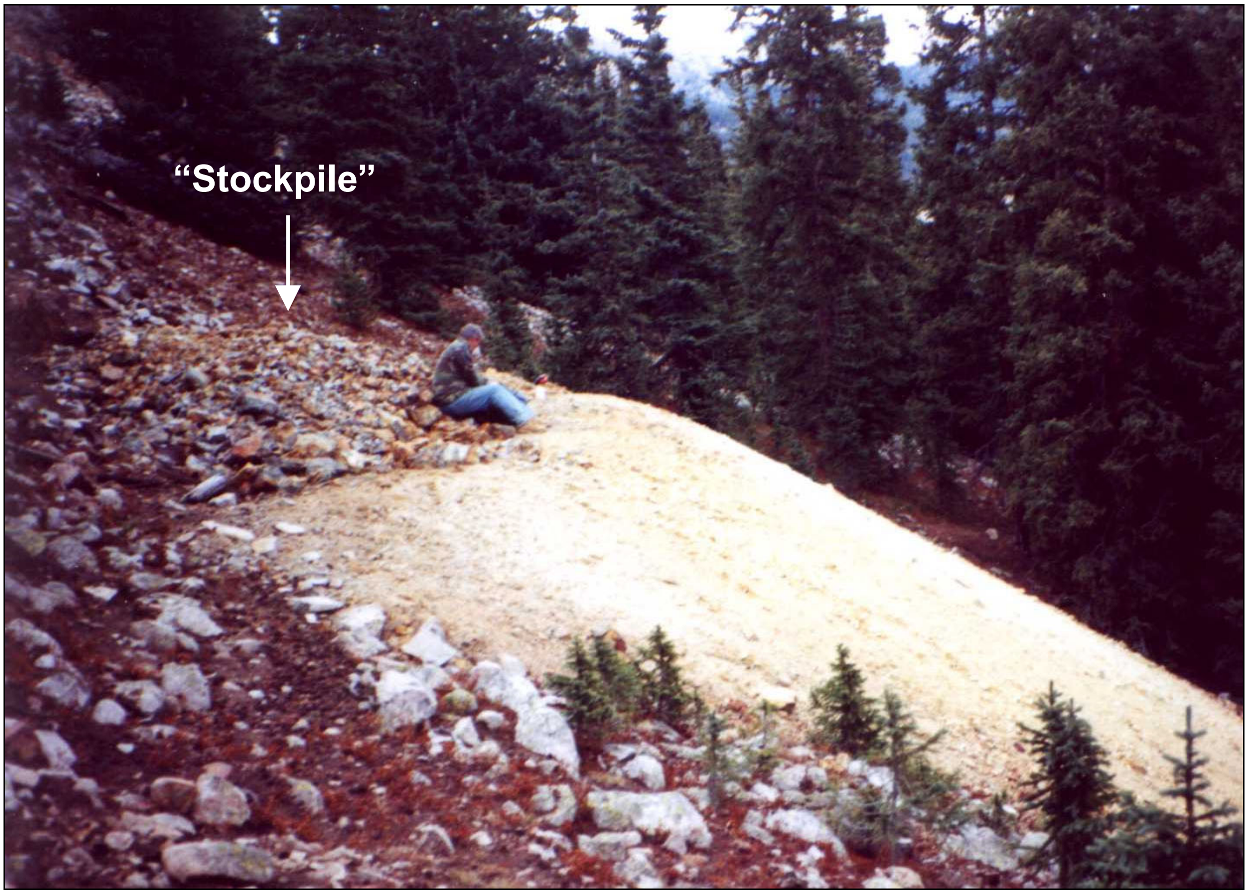


Figure 36. Dump #202 of the "Above Camptown" inventory area.

Flooded shaft #104 and associated dump #204 lie about 300 feet northwest of shaft #102 and are slightly higher in elevation. The shaft was on the north end and adit #105 was near the south end of a bench almost a hundred feet long. The highwall of the bench was composed of monzonite. Shaft #104 was nearly filled with water and had an ice coating in October 1999 (Figure 37).

Material on dump #204 (Figure 38) came from at least three different sources. Excavation of the bench formed a large portion of dump #204. Additional material came from shaft #104 and adit #105.

Dump #206 is associated with open adit #106 and is above and to the southwest of dump #204. Standing water was inside the adit during the inventory in 1995, but the adit was dry in October 1999. The pile contains about 80 cubic yards of iron-stained, weakly mineralized monzonite with traces of pyrite (Figure 39). Dump #206 was partly revegetated and is not an apparent environmental threat. No samples were collected. Reclamation efforts are probably not necessary because this site is small, weakly mineralized, and naturally revegetating.

Figure 37. Ice-capped shaft #104 of the "Above Camptown" inventory area.

Figure 38. Dump #204 of the "Above Camptown" inventory area.

Figure 39. Photograph of dump #206 of the "Above Camptown" inventory area.

WASTE AND HAZARD CHARACTERISTICS

Shaft #101 was sunk on a vein containing abundant sulfides and traces of calcite (Figure 35). In October 1999 water sample MH-3 was collected from beneath the ice in shaft #101. The shaft showed no obvious indications of discharging at the surface, and the standing water had 6.12 pH and conductivity of 471 µS/cm. Although the water appeared clear, the filter used in sampling collected minor amounts of red precipitate. This water exceeded standards in manganese, zinc, and lead, but the concentrations were not extreme (Table 5).

Waste-rock pile #201 consists of about 150 cubic yards of yellow-brown material that includes monzonite and quartz vein fragments with abundant galena, sphalerite, pyrite, and minor chalcopyrite. In October 1999 composite dump sample MWR-3 was collected (Table 6). Results indicated highly mineralized rock with more than 2% each of zinc and lead, and high concentrations of manganese and copper. Mercury, gold, and silver were elevated, and the gold and silver concentrations approached ore grade (0.13 and 2.7 oz/ton, respectively). Neutralization potential and potential acidity were high compared to most of the samples collected during this investigation. Despite the mineralized nature of the sample, the net acid-base potential was +12.4 tons $CaCO_3$/1,000 tons, but the paste pH was slightly acidic at 5.61.

Waste-rock pile #202 consists of about 235 cubic yards of mostly gray and yellow-brown fines and sand, with lesser amounts of coarse material. Most of the material is too fine to identify minerals, but some of the larger pieces include galena, sphalerite, and pyrite, with minor calcite in veinlets and fractures. A 10-cubic-yard "stockpile" on the south end of the bench contains large siliceous fragments with abundant sulfides (Figure 36). In October 1999 composite dump sample MWR-5 was collected (Table 6). The sample included a small amount of material from the "stockpile." Results indicated highly mineralized rock with more than 2% zinc and almost 1% lead. Copper, mercury, gold, and silver were also elevated, and the gold and silver concentrations approached ore grade (0.11 and 4.5 oz/ton, respectively). The sample had high neutralization potential and high potential acidity which nearly offset each other. Net acid-base potential was +1.1 tons $CaCO_3$/1,000 tons, and the paste pH was 6.01.

Shaft #104 was driven along a highly oxidized, mineralized vein. In October 1999 a deer, which presumably died by drowning, lay partly enclosed in ice in the shaft (Figure 37). Water sample MH-4 was collected from water beneath the ice. This shaft showed no obvious indications of discharging at the surface, and the standing water had 7.10 pH and conductivity of 325 μS/cm. Although the water appeared clear, the filter used in sampling collected minor amounts of yellow precipitate that may have been algae. The sample exceeded standards in manganese (Table 5).

Waste-rock pile #204 consists of about 450 cubic yards of three types of material. About 60% is yellow and gray fines and sand. About 25% comprises blocks of mineralized red-, brown-, and black-stained rocks. This mineralized rock includes galena, sphalerite, and pyrite, with minor calcite in fractures and veinlets. In October 1999 composite dump sample MWR-4 was collected (Table 6). Results indicated moderately mineralized rock with moderate to high concentrations of lead, manganese, and zinc. The sample had nearly identical neutralization potential and potential acidity, and the net acid-base potential was -0.4 tons $CaCO_3$/1,000 tons. Paste pH was slightly acidic at 5.89.

CAMPTOWN

The "Camptown" inventory area (381/4280-1) is on the west side of Pomeroy Gulch about 3 miles south of St. Elmo and 1 mile from the mouth of Pomeroy Gulch (Figure 2). CGS assigned an EDR of 3 to waste-rock pile #200 from caved adit #100 in this inventory area. Mine feature #100 is probably the Stanley Tunnel, positioned on the Stanley Lode claim. The Stanley Tunnel was intended to connect to the Stanley Shaft (probably feature #101 of the "Above Camptown" inventory area). Adit #100 was located incorrectly during the original inventory done by CGS in 1995. The adit was shown on the patented Dutch Cook Lode, about 600 feet north-northwest of its actual position on the Stanley Lode.

MINING HISTORY

The Stanley Shaft (shaft #101 of the "Above Camptown" inventory area) and the associated Stanley Tunnel (adit #100 of the "Camptown" inventory area) were started by 1880. Small production was recorded from 1883 through 1885, probably mostly from the shaft. The Stanley Lode was surveyed in 1887 and patented in 1890, but any production during that time was not recorded and was probably small. Mary Murphy Gold Mining Company acquired the mine in 1909, but probably did not produce from it. The mine reopened briefly in 1936, but no production was reported.

1880. William and Lewis Davis located the Stanley Lode claim (bk. 10, p. 551).

1881. The Davises amended the location in August (bk. 17, p. 82). In November, work on the Stanley Tunnel was progressing rapidly (*Rocky Mountain News*, November 29, 1881, p. 6).

1882. In January, F.B. Mercer and others acquired interest in the Stanley Lode from Davis (bk. 18, p. 202). A vein exposed in the Stanley Mine in June had assay values ranging from $77 to $340/ton (*Denver Republican*, July 2, 1882, p. 3). Early in July, Albert J. Byrns purchased interest from Lewis Davis (bk. 25, p. 192). By August, a carload of ore was awaiting shipment to Denver (*Rocky Mountain News*, August 16, 1882, p. 2). In September, Lewis Davis sold Elias F. Craus and Augustus Warren interest in the claim (bk. 31, p. 30–33). In October, Stanley Mining Company amended the location of the claim (bk. 16, p. 506), and in November, it was speculated that the ore removed while sinking a shaft (shaft #101 of the "Above Camptown" area) would be profitable (*Rocky Mountain News*, November 12, 1882, p. 7).

By December, three shifts were working in the "Crank" tunnel on the Stanley Lode claim. The width and value of the ore zone increased with depth at the Stanley Shaft (shaft #101 of the "Above Camptown" inventory area?), and a 2-foot-wide high-grade ore body and a larger volume of lower grade, but still shipping-grade ore, was exposed at the bottom. (See *Rocky Mountain News*, December 28, 1882, p. 3.) Also in December, Humboldt Mining Company obtained a 19-year right-of-way through the Stanley Tunnel and Shaft to develop the company's claims. Both companies paid for the development of the shaft and the planned 600-foot-long adit and were joint owners of the Stanley Lode. (See bk. 34, p. 550.)

The Stanley property included the Stanley, Stanley Extension, Humboldt, Tom Ewing, Ben Butler, and Ben Franklin Lodes. By the end of 1882 the Stanley Tunnel was more than 400 feet long, and the operators planned to extend the it another 500 feet to intersect a shaft (probably shaft #101 in the "Above Camptown" inventory area) higher on the hill. Assays of six samples from different ore zones exposed at the bottom of the shaft ranged from $23 to $315/ton and averaged $75/ton. Lewis Davis & Company was listed as the owner. (See Burchard, 1883, p. 418, 568.) Stanley Mining Company was incorporated in 1882 with Lewis Davis as president; Thomas Stark as vice president; A.J. Byrnes as secretary and superintendent; and William Davis as treasurer (Corregan and Lingane, 1883, p. 110–111).

1883. In January, a 16-inch-thick ore zone was exposed at the bottom of the 62-foot-deep shaft, and a 60-foot contract on the tunnel was completed. Later in the month, a south-trending drift at the bottom of the shaft followed a 27-inch-thick ore zone, and a crosscut was started at the end of the tunnel. In February, ore with an estimated value of $500/ton was mined from a crosscut off of the drift, and a crosscut was started in the lower adit. Mineralized zones from 1 inch to 1 foot wide were exposed in a 5-foot-wide crosscut in the tunnel. Chalcopyrite, pyrite, galena, zinc minerals, and black "sulphurets" (decomposed silver sulfide minerals) occurred in the mineralized zones. In March, quartz veins were exposed in both crosscuts in the lower adit, and they were extended in April. Large quantities of ore were shipped during the summer months, and several wagons of rich ore were hauled to the St. Elmo smelter in September. (See *Rocky Mountain News*, January 11, p. 7; January 26, p. 3; February 14, p. 3; February 20, p. 2; March 2, p. 2; April 12, p. 3; August 11, p. 3; September 17, p. 6, 1883.)

In a year-end summary of 1883, it was reported that mill runs of sorted ore averaged 2 oz/ton gold and 30 oz/ton silver, and production averaged 12 tons/week. Development included 445 feet of tunnel and a 75-foot-deep shaft. Stanley Mining Company was the owner. (See Corregan and Lingane, 1883, p. 110–111.) Another summary of 1883 reported that the Stanley Tunnel was 500 feet long, and a crosscut was started. No ore zones were discovered in the adit, and plans to connect it to the shaft were shelved. A vein containing a 2-foot-wide, high-grade ore zone was exposed at the bottom of the 55-foot-deep shaft. (See Burchard, 1884, p. 259.) For 1883, the accounts and lengths of the workings are inconsistent between Corregan and Lingane (1883) and Burchard (1884). It is not clear if the production was from the shaft or from the adit. The description of the vein and workings in the shaft suggests that production originated from the shaft.

1884. In February, Stanley Mining Company sold the Stanley Lode to Warren, Nelson, Byrns, Ray, and Little (bk. 33, p. 455; bk. 36, p. 107). A 6-inch-wide quartz vein containing disseminated "white iron" (siderite? or marcasite?), galena, and chalcopyrite, and a 1-inch-thick copper-bearing ore streak was exposed in June. In September, work in the east crosscut in the adit was contracted out. John Gattlander operated the mine in early November. Captain A. Brown acquired an 18-month lease on the tunnel and shaft later in November and shipped ore in December. (See *Rocky Mountain News*, June 20, p. 6; September 11, p. 2; November 12, p. 6; November 17, p. 3; December 9, p. 6, 1884.)

By the end of 1884 the shaft was 70 feet deep where the ore zone was up to 2.5 feet wide. Assay values were $85/ton, and the vein contained galena, chalcopyrite, and zinc minerals. Annual production was 4 tons of ore worth $280, probably from shaft #101 of the "Above Camptown" inventory area. A whip (horse-driven hoist) was used to remove water. (See Burchard, 1885, p. 188, 190.)

1885. Forty-five sacks of "very rich" ore were shipped in March. The mine must have ceased operations during the spring, because work resumed in May. (See *Rocky Mountain News*, April 3, p. 6; June 1, p. 6, 1885.)

1887. In July, Mineral Survey No. 4735 was conducted on the Stanley, Tom Ewing, and Ben Franklin Lode claims owned by Warren. A 300-foot-long adit with two 110-foot-long crosscuts (adit #100 of the "Camptown" inventory area) and a 60-foot-deep shaft (shaft #101 of the "Above Camptown" inventory area) were surveyed on the Stanley Lode (Figure 32). (See Mineral Survey No. 4735, BLM files.) In September, Warren acquired additional interest in the Stanley claim from George Little, Thomas Warren, and Dwight E. Ray (bk. 58, p. 6, 176).

1890. R.M. Cash, W.J. Van Wetering, Herbert Warren, and George Warren acquired interest in the Stanley Lode from Augustus Warren between March and May. The U.S. Government issued a patent for the Stanley, Tom Ewing, and Ben Franklin Lodes to Dwight Wright, E. Ray, Augustus Warren, and the heirs of A.J. Byrns in October. (See bk. 65, p. 385; bk. 69, p. 152, 170; bk. 71, p. 163; bk. 121, p. 84.)

1895. Chaffee County awarded a trust deed for the Stanley Lode to W. Hessey (bk. 87, p. 155).

1897. Thomas Stark acquired a deed on the Stanley Lode from Hessey (bk. 58, p. 551).

1905. Hessey reacquired the deed from Stark (bk. 113, p. 188).

1909. Frank Prestige bought the Stanley Lode from Hessey in March. Mary Murphy Gold Mining Company acquired the claim from Prestige in July. (See bk. 127, p. 508; bk. 128, p. 486.)

In 1911, 1914, and 1916 the Stanley Lode was on a list of mining claims owned by Mary Murphy Gold Mining Company (Mine Managers report for 1911—Mary Murphy Mine, p. 24; J.R. Curley, Inspector report-Stanley Mine, June 22, 1914, v. 16, p. 26; Operators Annual Report for 1916—Mary Murphy Gold Mining Co., January 31, 1917, CBM). Curley's report was actually on the Mary Murphy Mine, and after the company acquired the Stanley Lode, any of the work done on the claim was probably included with Mary Murphy Mine reports.

1936. S.E. Burleson opened the Stanley adit in 1936 (Operators Annual Report for 1936—Mary Murphy Mine, January 11, 1937, CBM).

1950. The Stanley adit had caved and was inaccessible (Dings and Robinson, 1957, p. 103).

1954. Walter E. Burleson leased the Stanley Lode to John V. and Henry Cary (bk. 275, p. 497).

1958. Burleson leased the mine to Minerals Production Company of California (bk. 301, p. 269).

The 1984 St. Elmo PBS map depicts the Stanley Lode as NFS land. It is not known when the United States reacquired the claim.

GEOLOGY

In and near the "Camptown" inventory area, north-south trending veins are hosted in Mount Princeton quartz monzonite (Figure 24). Pyrite, sphalerite, galena, chalcopyrite, quartz, and silicified quartz monzonite were on the dump of the Stanley adit. (See Dings and Robinson, 1957, plate 1, p. 103.)

Although the widths of the vein and ore shoots varied along strike and depth, in 1883 a 4- to 12-foot-wide vein contained 6- to 20-inch-thick ore zones comprising quartz, galena, and copper minerals. Mill runs of sorted ore averaged 2 oz/ton gold and 30 oz/ton silver. (See Corregan and Lingane, 1883, p. 110–111.)

SITE DESCRIPTION

The only feature of environmental concern identified during the abandoned mine inventory within the "Camptown" inventory area was waste-rock pile #200, associated with caved adit #100 (Benson and others, 1997, p. 19–20). These features lie on the west side of Pomeroy Gulch, about 1,800 feet upstream from the Mary Murphy 1400-level adit (Figure 2).

Adit #100 was the largest mine on the western side of Pomeroy Gulch in this area. A miniscule volume of water trickles from the caved adit and soaks into the ground before reaching Pomeroy Gulch at the surface.

Dump #200 has a cabin foundation on it. The eastern toe of the pile is adjacent to and forms the bank of the Pomeroy Gulch stream for about 100 feet. A spring emerges adjacent to the toe near the northeast part of dump and nearly at stream level.

WASTE AND HAZARD CHARACTERISTICS

Adit #100 was a crosscut, excavated to develop vein(s) at depth. Most of the 1,200-cubic-yard dump is barren, blocky monzonite country rock. The small amount of quartz vein material on the dump contained pyrite, galena, and sphalerite. In October 1999 composite dump sample MWR-8 was collected (Table 6). Results indicated weakly mineralized rock with elevated concentrations of manganese, lead, and zinc. The sample had high neutralization potential and low potential acidity, and the net acid-base potential was +10.3 tons $CaCO_3$/1,000 tons. Paste pH was slightly alkaline at 7.61.

In October 1999 water from the portal seep had 6.85 pH and 234 µS/cm conductivity and was not sampled. The flow rate was too low to measure, and no suitable sample location was found. Collecting enough water from the mossy channel for a test was difficult, and the test water was somewhat stirred up and murky which may have affected the test results slightly.

The spring near the northeast toe of dump #200 was tested and had 7.08 pH and 110 µS/cm conductivity. This spring had no associated precipitate and appeared clean. Pomeroy Gulch stream water was tested immediately upstream of the spring and had similar parameters of 7.16 pH and 102 µS/cm conductivity. Test parameters and the location of the spring virtually at stream level suggest that most of the water is probably from the Pomeroy Gulch alluvial aquifer, rather than seepage from the waste rock. No water samples were collected.

Further downstream, but upstream of the influence of effluent from the Mary Murphy 1400-level, water sample MH-5 was collected from Pomeroy Gulch (Figure 2). In October 1999 flow was about 300 gpm, pH was 6.37, and conductivity was 118 µS/cm. All of the tested parameters fell within standards (Table 5). Compared to water sample MH-2, collected from Pomeroy Gulch upstream of the influence of the "West Pomeroy Gulch", "Middle Pomeroy Gulch", "Above Camptown", and "Camptown" inventory areas, pH was slightly lower, and conductivity was slightly higher. Hardness was higher at the downstream site. Most of the analytical results were similar, although zinc and sulfate increased, and aluminum decreased at the downstream site (Table 5). Water sample results suggest little degradation associated with mines upstream of the Mary Murphy 1400-level.

MIDDLE MARY MURPHY

The "Middle Mary Murphy" inventory area (381/4280-2) is about 2.5 miles south of St. Elmo on the west side of Chrysolite Mountain in an area known as Murphy Hill (Figure 2). From St. Elmo, Forest Road 295 and Forest Road 297 provide access to the mine features. CGS assigned EDRs of 3 to three waste-rock piles. Dumps #200 and #205 are associated with adits #100 and #105, respectively. Dump #201 is adjacent to a transfer station at the base of a tramline near the Mary Murphy 1400-level adit (feature #100). These waste-rock piles appear to be located on NFS land. Dumps #200 and #201 came from the Mary Murphy Mine and are near the 1400-level (No. 14 or 14th level) portal. For several years the 1400-level was the main level of the Mary Murphy Mine. The Caro, Sun No. 1 Lode, No. 1400 Tunnel and Tunnel Site unpatented claims included the portal (feature #100) and waste-rock piles #200 and #201. The 1400-level portal is near, and the adit trends toward the patented H.M. Stanley Lode claim (Figure 40). Initially the Mary Murphy and Pat (Paddy) Murphy Mines worked two parallel veins (Mary Murphy and Pat Murphy) from different openings on the Mary Murphy Lode claim. Through the long years of production, the Mary Murphy Mine and nearby mines evolved into a large, interconnected, multi-level operation with several openings. A sizable block of mining claims covered the surface and underground workings. This report attempts to differentiate the various levels and workings within the mine complex, but usually the past records lump information together, and the facts are not separable.

Neither a claim nor mine name was identified for adit #105 and associated waste-rock pile #205. Dings and Robinson (1957, plate 1) show a mine at or near the site of adit #105 (Figure 24), suggesting that adit #105 was excavated prior to 1957. This caved adit trends toward the Stockholm Lode, situated about 300 feet to the east. Adit #105 may have been related to the Stockholm Lode, but it may have been an exploratory effort to discover a vein parallel to the Mary Murphy vein.

MINING HISTORY

The Mary Murphy Mine was by far the largest producer in the Chalk Creek mining district. It has a long operational history spanning several decades, and it is connected to several other important mines in the district through underground workings. Physical, operational, and ownership ties to other mines further complicate its history.

Because it may be related to adit #105, information regarding the Stockholm Lode is included in this section.

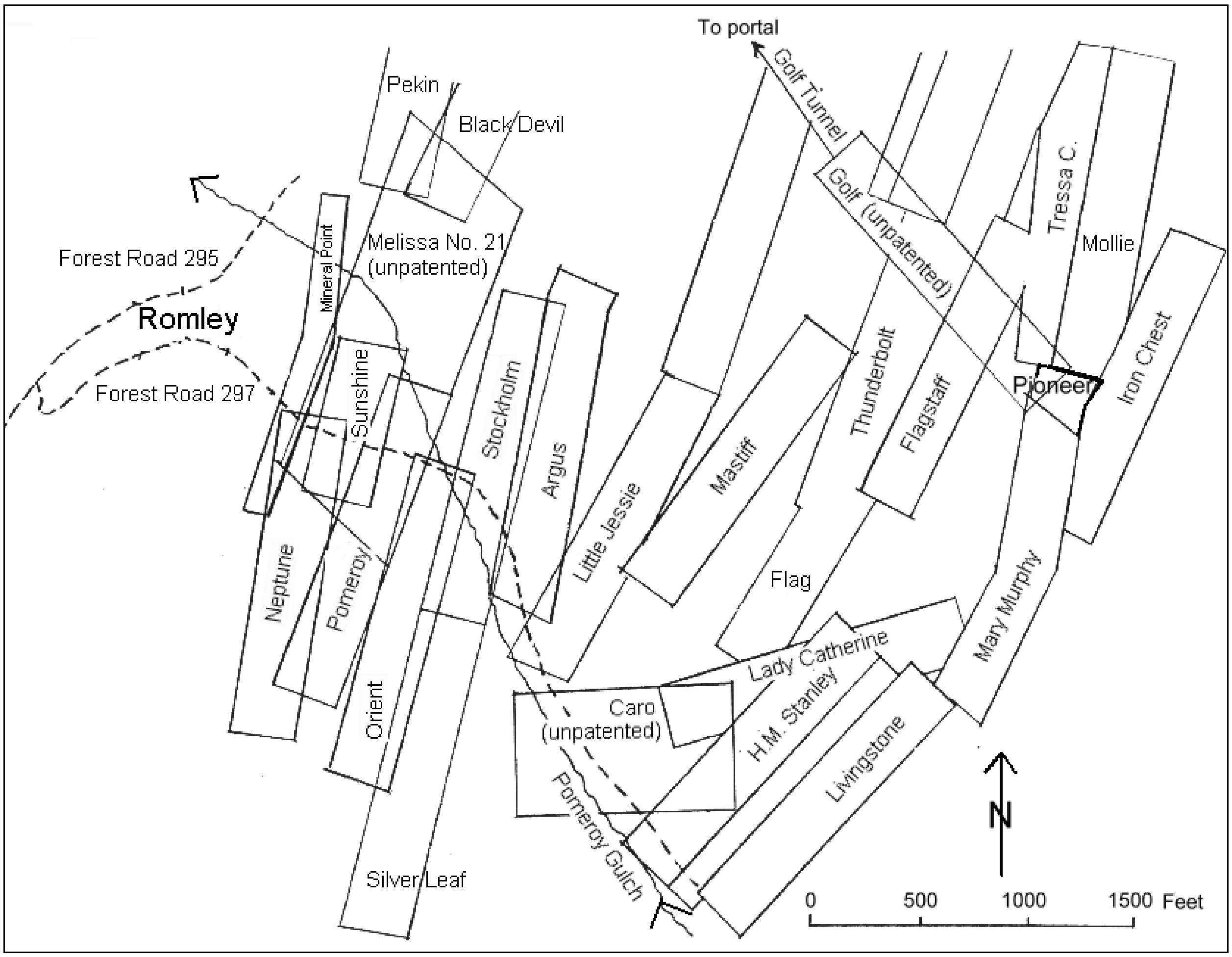


Figure 40. Map of relative positions of some of the patented and unpatented mining claims in lower Pomeroy Gulch. (Modified from county land status plats. Numerous discrepancies exist between this map, individual mineral surveys, and the Forest Service PBS map; scale is approximate.)

Mary Murphy Mine

From the late 1870's to 1925, the Mary Murphy Mine, one of the first mines developed in the district, was operated almost continuously. The mine was active intermittently from 1932 to 1954. Although sporadic exploration and development efforts have been attempted, no production is recorded after 1954.

Reportedly, more than $5,000,000 of ore was produced prior to 1898 (*Denver Times*, March 30, 1901, p. 11). In 1898 the mine boosted production significantly, and in one year it produced more than its combined previous production (*Mining Reporter*, October 6, 1898, v. 38, p. 12). Table 7 shows the recorded production from 1901 to 1949.

Mary Murphy Gold Mining Company owned and operated the mine during its most productive years. After 1932, individuals or companies leasing from Mary Murphy Gold Mining Company provided virtually all of the production.

The original location date for the Mary Murphy claim was not found. It may be in the Lake County records.

1877. A 10-foot-wide vein on the Mary Murphy assayed 100 oz/ton silver and 2 oz/ton gold (*Daily Rocky Mountain News*, March 28, 1877, p. 4).

1879. In February, the reported assay values from the Paddy and Mary Murphy veins on the Mary Murphy Lode claim averaged $48/ton. The ore was considered unusual for this district because it contained gold ranging from 0.5 to 2.5 oz/ton. (See *Leadville Daily Chronicle*, February 8, 1879, p. 3.) Mineral Survey No. 330 completed on the Mary Murphy Lode claim showed a discovery shaft and two adits. (See Mineral Survey No. 330, BLM files.)

At the end of the year, A.E. Wright, M.D. Wright, and Kansas City Mining and Smelting Company (organized by Benjamin L. Riggins, John Chapman, and George Holmes; incorporated in 1876) owned the Mary Murphy and Pat Murphy Mines. Development on the Mary Murphy consisted of two shafts with two 25-foot-long levels each. Development on the Pat Murphy consisted of a 30-foot-long level 25 feet below the surface. Average assays of the Mary Murphy vein were 75 oz/ton silver and 2 oz/ton gold. Ore from the Pat Murphy vein assayed from $50 to $150/ton silver. (See Corbett, 1879, p. 279.)

1880. The Mary Murphy Mine started shipping bulk ore to Denver. A 4.5-foot-thick ore zone was exposed at the face of 180-foot-long level #2. The "Pat and Mary Murphy mines were sold a few months since for $125,000, and stocked by St. Louis parties on the close corporation plan for $250,000, and par is now offered for the stock, but none for sale." Production from the Murphy mines averaged 3 tons/day. (See *Rocky Mountain News*, October 6, p. 6; October 19, p. 7; November 9, p. 3, 1880.)

J. Baily, H. Bernard, and J. Schafer located the H.M. Stanley Lode claim just to the east of the future site of the Mary Murphy 1400-level portal (bk. 15, p. 107). Baily acquired Bernard's interest in November (bk. 18, p. 551).

Table 7. Production of the Mary Murphy Mine from 1901 through 1949 (Dings and Robinson, 1957, p. 100).

Production of the Mary Murphy mine, 1901–49

[Compiled by A. J. Martin, Statistics Branch, Economics Division, U. S. Bureau of Mines, Denver, Colo. No production recorded for years not listed. Published by permission of the lessors]

Year	Crude ore (dry tons)	Gold (ounces)	Silver (ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
1901	10,261	3,794	45,662	—	—	—
1902	16,465	14,818	57,782	—	—	—
1903	11,661	5,758	34,134	—	—	—
1904	4,807	949	6,438	—	142,761	—
1906	700	427	24	—	146,474	68,606
1907	2,000	1,375	12,666	11,960	196,860	56,240
1908	1,900	1,320	6,130	—	150,000	140,000
1909	68	75	1,231	409	6,208	—
1910	513	525	9,767	3,142	48,500	—
1911	1,308	1,623	19,572	20,487	178,479	—
1912	3,220	3,767	33,202	41,690	368,126	—
1913	43,426	14,698	148,110	147,736	2,841,168	1,494,835
1914	56,895	14,493	141,356	246,494	3,366,434	1,960,851
1915	60,588	14,152	121,159	406,263	4,001,582	4,119,283
1916	5,887	8,589	75,575	228,778	2,576,002	2,670,878
1917	36,602	5,481	47,015	72,700	1,198,503	1,455,934
1918	29,554	5,232	55,036	74,157	1,091,934	1,739,347
1919	16,381	2,737	27,087	30,237	453,209	—
1920	2,235	1,486	33,616	14,140	237,486	—
1921	2,069	1,535	25,045	7,575	191,486	—
1922	1,164	931	9,543	9,585	587,948	—
1923	818	741	11,393	6,593	103,473	29,070
1924	374	385	6,023	982	48,065	—
1932	63	36	643	—	2,674	—
1933	203	125	1,709	175	13,733	—
1934	913	1,319	9,662	—	94,560	—
1935	976	1,200	8,741	16,126	93,855	18,480
1936	1,134	1,316	9,236	22,430	224,086	326,356
1937	991	822	8,028	22,164	207,866	280,733
1938	248	137	1,778	5,123	61,071	71,608
1939	129	139	1,511	1,211	29,630	13,937
1940	114	74	757	741	28,780	13,699
1941	91	129	613	2,033	19,821	39,540
1942	50	39	417	816	7,764	10,920
1944	36	11	321	472	5,853	11,614
1949	370	16	136	—	8,077	13,413
Total	314,214	110,254	971,118	1,394,219	18,732,968	14,535,344

1881. The Mary Murphy Lode was patented in January (USFS records). At the time, the Mary Murphy Mine was the deepest mine in the district at about 100 feet deep, and the ore was worth $500/ton (*Rocky Mountain News*, January 15, 1881, p. 3.) In February, a large vein of high-grade ore containing rhodonite, silver, lead, and gold was revealed, and in June, a 5-foot-thick ore body was exposed at a depth of 250 feet (*Denver Republican*, February 8, p. 2; June 21, 1881, p. 6). Colonel John Kelly managed the Pat and Mary Murphy Mines. The St. Louis company that owned the mines rejected a $2 million offer for the property. (See *Rocky Mountain News,* August 24, 1881, p. 6.)

By late in the year, the Mary Murphy vein had a known length of 5,000 feet. The southern extension of the vein was 8 feet wide and was exposed in a 150-foot-long tunnel on the Livingstone Lode claim. An 8- to 10-foot-wide pay zone in the vein was exposed along 410-foot-long tunnel #3 (level 3) and in 250-foot-long tunnel #2 (level 2) on the Mary Murphy Lode. Tunnel #4 (level 4), just north and above the Livingstone Lode was 80 feet long. On the north side of the Mary Murphy Lode, a 45-foot-long adit with a 22-foot-long crosscut was on the Pioneer Lode. The northern extension of the Mary Murphy vein was exposed on the Mollie Lode. (See *Denver Republican*, October 24, 1881, p. 1.)

A shortage of ore cars limited daily production at the Mary Murphy Mine to 30 tons. Ore contained from 100 to 600 oz/ton silver, 1 to 5 oz/ton gold, and 25 to 60% lead. Profits after expenses of mining, transportation, and milling were from $75 to $100/ton. Thirty employees worked at the mine, and shipments from June to October amounted to 1,800 tons. In November, three carloads per day were shipped. (See *Denver Republican*, October 24, p. 1; November 2, p. 6, 1881.) A 250-ton/day capacity, 1-mile-long tramway was completed later in November (*Rocky Mountain News*, November 23, 1881, p. 2). Despite the completion of the tram, only three carloads per week were shipped in December. The lowest grade ore contained 122 oz/ton silver (*Denver Republican*, December 13, 1881, p. 6). Burchard (1882, p. 366) reported that the absence of a railroad limited production to about 30 tons/day, about 50% of the mine's capacity.

1882. Early in the year, 18 miners were doing development work, but no shipments were made. Daily production of 5 to 6 tons of high-grade ore ($300 to $500/ton) was stored in an 800-ton capacity ore house. Mary Murphy Mining Company planned to construct a mill at the mouth of Pomeroy Gulch and use a new concentrating process invented by Captain Perry. A contract was let for 200 feet of tunnel on the second and third levels, 300 feet of tunnel on the fourth level, and an 80-foot winze connecting the third and fourth levels. The fourth level would become the haulage level. All the ore was moved through the fourth level to the tramway located near the portal. By March, two shifts of workers operated on levels 2, 3, and 4; and level 4 had reached the vein. Tramway buckets, each with a capacity of 150 lbs, transported ore to the railroad for $0.30/ton compared to $3.50/ton by wagon. Bob Crawford, working as a contractor, completed 30 feet of tunnel on high-grade ore on the Pat Murphy vein in April. In May, a winze connecting levels 4 and 5 was started on the Mary Murphy vein. Large quantities of free gold and native copper were exposed in an 11.5-foot-wide vein on level 4. In June, the estimated value of ore exposed in the Pat and Mary Murphy veins was more than $2,000,000. (See *Denver Republican*, January 24, p. 6; March 7, p. 6; June 8, p. 6k, 1882; *Rocky Mountain News*, April 7, p. 2; May 13, p. 2, 1882.)

At year end, development on the Mary Murphy vein included the discovery shaft (winze A) near the crest of Murphy Hill on Chrysolite Mountain. The shaft was 100 feet deep and connected to level 2. Level 2 started on a vein outcrop and followed a 5-foot-wide vein for 425 feet. An 80-foot-deep winze (winze B) connected levels 2 and 3. Level 3 was 550 feet long and followed an 8-foot-wide vein for most of that distance. Ore values near the end of level 3 were $600 to $700/ton. Two 80-foot-deep winzes (winzes C and D) connected levels 3 and 4. Level 4 was 425 feet long and followed an 11- to 16-foot-wide vein (ranging in value from $90 $150/ton) for 265 feet. Near the portal of level 4, a 4,996-foot-long tramway with 96 buckets, each with a 200 lb capacity, transported ore to the South Park Railroad at a rate of 128 tons in a 20-hour period. Winze E, a continuation of winze D, was connected to level 5 at a depth of 80 feet. Winze F was a continuation of winze C and was within 10 feet of connecting to level 5. Work started on "the main tunnel site" (adit #100), which was expected to intersect the vein about 1,500 feet from the portal and a vertical distance of 808 feet below level 5. Mine development was the primary objective, and only one 200-ton shipment was made. (See Burchard, 1883, p. 416–417, 568.)

The Pat Murphy vein was developed on two levels (146 and 230 feet long), 100 feet below the crest of Murphy Hill and 100 feet apart. Assays ranged from $60 to $120/ton on a 13-foot-wide vein exposed along the entire 230-foot length of the lower level. John G. Kelly was listed as the manager of Murphy Mining Company. (See Burchard, 1883, p. 416–417, 568.)

The H.M. Stanley Lode claim, owned by J.H. Baily and others, was surveyed. (Mineral Survey No. 3030, BLM files). The portal of the 1400-level of the Mary Murphy Mine (adit #100) is adjacent to the H.M. Stanley, and adit #100 trends toward this claim. Adit #100 is above the workings surveyed on the H.M. Stanley, but they could have a subsurface connection.

1883. A British syndicate negotiated to buy the Mary Murphy group for $2,500,000 in February, but the purchase never closed. Large quantities of ore were shipped in the summer; and a contract for 380 feet of tunnel and a 90-foot-deep winze on the Pat Murphy vein was up for bid in August. Most of the adit and winze would require timbering. Dr. Campbell acquired a one-year lease on the Alpine Smelter and intended to treat 30 tons/day of Mary Murphy ore using a "new" process. (See *Rocky Mountain News*, February 12, p. 2; August 11, p. 3; September 24, p. 7, 1883.) Mill runs of sorted ore contained 1 to 2 oz/ton gold and 30 to 50 oz/ton silver. Four shafts, connected by adits 100- to 500-feet long, developed the Mary Murphy vein. Two adits, 146 and 250 feet long, developed the Pat Murphy vein. Known ore reserves averaging $50/ton net would last at least two years at a mining rate of 50 tons/day, depending on transportation rates. A 1-mile-long tramway connected the mine to the railroad. Mary Murphy Mining Company (incorporated in Missouri in 1880; J.H. Morley-president; M. Donaldson-vice president, C.H. Billings-treasurer, J. Kelly-general manager, T.W. Werlitz-mining engineer) were the owners. (See Corregan and Lingane, 1883, p. 101–102.)

By the end of the year, development on the Mary Murphy vein included a 100-foot-deep winze from the surface to 600-foot-long level 2. Level 3, connected to level 2 by an 80-foot-deep winze, was 700 feet long. Level 4, connected to level 3 by two 80-foot-deep winzes, was 485 feet long. Work continued on a lower crosscut intended to intersect the vein 2,100 feet from the portal (adit #100). A large amount of ore with an average value of $100/ton was mined from level 4. (See Burchard, 1884, p. 256–257.)

The Pat Murphy vein was developed on three levels. No. 1 level was 100 feet below the crest of Murphy Hill and was 160 feet long. No. 2 level was 100 feet below level 1 and was 285 feet long. No. 3 level, 90 feet below level 2, was started late in the year. Assays averaged $70/ton across a 5-foot-wide vein exposed on level 1 and $90/ton on a 13-foot-wide vein on level 2. Smelters paid an average of $3,700/month for ore produced by Murphy Mining Company. (See Burchard, 1884, p. 256–257.)

In November, J. Bailey sold the H.M. Stanley Lode to J. Kelly, and Kelly sold the claim to L. Green (bk. 37, p. 152 and 190). In December, Green sold part interest back to Kelly, and J. Schafer sold his interest in the claim to Kelly (bk. 37, p. 194; bk. 40, p. 56).

1884. Early in the year, a large ore shoot was discovered on the Pat Murphy vein. In June, contractors were considering doubling the workforce to 100, and 5 carloads of ore were produced the first week after regular shipments resumed for the season. In September, Mary Murphy Mining Company leased the Alpine smelter and planned to process 400 tons of ore using a new process invented by Dr. Campbell. Hurley, Hogan, and Sullivan completed a 65-foot-deep winze below level 4. During October, 16 tons/day of low-grade ore, containing 14% to 18% zinc, up to 10% lead, and 50% silica, was processed at the Alpine smelter. The 18-day, 400-ton experimental run at the Alpine smelter was successful, netting $8,000. In November, 45 employees shipped about 30 tons/day. An additional 600 tons of ore were shipped to Gunnison and Denver in November. Eighteen carloads were shipped during the first ten days of December. (See *Rocky Mountain News*, February 1, p. 3; June 20, p. 6; June 23, p. 6; September 3, p. 6; October 16, p. 6; October 30, p. 6; November 23 p. 7; November 29, p. 6; December 3, p. 6; December 19, p. 6, 1884.)

By the end of 1884, total development on the Mary Murphy vein was 2,639 feet. Development included a 130-foot-deep discovery shaft that connected to 500-foot-long level 2; an 80-foot-deep winze connecting level 2 to 750-foot-long level 3; and three 80-foot-deep winzes between level 3 and 850-foot-long level 4. Contract work started on a 600-foot-deep winze between levels 4 and 7. Ore was stoped above levels 3 and 4. Annual production was 2,635 tons of ore worth $92,246. (See Burchard, 1885, p. 188–189.)

J. Kelly sold his interest in the H.M. Stanley Lode to Mary Murphy Mining Company in January (bk. 37, p. 198). J. Bailey and J. Schafer received a patent on the H.M. Stanley Lode in April (bk. 40, p. 201). The 1400-level adit extends through the H.M. Stanley Lode.

1885. During February, about 5 cars/day were shipped to the Grant works in Denver. Shipments during the first week of March totaled 180 tons, and about 1,000 tons were shipped at a rate of 4 to 6 carloads/day for the entire month. April shipments totaled 920 tons (71 carloads). Output decreased because the mine was quarantined for smallpox. At a production rate of 50 tons/day, 2 years of reserves were estimated on level 4. (See *Rocky Mountain News*, February 10, p. 2; March 6, p. 6; April 3, p. 6; April 7, p. 3; May 8, 1885, p. 6, 1885.)

1887. The Mary Murphy Mine produced $383,067 in gold, $248,080 in silver, and $107,523 in lead. Production figures for the Pat Murphy Mine were combined with the Iron Chest Mine, and these mines shipped nearly $19,000 in gold and $49,131 in silver. (See Munson, 1888, p. 164.)

1888. Production figures from the Mary Murphy Mine were not released. Ore sold from the Pat Murphy Mine was valued at $5,250 in gold, $11,897 in silver, and $1,320 in lead. (See Munson, 1889, p. 104.)

1889. Shipments from the Mary Murphy Mine were worth $205,869 in gold, $171,224 in silver, and $57,326 in lead. Pat Murphy Mining Company produced $4,080 in gold, $1,978 in silver, and $1,550 in lead. (See Smith, 1890, p. 146.)

1890. Production from the Mary Murphy Mine was worth $154,183 in gold and $188,466 in silver. The Pat Murphy Mine had production of $171 in gold and $2,702 in silver. (See Smith, 1891, p. 130.)

1891. Ore shipments from the Mary Murphy Mine were worth $206,718 in gold and $64,645 in silver (Smith, 1892, p. 176).

1892. Production declined to $83,822 in gold, $36,796 in silver, and $6,148 in lead (Smith, 1893, p. 121).

1893. The price of silver plummeted. After the silver crash, little work was done in the Chalk Creek mining district until B.F. Morley erected the New Morley smelter in Buena Vista in 1898. (See *Denver Times*, April 6, 1901, p. 11.)

1897. The Mary Murphy Mine was owned by Mary Murphy Mining Company (W.R. Donaldson-president; J.W. Wallace-secretary) and leased to Golf M. & M. Company (B.F. Morley-manager). The 8-foot-wide vein had average assays of $8 to $10 in gold, $5 to $6 in silver, and 15% lead. About 40 workers produced 2,500 tons/month. After milling the ore to an 8 to 1 ratio, the concentrate had a value of $35/ton. Gross investment was $400,000, and gross receipts were $3,000,000. The mine was operated through two crosscuts and three adits. Tunnel No. 14 (adit #100) was the deepest opening to the surface. It intersected the vein 1,100 feet below the surface, 1,671 feet from the portal, and drifted 325 feet to the west on the vein. Tunnel No. 7, situated 570 feet above No. 14, intersected the vein at a depth of 550 feet and 400 feet from the portal, and drifted 1,000 feet on the vein. Ore from level 14 was hoisted through a three-compartment winze to No. 7, where a 4,500-foot-long bucket tram transported it to the mill. Six levels, with extensive drifting, were between levels 14 and 7, and tunnel No. 14 was connected to the surface through numerous openings and upraises. Level 4 was 260 feet above level 7 and followed the vein for 1,000 feet. Levels 2 and 3 were 80 feet apart, and a 100-foot-deep shaft connected No. 2 to the surface. Past production was mostly from workings above level 7 in the Mary Murphy Mine. Very little drifting had been done on the Pat Murphy vein, which was developed on four levels. (See F.H. Nye, Inspector and Mine reports for 1897—Mary Murphy Mine, v. 1, p. 64; v. 3, p. 40, CBM.)

1898. The New Morley smelter in Buena Vista was completed, sparking an increase in production from the Mary Murphy and other mines in the Chalk Creek mining district. B.F. Morley's company controlled the Mary Murphy as well as "other important properties in the vicinity" (*Denver Times*, April 6, 1901, p. 11). Following completion of the smelter, more ore was shipped from the mine during the summer of 1898 than its combined previous production dating back to the 1870s (*Mining Reporter*, October 6, 1898, v. 38, p. 12). Golf Mining and Milling Company (Colonel B.F. Morley, manager) operated the mine, which used a 100-ton capacity tramway (Western Mining Directory Company, 1898, p. 263).

1899. Forty employees of Mary Murphy Mining Company operated the mine (Mine Manager report for 1899—Mary Murphy Mine, p. 125, CBM). In July, a 4-foot-wide quartz vein exposed in a 6-foot-deep shaft assayed $60/ton gold (*Denver Times*, July 28, 1899, p. 2).

1900. Golf Mining and Milling Company (Black, president; Morley, secretary, treasurer, and manager; John Taylor, superintendent) leased the Mary Murphy Mine from Mary Murphy Mining Company. The mine was developed by six adits from 80 to 500 feet apart with 10 miles of drifts and raises. No. 7 was the main working level and was the second longest level. Thirty workers mined an average of 60 tons/day worth $12 to$15/ton. Six mills with a combined capacity of 100 tons/day, processed lead-zinc-silica ore. (See Mine report and Mine Managers report for 1900—Mary Murphy Mine, v. 4, p. 136; p. 73, CBM.) According to Hodges (1901, p. 102–103), Buena Vista Mining and Smelting Company leased the Mary Murphy Mine and produced an undetermined quantity of ore. Morley was probably a principal officer in Mary Murphy Mining Company, Golf Mining and Milling Company, and in the Buena Vista smelter.

1901. New developments added about 300 tons/day of ore reserves in addition to the ore that was shipped. In April, Morley began increasing the smelter capacity to 250 tons/day because of the large known reserves. By August, the Mary Murphy Mine supplied all of the ore for the New Morley smelter, and the 50-person workforce at the mine was expected to double when smelter expansion was completed. (See *Denver Times*, March 30, p. 11; April 6, p. 11; August 4, p. 9, 1901.) Golf Mining and Milling Company continued leasing the mine from Mary Murphy Mining Company. Six tunnels with 14 levels developed the mine. Level 7 connected to level 14 through a 350-foot-deep, 4- by 12-foot winze. Level 14, another crosscut adit, was the lowest working on the vein. Total length of workings was about 23,000 feet. Nearly all production originated above level 7. A crosscut tunnel (probably the Golf tunnel) was started about a mile down the hill and was 50 feet long. (See Mine report for 1901—Mary Murphy Mine, v. 5, p. 118–119, CBM.) This new adit was projected to be 5,000 feet long and would be used as a haulageway and for drainage (*Denver Times*, December 29, 1901, sec. 3, p. 8).

1902. Mary Murphy Mining Company leased the mine to Golf Mining and Milling Company, who operated with 35 employees. Ore was processed at the smelter in Buena Vista. (See *Mining Reporter,* December 4, 1902, v. 46, p. 470.) Steam power was used in the mine, and its associated mill had 80 stamps (Dunbar, 1902, p. 184). According to Wahlgreen (1902, p. 32), Mary Murphy Mining and Milling Company (Morley, manager) controlled eight claims, the ore was primarily lead and zinc, the associated mills had 100-ton capacity, and 60 people were employed.

1903. Early in the year, Golf Leasing Company (Morley, president) worked the property. Monthly shipments averaged 100 tons with an average value of $30/ton. The Golf Tunnel was over 2,000 feet long and was advancing toward the vein at a rate of 175 feet/month. It was calculated that the vein would be intersected at a depth of 2,600 feet. (See *Mining Reporter*, April 2, 1903, v. 47, p. 313.) Morley died of asphyxiation in the mine in September, and the smelter and mine closed pending a meeting of the directors and stockholders. (See *Denver Times*, September 23, 1903, p. 4.) W.R. Donaldson was president of Mary Murphy Mining Company, and Golf Mining and Milling Company continued leasing the mine. R.G. Hinkson, Morley's nephew, became the general superintendent, and Taylor was the superintendent at Romley. Thirty-six workers mined ore with an average value of $12/ton. (See Mine Manager report for 1903—Mary Murphy Mine, p. 143, CBM.) Reportedly, the mine lost money during its "early years" despite having good ore bodies and equipment. However, "for the past several years the property has operated at a profit." (See CBM, 1903, p. 31.)

1904. In February, 500 tons of $20/ton ore was shipped to the Globe plant; the company's plant in Buena Vista was closed. By May, a new concentrating plant at Romley was processing 50 tons/day of ore. Most of the ore was from the 1,100-foot level. (See *Mining Reporter*, May 19, 1904, v. 49, p. 512.) Golf Mining and Milling Company did extensive development work (*Mining Reporter*, June 16, 1904, v. 49, p. 616).

1906. "The J.A.J. Milling Company resumed operations at the Mary Murphy Mine" (Naraome, 1907, p. 209).

1907. J.A.J. Milling Company operated the mine, which was the largest producer in the Chalk Creek mining district. Most of the ore was processed at the Pawnee mill, equipped with 20 stamps, plates, and Wilfley tables. Some gold was recovered on the plates. Lead concentrates (containing gold, silver, and copper), zinc concentrates, and a small amount of precious-metal-bearing lead ore were shipped to the smelter. Work continued on a 4,000-foot-long adit intended to intersect the Mary Murphy vein at a depth of 2,200 feet. "The Mary Murphy Reduction Company was erecting a 200-ton concentrating plant in St. Elmo." (See Naraome, 1908, p. 247.)

1908. J.A.J. Milling Company operated the Mary Murphy, the only producer in the district (Henderson, 1909, p. 373). John Taylor & Company leased the mine from Mary Murphy Mining Company (Donaldson, president). Six adits (no. 1=400 feet, no. 2=500 feet, no. 3=800 feet, no. 4=1,000 feet, no. 7=1,200 feet, and no. 14=1,600 feet) developed the mine. Underground workings included 1,100 feet of shafts, 5,400 feet of tunnels, and 1,600 feet of crosscuts. Assays averaged $20/ton; and total expenses (mining, transportation, and treatment) ranged from $7.60 to $8.60/ton. (See P.J. Buckel, Inspector report—Mary Murphy Mine, September 26, 1908, v. 10, p. 13, CBM.) It is not clear if J.A.J. Milling Company was related to Taylor & Company.

1909. An unspecified quantity of ore was sold from the Mary Murphy and two other mines in the Chalk Creek district (Henderson, 1911a, p. 305).

1910. Mary Murphy Mining Company did extensive development work and increased mine production. Partially oxidized zinc-lead-iron-copper ore in quartz and rhodonite was mined, although zinc was not recovered. (See Henderson, 1911b, p. 402.)

1911. Mary Murphy Gold Mining Company (C.C. Parsons, president; H.W. Robinson, secretary; George E. Collins, manager; E.H. Crabtree, mine superintendent) owned and operated the mine with an average of 45 workers. A list of claims owned by the company included the Caro Lode, the site of the 1400-level adit (adit #100). Length of underground workings totaled about 7 miles. The 4,300-foot-long Golf Tunnel intersected the vein about 2,000 feet below the surface and 870 feet below the older workings. (See Mine Managers report for 1911—Mary Murphy Mine, p. 24, CBM; CBM, 1913, p. 35.) Compared to 1910, production of partially oxidized lead-sulfide ore increased significantly. The ore was mined entirely above level 3. (See Henderson, 1912, p. 534.) This is the first year that Mary Murphy Gold Mining Company is mentioned. It is not clear if it evolved from Mary Murphy Mining Company, or is an entirely new entity. This is also the first year that the Golf Tunnel is reported to have intersected the vein.

1912. Mary Murphy Gold Mining Company (Parsons, president; Allen F. Ayres, vice president; Robinson, secretary; Collins, manager; D.J. Richards, superintendent) owned and operated the mine with an average of 70 workers including 22 lessees. Four 4-foot-wide veins had average assays of 1 oz/ton gold, 10 oz/ton silver, 8% zinc, and 8% lead. Lessees shipped 300 tons/month from the old workings to the smelter. Direct shipping ore had an average value of $25/ton and milling ore averaged $8/ton. A 100-ton/day mill and a 20-ton/day electrostatic separation plant were used to treat the mill-grade ore. The company drove 750 feet along the vein in the Golf Tunnel. (See J.R. Curley, Inspector report, February 12, 1912; Mine Manager report for 1912—Mary Murphy Mine, November 25, 1912, CBM.) Production continued increasing and a mill was under construction at the portal of the Golf tunnel. In addition to conventional concentration methods, the mill was designed for amalgamation and electrostatic separation of zinc, iron, and copper. (See Henderson, 1913, p. 699.) Information from the mine manager and inspector suggests that this mill and separation plant were operating by the end of 1912.

1913. Mary Murphy Gold Mining Company continued as owner/operator. Employment increased to 130 including lessees. Robb Rowland, Mark Swope, Alfred Thorndale, Mike Hines, William Altman, and L.E. Cartwright were some of the lessees. Direct-shipping ore ranged from $15 to $60/ton in value, and crude ore processed at the new 150-ton/day mill ranged from $5 to $10/ton in value. (See Mine Manager report for 1913—Mary Murphy Mine, p. 65, CBM.) Combining production of the company and lessees, 7,598 tons ($230,825) of crude lead ore were shipped directly to the smelter. The company's mill processed 34,271 tons of ore and recovered 477 tons ($5,636) of bullion and 4,069 tons ($160,136) of lead-iron-copper-zinc concentrates. (See Henderson, 1914, p. 246; Henderson, 1917, p. 440.)

1914. Mary Murphy Gold Mining Company operated with 150 workers and lessees. E. Erickson, Mark Swope, Alfred Thorndale, Perry Maine(?), William Grose, and T. Bronson leased parts of the mine. (See Mine Manager report for 1914—Mary Murphy Mine, p. 59, CBM.) Production was 7,041 tons ($183,504) of crude lead ore that was shipped directly to the smelter. The company's mill processed 48,526 tons of ore and recovered 425 tons ($5,289) of bullion and 6,137 tons ($211,217) of lead, iron, copper, and zinc concentrates. (See Henderson, 1917, p. 440.) Ore was produced on all levels of the mine above the 1400-level adit, a vertical distance of 1,200 feet. The Golf Tunnel intersected the vein 3,800 feet from the portal and followed the vein for 200 feet. Near the end of the adit, a three-compartment raise was started to connect the Golf Tunnel to the older workings about 800 feet above. (See CBM, 1914, p. 32; Collins, 1914, p. 66.)

1915. The Mary Murphy Mine continued as the principal producing mine in the county. About 4,500 tons of ore worth about $100,000 were shipped directly to the smelter. In addition, the mill processed 55,880 tons, recovering 1,925 tons ($168,484) of lead concentrate, 1,741 tons ($43,470) of lead-copper concentrate, 4,700 tons ($327,570) of zinc concentrate, and 49 tons ($614) of bullion. A flotation plant for the treatment of slimes was added to the wet-concentration mill near the portal of the Golf Tunnel. The mill processed about 175 ton/day and operated throughout the year, however, a lack of mill-grade ore limited operations. Production exceeded the discovery of additional reserves. Ore bodies were irregular and estimating reserves was difficult. Estimates of broken ore reserve in the mine were 12,000 tons of mill-grade ($125,000 net value) and 100 tons of smelting-grade ore ($3,000 net value). New reserves were needed for mill operations. (See Henderson, 1917, p. 439–440.)

Beginning in 1915, production from the Iron Chest Mine was included with the Mary Murphy Mine (Dings and Robinson, 1957, p. 98). Presumably the same company operated both mines. The mines were not connected underground until 1921.

1916. Mary Murphy Gold Mining Company owned or controlled a number of patented and unpatented mining claims including the Stanley, Tressa C., Iron Chest, Caro, Lady Murphy No. 2, Old Discovery, Golf Tunnel and Tunnel site, and part of the Red Cloud. Development in the Mary Murphy Mine during the year included 290 feet of raises, 1,560 feet of winzes, 3,520 feet of drifts, and 2,055 feet of crosscuts. A three-compartment raise connected the Golf Tunnel to the 1400-level. Total development of the mine included about 2,700 feet of shafts, 3,000 feet of winzes, and several miles of drifts and crosscuts. In addition to the underground development, aerial trams served the 1400- and 700-levels. Ore averaged 0.18 oz/ton gold, 2 oz/ton silver, 3% lead, 0.5% copper, 6% zinc, and 2.5% manganese. (See A.E. Moynahan, Inspector report, August 17, 1916; Operators Annual Report for 1916—Mary Murphy Gold Mining Co., January 31, 1917, CBM.) A total of 771 tons of crude ore worth $20,121 was shipped directly to the smelter. The mill processed 51,116 tons and recovered 1,587 tons ($171,788) of lead concentrates, 1,635 tons ($58,323) of lead-copper concentrates, and 3,971 tons ($227,459) of zinc concentrates. The mill operated all year and processed about 150 tons/day. (See Henderson, 1919, p. 348–349.)

Between 1915 and 1916 up to 225 people worked in the mine. After a raise connected the Golf Tunnel to the 1400-level, new levels were started between the two tunnels. (See CBM, 1916, p. 63.)

1917. Because of lower grade ore, higher operating costs, decreased tonnage, and falling zinc prices, Mary Murphy Gold Mining Company lost money for the year. A total of 1,040 tons of crude ore worth about $25,934 was shipped directly to the smelter. The mill operated throughout the year, but the workforce was reduced to two shifts. About 100 tons/day were processed. The mill processed 35,566 tons and recovered $189 in bullion, 950 tons ($113,025) of lead concentrate, 756 tons ($29,597) of lead-copper concentrate, and 1,754 tons ($73,956) of zinc concentrate. The mill produced at least a 40% zinc product, but about 2% zinc was lost to the tailings because the cost of increasing the mill's efficiency was greater than the low price of zinc justified. (See Henderson, 1920, p. 811–813.)

The Portland, Independence, and K.&P. Lode claims were purchased for $7,500. These claims covered the southern extension of the Mary Murphy vein. A 10-year lease was obtained from Lady Murphy Mining Company for the Mollie and Pioneer Lode claims on the northern extension of the Mary Murphy vein. With this lease agreement, Mary Murphy Gold Mining Company controlled or owned the entire known length (1.25 miles) of the Mary Murphy vein. Miners began removing mill-grade ore from the older workings above the 700-level. In addition, miners operated on the northern extension of the 1400-level adit through the Pioneer claim. (See Henderson, 1920, p. 811–813.) Mine development during the year included 530 feet of upraise, 2,506 feet of drifts, and 575 feet of crosscuts (Operators Annual Report for 1917—Mary Murphy Gold Mining Co., February 8, 1918, CBM). Mine maps show extensive workings in the Mary Murphy Mine by 1917 (Dings and Robinson, 1957, plates 12, 13, figure 7; Figure 41).

Monthly shipments of about 250 tons of gold-silver-copper-lead ore were sent to Leadville during 1917 and early 1918. A small tonnage of zinc ore was shipped to Oklahoma, and silver-iron ore was shipped to Salida. (See CBM, 1919, p. 67.)

1918. Production decreased in 1918 (Henderson, 1921, p. 835). In June and July, about 130 tons of ore were processed in the mill. New underground developments included 100 feet of winzes, 200 feet of raises, 500 feet of drifts, and 200 feet of crosscuts. George Collins became president of Mary Murphy Gold Mining Company and continued managing 54 workers at the mine. (See Operators Annual Report for 1918—Mary Murphy Gold Mining Co., May 3, 1919, CBM.)

1919. Mary Murphy Gold Mining Company operated the mine until June 1 and closed their mill on November 1. Lessees continued producing from the upper levels. (See Henderson, 1922a, p. 764.) Eight miners worked four leases, and the company employed 36 workers. Frank Pesho and Gus Ottomon were two of the lessees. About 1,300 tons of crude ore (0.77 oz/ton gold, 9.7 oz/ton silver, 4.2% lead, 0.2% copper, 6.5% zinc, and 4.5% iron) were shipped to various smelters. Zinc concentrates (635 tons) contained about 0.49 oz/ton gold, 11.5 oz/ton silver, 9.1% lead, 2% copper, 40% zinc, and 6% iron. Lead concentrates (247 tons) contained about 7 oz/ton gold, 14 oz/ton silver, 37% lead, 0.06% copper, 11% zinc, and 12.5% iron. Iron-copper concentrates (135 tons) contained about 0.82 oz/ton gold, 12 oz/ton silver, 9% lead, 4.7% copper, 16% zinc, and 25% iron. Underground development included 30 feet of winzes 200 feet of raises, 100 feet of drifts, and 100 feet of crosscuts. (See R.J. Murray, Inspector report, March 1, 1919; Operators Annual Report for 1919—Mary Murphy Gold Mining Co., February 28, 1920, CBM.)

1920. Mary Murphy Gold Mining Company only shipped smelting ore; their mill remained closed. The company leased the adjoining Iron Chest Mine. Development work was done on the 1400-level. (See Henderson, 1922b, p. 764.) CBM (1921, p. 28) reported that Mary Murphy Gold Mining Company shipped gold-silver-lead-copper-zinc-manganese ore. Collins, Pesho, and Hedlund managed leases on the property, and about 2,300 tons of crude ore were shipped. Underground development included 100 feet of drifts and 20 feet of crosscuts. (See Operators Annual Report for 1920—Mary Murphy Mine, February 26, 1921, CBM.)

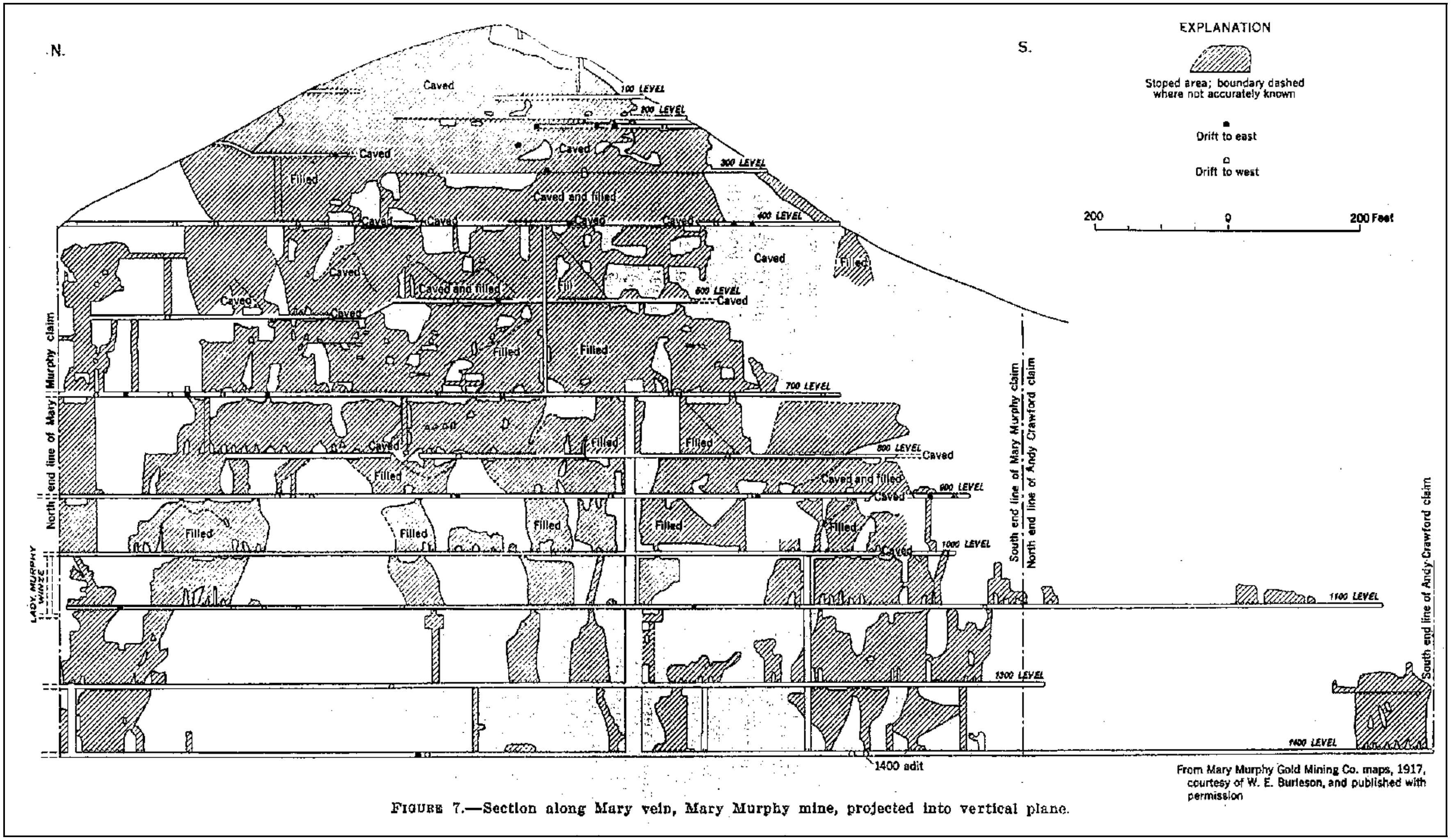


Figure 41. Map of developments along the Mary Murphy vein above the 1400-level of the Mary Murphy Mine in 1917 (Dings and Robinson, 1957, Figure 7).

1921. Lessees shipped gold-silver-lead ore (mostly sulfides) from the upper levels of the Mary Murphy and Iron Chest, which were connected during the year. In March, the lessees discontinued work on the 1400-level. The mill remained closed. (See Henderson, 1924, p. 491.) About 2 tons of crude ore (0.72 oz/ton gold, 11.5 oz/ton silver, 5.5% lead, 0.05% copper, and 5.8% zinc) were shipped. New underground development included 60 feet of winzes, 50 feet of raises, 550 feet of drifts, and 120 feet of crosscuts. (See Operators Annual Report for 1921—Mary Murphy Mine, February 20, 1922, CBM.) Perhaps the Operators Report only included company production, because the production figure in Table 7 is much larger.

1922. Lessees shipped ore from the upper levels of the Mary Murphy (Henderson, 1925, p. 532).

1923. Mary Murphy Gold Mining Company operated the mine. The C.&S. Railroad scheduled a July hearing for abandonment of the branch from Buena Vista to Romley. (See Inspectors report—Mary Murphy Mine, June 29, 1923, CBM.) Lessees producing from the upper levels of the mine shipped one carload of zinc-lead sulfide ore, several hundred tons of oxide ore, and several tons of lead-silver-gold sulfide ore (Henderson, 1927a, p. 625). Shipments from the Mary Murphy and Allie Bell Mines yielded a combined value of $34,441 (Henderson, 1927b, p. 558). About 733 tons of crude ore (0.96 oz/ton gold, 15 oz/ton silver, 6.8% lead, and 7.8% zinc) were shipped. Erik Matsson and Herman D. Clark leased part of the mine. (See Operators Annual Report for 1923—Mary Murphy Mine, March 18, 1924, CBM.) According to Dings and Robinson (1957, p. 100), 818 tons were shipped from the Mary Murphy (Table 7).

1924. Production from the Mary Murphy Mine was reported with the Allie Bell Mine. The two mines produced 401 tons that sold for $16,773 ($8,006 in gold, 6,982 oz of silver, 984 lbs of copper, and 49,500 lbs of lead). (See Henderson, 1927b, p. 558.) Dings and Robinson (1957, p. 100) reported that 374 tons were shipped from the Mary Murphy (Table 7).

1925–1931. The Mary Murphy Mine and mill were inactive (Henderson, 1928–1934).

1933. Sid Burleson and Associates shipped gold-silver-lead-zinc ore from above the 400-level (CBM, 1934, p. 47). About 110 tons of crude ore worth $6.77/ton and containing 0.67 oz/ton gold and 10.8 oz/ton silver were shipped to the smelter. About 900 tons of ore were milled, yielding 92 tons of concentrate worth $15.38/ton. Gold was concentrated from 0.11 to 0.967 oz/ton, silver from 2.05 to 6.386 oz/ton, lead from 2.01% to 16.3%, and zinc from 8.07% to 17.6%. New development included 40 feet of winzes, 170 feet of drifts, and 58 feet of crosscuts. (See Operators Annual Report for 1933—Mary Murphy Mine, February 28, 1934, CBM.)

1934. Mary Murphy Gold Mining Company shipped ore (CBM, 1935, p. 49). Henderson (1935, p. 214) reported that lessees worked the upper levels of the mine on a royalty basis and shipped gold-silver-lead ore to Colorado Springs and Leadville. Burleson (lessee) operated for 320 days and received $30,636 for 754 tons containing 1.4 oz/ton gold, 7.7 oz/ton silver, and 6.8% lead. He dug a winze on the 400-level and cut 500 feet of drifts. H. Payne (lessee) operated above the 400-level for 275 days and sold 132 tons for $4,530. His ore contained 1 oz/ton gold, 23 oz/ton silver, and 2% lead. J.P. Edwards (lessee) operated for 59 days and sold 26 tons (one carload) of ore for $2,329. The ore carried 2.5 oz/ton gold, 36 oz/ton silver, and 8.6% lead. (See Operators Annual Report for 1934—Mary Murphy Mine, February 25–26, 1935, CBM.)

1935. Lessees Lee Dillon, Payne, and Burleson shipped gold-silver-lead ore (CBM, 1936, p. 51). Ore was extracted from pillars in the upper levels and trammed to the 1400-level, where it was trucked to the railroad in Nathrop. Burleson operated for 340 days, mostly on the 1400-level and sold 840 tons for $40,714. Ore contained 1.4 oz/ton gold, 9.4 oz/ton silver, and 6.6% lead. Payne operated for 348 days and sold 143 tons carrying 0.68 oz/ton gold, 12 oz/ton silver, 8% lead, and 11% zinc for $4509. Dillon operated for 183 days and reported no production. (See R.J. Murray, Inspector report, September 19, 1935; Operators Annual Report for 1935—Mary Murphy Mine, January 20, 23, 1936, CBM.)

R. Stark purchased the H.M. Stanley Lode from Chaffee County for back taxes (bk. 224, p. 9).

1936. Lessees operated the mine, and all of the ore was shipped to custom mills and smelters. Most metal production in Chaffee County came from the Mary Murphy Mine. (See Henderson and Martin, 1937, p. 319.) From 50 to 75 tons/day was mined from the 700- and 900-levels. The ore was trammed in buckets to the 1400-level where it was trucked to the railroad in Nathrop. Burleson operated for 330 days and sold 800 tons of ore for $37,189. The ore carried 1.5 oz/ton gold, 8 oz/ton silver, 9% lead, 15% zinc, and 1% copper. Burleson excavated 35 feet of winzes, 250 feet of drifts, and 275 feet of raises. Dillon operated for 362 days and sold 121 tons containing 0.8 oz/ton gold, 6 oz/ton silver, 8% lead, 14% zinc, and 1% copper for $4,000. Payne operated for 201 days and received $4,002 for 103 tons of ore with 0.97 oz/ton gold, 16 oz/ton silver, 7% lead, 2.7% zinc, and 0.24% copper. Henry Cary worked 182 days and sold 5 tons of ore with 1.9 oz/ton gold, 21 oz/ton silver, 11% lead, and 0.6% zinc for $314. (See R.J. Murray, Inspector reports, July 14, November 7, 1936; Operators Annual Report for 1936—Mary Murphy Mine, January 11, 18, 21, 23, 1937, CBM.)

1937. Lessees operated the mine. Ore with high zinc concentration was shipped to a custom mill at Midvale, Utah. Ore with less zinc was shipped to the Leadville smelters. (See Henderson and Martin, 1938, p. 262.) Burleson operated for 253 days and sold 794 tons of ore containing 0.68 oz/ton gold, 7 oz/ton silver, 11% lead, 18% zinc, and 1.3% copper for $23,646. Payne operated for 170 days and received $5,635 for 93 tons carrying 2.4 oz/ton gold, 20 oz/ton silver, 9% lead, and 3.5% zinc. (See Operators Annual Report for 1937—Mary Murphy Mine, January 17, February 4, 1938, CBM.)

1938. Lessees shipped 248 tons worth $11,340. About 137 oz of gold, 1,778 oz of silver, 4,400 lbs of copper, 57,700 lbs of lead, and 48,000 lbs of zinc were recovered. (See Henderson and Martin, 1939, p. 284, 288.) Payne operated for 223 days, selling 53 tons with 0.37 oz/ton gold, 6 oz/ton silver, 13% lead, 0.6% copper, and 13% zinc for $1,064 (Operators Annual Report for 1938—Mary Murphy Mine, January 25, 1939, CBM). No other lessees were listed in the annual report.

1939. Lessees shipped a small quantity of ore to the Leadville smelter (Henderson and Martin, 1940, p. 264). M.K. McIver operated for 231 days and sold ore with a value of $40/ton containing 0.75 oz/ton gold, 15 oz/ton silver, 13% lead, and 8% zinc. He mined lead carbonate ore from a 2-foot-wide vein about 40 feet above the 500-level, and he removed pillars between the 700- and 400-levels. (See R.J. Murray, Inspector report, October 2, 1939; Operators Annual Report for 1939—Mary Murphy Mine, January 27, 1940, CBM.)

1940. Lessees shipped 114 tons to the Leadville smelter (Henderson and Martin, 1941, p. 294). McIver operated the mine for 225 days and was the only lessee with reported production. He mined above the 400-level and started a new shaft at the surface. Shipped ore was valued at about $30/ton and contained 0.65 oz/ton gold, 6.7 oz/ton silver, and 10% lead. (See R.J. Murray, Inspector reports, July 12, October 12, 1940; Operators Annual Report for 1940—Mary Murphy Mine, April 26, 1941, CBM.)

1941. Lessees shipped less than 100 tons of ore, including production from another mine in the district. Zinc ore was shipped to Midvale, Utah, and ore with less zinc was sent to the Leadville smelter. (See Henderson and Martin, 1943, p. 296, 300.)

1942. Lessees sent 40 tons of ore to Midvale and 10 tons to the Leadville smelter. The ore yielded 42 oz of gold, 447 oz of silver, 897 lbs of copper, 8,043 lbs of lead, and 16,293 lbs of zinc. (See Henderson, 1943, p. 330.) McIver was the only reported operator and obtained most of his production from tailings around the mill, which was destroyed by fire several years earlier. The tailings McIver recovered had an average value of about $35/ton and contained 0.51 oz/ton gold, 9.4 oz/ton silver, 7% lead, and 14% zinc. (See R.J. Murray, Inspector report, November 7, 1942; Operators Annual Report for 1942—Mary Murphy Mine, February 26, 1943, CBM.)

1943. McIver was the only operator and cleaned up tailings and ore around the mill and mine. No production was reported. (See R.J. Murray, Inspector report, July 2, 1943; Operators Annual Report for 1943—Mary Murphy Mine, March 31, 1944, CBM.)

1944. McIver shipped 36 tons of ore to Midvale, Utah. The ore yielded about 12 oz of gold, 354 oz of silver, 536 lbs of copper, 6,149 lbs of lead, and 12,155 lbs of zinc. Minerals Recovery Company of Houston, Texas, installed a 1,000-ton Humphrey spiral gravity-concentration plant for treating the old mill tailings. (See Mote, 1946, p. 313.)

1945. Although Mrs. McIver planned to operate her late husband's lease (R.J. Murray, Inspector report—Mary Murphy Mine, August 11, 1945, CBM), no production was reported (Table 7).

1949. S.E. and W.E. Burleson leased from Mary Murphy Gold Mining Company, intending to work on the 700-level (CMA, 1949, p. 75). A jig mill was installed at the location of the old Mary Murphy mill. Burleson planned to process dump material from the 1400-, 700-, and 400-levels and eventually reopen the 1400-level. The mill reduced 370 tons of ore into 104 tons of concentrate worth $16.54/ton and containing 0.18 oz/ton gold, 1.9 oz/ton silver, 5.4% lead, and 10.8% zinc. (See J. Doyle, Inspector report, September 20, 1949; Operators Annual Report for 1949—Mary Murphy Mine, January 24, 1950, CBM.)

1950. The Burlesons continued leasing the mine and prospecting dumps (CMA, 1950, p. 75.) Work at the 1400-level included repairing buildings, compressor installation, and retimbering the caved portal. About 30 tons of gold-silver-lead-zinc ore were sold. (See Martin, 1953, p. 1452.) The ore was worth $37/ton and contained 0.5 oz/ton gold, 8 oz/ton silver, 6% lead, and 10% zinc. Material from the 700-level dump was trammed to ore bins at the 1400-level. About 1,000 feet of the 1400-level were rehabilitated. The Lady Murphy Tunnel, which connected to the 1100-level of the Mary Murphy Mine, was reopened. Abundant water was encountered during the reopening, temporarily flooding the adit. This flooding also washed away a large portion of the dump. (See J. Doyle, Inspector report, September 23, 1950; Operators Annual Report for 1949—Mary Murphy Mine, February 9, 1951, CBM.) Underground workings were only accessible through the Lady Murphy Tunnel (1100-level) and 1400-level tunnel (Dings and Robinson, 1957, p. 98).

1951. The Burlesons continued leasing and operating the Mary Murphy. Henry and John Carey worked on a contract basis. Timber was replaced in one adit, the caved portal of the 1400-level was opened, and two ore shipments were made. (See Burleson, 1951, p. 82.) About 28 oz of gold, 465 oz of silver, 26,906 lbs of lead, 1,864 lbs of copper, and 50,207 lbs of zinc were recovered from 252 tons of ore that was mined between the 1400- and 1300-levels (Martin, 1954, p. 1463).

1952. About 320 tons of ore yielded 28 oz of gold, 567 oz of silver, 3,900 lbs of copper, 42,000 lbs of lead, and 54,000 lbs of zinc (Martin, 1955, p. 226-227). The 1400-level was retimbered and rehabilitated. The Burlesons leased the mine, and Henry Carey supervised contract work. (See Burleson, 1951, p. 98.)

1953. Shipments of 247 tons yielded 279 oz of gold, 662 oz of silver, 2,000 lbs of copper, 22,000 lbs of lead, and 32,000 lbs of zinc (Martin and Kelly, 1956, p. 247, 259). The ore sold for almost $12,000, but production costs were higher (Operator's Annual Report for 1953—Mary Murphy Mine, February 10, 1954, CBM). All of this ore was produced during rehabilitation work in the old workings. The Careys mined on a contract basis for the Burlesons, who leased the mine from Mary Murphy Gold Mining Company. (See CMA, 1953, p. 87.)

1954. Early in the year, Henry Carey continued contract work for the Burlesons. A few hundred tons of high-grade lead-zinc-gold ore were shipped. (See CMA, 1954, p. 113.) About midyear, John and Henry Carey subleased all of the Mary Murphy Gold Mining Company property from the Burlesons. The Careys shipped about 65 tons worth $2,096 to Leadville. (See J. Dole, Information report, January 13; Operators Annual Report for 1954—Mary Murphy Mine, February 1, 1955, CBM.)

1956. Burleson continued leasing the mine from Mary Murphy Gold Mining Company, but no activity was reported (CMA, 1956, p. 157). Some time prior to 1956, Marie Skogsberg acquired the H.M. Stanley Lode from Chaffee County (bk. 286, p. 87).

1957. Walter E. Burleson owned the Mary Murphy Mine. Omni-Metals Corporation of Salida (Burleson, Harold R. Koster, and John Murphy-principal officers) included the mine with their list of operations. (See CMA, 1957, p. 146.) It is not clear if Burleson bought the mine, or if he was the driving force behind Mary Murphy Gold Mining Company in the years when he was listed as a lessee. Most likely he was one of the owners.

1975. The Mary Murphy Mine and claim group (about 30 claims) was owned and operated by Cisco Mining Company and Big Basin Mining Corporation (joint venture). A 9-foot-diameter steel culvert was installed at the 1400-level portal. (See G.W. Addyman, Information report for 1975—Mary Murphy Mine, October 22, 1975, CBM.)

1979. The nearby H.M. Stanley Lode and several other claims were put into the Milam Trust from the Skogsberg estate following the death of Marie Skogsberg (bk. 289, p. 931; bk. 491, p. 196). The Milam Trust was the owner of the H.M. Stanley Lode as of July 2000.

1981. The Mary Murphy Mine was owned and operated by American International Mining Company Inc. which was owned by Omni Resources (Phillip F. Myers-president; Phillip Miller-vice president). The Golf and 1400-level portals were reopened and supported with steel tubing and timber. Except for sporadic geologic studies by various companies, the mine was inactive for several years prior to 1981. (See G.W. Addyman, Information report, August 5, 1981; Operator's annual report for 1981—Mary Murphy Mine, February 3, 1982, CBM.)

1982. Early in the year, American International was rehabilitating the 1400-level for rubber tire equipment. Known veins were core drilled, and bulk samples were collected. The company intended to reopen the mine in May, but by the end of August they had resealed the portals and removed their equipment. (See G.W. Addyman, Information reports—Mary Murphy Mine, January 15, August 24, 1982, CBM.)

Stockholm Lode

The positions of this patented claim on Mineral Survey No. 2634, the Chaffee County land status map, and the St. Elmo PBS map differ significantly. On the mineral survey and county map, the claim is plotted further northwest, placing it closer to adit #105 of the "Middle Mary Murphy" inventory area. If so, adit #105 may have crosscut to the Stockholm Lode.

The Stockholm Lode was located in 1881 and patented in 1884. No production from the claim is recorded. The lack of any large mines in this part of Pomeroy Gulch suggests that any unrecorded production was probably small. Scant information was available regarding mining history of this part of Pomeroy Gulch.

1881. Elisha C. Monk and M. Douglas located the Stockholm Lode (bk. 14, p. 407).

1882. Monk and Douglas relocated the claim in July (bk. 17, p. 388), and a mineral survey was completed in August (Mineral Survey No. 2634, BLM files). Samples from the mine were exhibited at the Denver National Mining Exposition in September. Development work started in December and was expected to last through the winter. (See *Rocky Mountain News*, September 13, p. 1; December 4, p. 3, 1882.) Later in December, Douglas quitclaimed interest in the claim to J.V. Marston and George Monk (bk. 25, p. 557). A 5-foot-deep shaft and a 50-foot-long adit were surveyed on the claim. The surveyed adit could not be adit #105, however, because the surveyed adit is on the southwest side of the Pomeroy Gulch, and adit #105 is on the northeast side.

1883. In February, Griffith Evans purchased interest in the Stockholm and Silver Leaf Lodes from Douglas for $1,000. In October, E. Monk still owned part of the Stockholm and Silver Leaf Lodes (*Rocky Mountain News*, February 14, p. 3; October 18, p. 3, 1883.) Monk quitclaimed interest in the Stockholm to J. Phimey and C. Stone (bk. 25, p. 558-559; bk. 34, p. 25).

1884. The Stockholm Lode was patented (USFS records).

1885. Douglas quitclaimed interest in the claim to W. Butler (bk. 25, p. 558-559; bk. 34, p. 25).

1886. William Evans and Margaret Ehrhart quitclaimed interest in the Stockholm to Jane Evans (bk. 36, p. 389).

1902. H.G. Laing paid the taxes on the Stockholm Lode (bk. 102, p. 131).

1903. Charles A. Smith paid the taxes for the claim (bk. 102, p. 164-165).

1908. Smith sold the Stockholm Lode to Little Moon Tree Mining Company (bk. 139, p. 18).

1959. Chaffee County sold the Stockholm Lode to Harold Kramer (bk. 307, p. 409). No current ownership information was found for the claim in the Chaffee County courthouse. The U.S. Forest Service may have reacquired this parcel.

Claim Blocks

Caro and Sun Claims. C.H. Swanton located the Caro Lode claim (Figure 40) for Mary Murphy Gold Mining Company in December 1913 and amended the location in February 1914. Seth Frink originally located this claim in 1886. (See bk. 26, p. 499; bk. 165, p. 17; BLM records.) This claim covered the portal and dump of the 1400-level adit. Mary Murphy Gold Mining Company probably held the claim for the next several decades.

H.A. Hackathorn located the Sun No. 1 Lode claim in 1974. Claim maps suggest that the Sun No. 1 was staked at the exact location of the older, unpatented Caro claim. (See bk. 391, p. 496, 601, 602; BLM records.) These claims covered inventory features #100, #200, and #201.

Land and Minerals Reclamation Company, Inc. (A.B. Trautwein-secretary-treasurer) filed a notice of intention to hold the Caro and Sun No. 1 Lode claims in October 1979 (BLM records). In 1981 Omni Resources (Dr. Phillip F. Myers-president; Phillip Miller-vice president) was listed as the owner of the Mary Murphy Mine and associated claim group, including the Caro Lode (Operator's Annual Report for 1981—Mary Murphy Mine, February 3, 1982, CBM).

In October 1982 A.H. Trautwein, R.I. Hackathorn, A.B. Trautwein, and the estate of H.A. Hackathorn acquired the Caro Lode following the liquidation and dissolution of Land and Minerals Reclamation Company, Inc. (BLM records).

BLM closed the file on the Caro and Sun No. 1 Lode claims in 1986. Then in 1988, R.I. Hackathorn and A.B. Trautwein located the Caro 1, Caro 2, and Sun No. 1 claims over the site of the former Caro Lode, again covering inventory features #100, #200, and #201. In 1991 BLM closed the file on the Caro 2 and Sun No. 1 Lode claims. (See bk. 494, p. 535-536, 545-546; BLM records.)

Other Claims. In 1983 W. Milam of Inglesrud Corporation located the No. 1400 Tunnel, Tunnel Site, and an area of land for dumping purposes. No map was available, but the description of the claim block suggests that it covered features #100/200, and #201. BLM closed the file on the No. 1400 Tunnel claim group for non-payment of fees in 1997. (See bk. 460, p. 281; BLM records.)

Omni Resources located the Melissa claim group in October 1981 (bk. 446, p. 925-966; BLM records). The Melissa No.21 claim may include adit #105 of the "Middle Mary Murphy" inventory area (Figure 40). It is not known if these claims remain active.

GEOLOGY

This section is summarized from Collins (1914) and Dings and Robinson (1957). The Mary Murphy Mine group was driven in a complex system of steeply dipping veins hosted by Mt. Princeton quartz monzonite (Figure 24). Mines produced from five large veins (Mary, East Pat, West Pat, Morley, and Nelson) and several smaller veins. The Mary vein was the principal producer. It ranged in width from 6 inches to 20 feet and was traceable on the surface for 6,000 feet. Mines produced and/or explored this vein over a vertical height of about 2,000 feet and a horizontal distance of 5,000 feet. Above the 900-level the dip of the vein is 75° to 90° W., which changes to 75° to 90° E. below the 900-level.

The Pat vein crops out about 100 to 200 feet east of the Mary vein and could be traced at the surface for 4,000 feet. Below the 400- or 500-levels, the Pat vein splits into the East and West Pat veins. The East and West Pat veins were mined as deep as the 900-level. On the 900-level, the West Pat vein is 50 to 75 feet east of the Mary vein, and the East Pat vein is 300 to 350 feet east of the Mary vein.

Neither the Nelson nor the Morley veins crop out at the surface. On the 900-level, the Morley and Nelson veins are 80 and 150 feet west of the Mary vein, respectively. On the 1100-level, the Nelson is believed to lie 200 feet west of the Mary vein. The Morley apparently intersects the Mary vein about 100 feet below the surface.

Ore minerals, arranged in order of abundance, were sphalerite, galena, pyrite, and chalcopyrite. Cerussite, anglesite, malachite, and sulfur occurred in the oxidized zone. In the upper levels, gangue minerals were rhodonite, quartz, and minor calcite. Gangue in the lower levels was mostly quartz and clay, with minor calcite and fluorite. Gold and silver decreased with depth and occurred in ore minerals and in gangue.

SITE DESCRIPTION

Features of environmental concern in this inventory area are dump #200 associated with open adit #100 (Mary Murphy 1400-level), dump #201 associated with a tram station just below adit #100, and dump #205 associated with caved adit #105 (Benson and others, 1997, p. 20). Adit #105 is adjacent to the east side of Pomeroy Gulch, about 2,000 downstream of the Mary Murphy 1400-level (Figure 2).

The Mary Murphy 1400-level is presently part of a reclamation research project. The 1400-level has extensive underground workings above it, and degraded water descends from some of the upper levels and stopes. The 1400-level portal was completely caved and was discharging a large volume of water during the inventory in 1995. From July 1999 through late fall of 1999, the adit was reopened to allow underground research and mitigation efforts. In order to minimize the discharge points where remediation or water treatment would be necessary, Colorado Division of Minerals and Geology (CDMG) constructed a temporary underground earthen dam to prevent mixing of relatively clean and highly degraded mine waters. The highly degraded water was diverted into a raise that descends to the Golf Tunnel and eventually drains from the Golf portal. Cleaner mine water in the Mary Murphy 1400-level was allowed to discharge from adit #100 (Bruce Stover, CDMG, oral communication, July 2000).

In October 1999, effluent drained from the portal and was channeled into a small settling pond near the north edge of dump #200. The pond discharged into a steep, braided channel that ran to the north of the tram station and associated dump #201. In October 1999 nearly all of the effluent soaked into the colluvium of the slopes prior to reaching the road that accesses Pomeroy Gulch.

Dump #200 is quite large and is easily visible and accessible from the Pomeroy Gulch road. Dump #201 is conical and is adjacent to a tram station. This rock is probably at least moderately mineralized, because the miners took the effort to tram the material from mines higher on the mountain, rather than discarding it as waste adjacent to the upper workings. Numerous partly intact mining-related buildings and abundant debris were scattered throughout the area surrounding the Mary Murphy 1400-level.

Caved adit #105 and dump #205 are adjacent to and on the east bank of the Pomeroy Gulch stream about 200 feet downstream of where the Pomeroy Gulch road crosses the stream over a large culvert. In October 1999 effluent from adit #105 crossed the bench of the dump and flowed down the dump face directly into Pomeroy Gulch. The bench had a cabin on the south end and was moderately vegetated with spruce trees and other plants (Figure 42). The dump face was oversteepened and barren of vegetation because of erosion by the Pomeroy Gulch stream. A spring emerged at the base of the northwest face of dump #205, nearly at stream level.

WASTE AND HAZARD CHARACTERISTICS

Because reclamation activities were underway, and other agencies have sampled the water at the Mary Murphy 1400-level, no additional samples were collected during this investigation. Effluent samples collected at the portal of adit #100 in September 1998 and June 1999 contained about 5,000 and 3,300 µg/L zinc, 33 and 23 µg/L cadmium, and 2,300 and 800 µg/L manganese, respectively. Shortly after construction of the experimental underground dam, zinc concentration dropped to about 250 µg/L zinc. As of April 2000, seepage through the earthen dam raised the zinc concentration at the portal to about 6,800 µg/L, cadmium to about 44 µg/L, and manganese to about 2,300 µg/L (Bruce Stover, CDMG, written communication, July 2000).

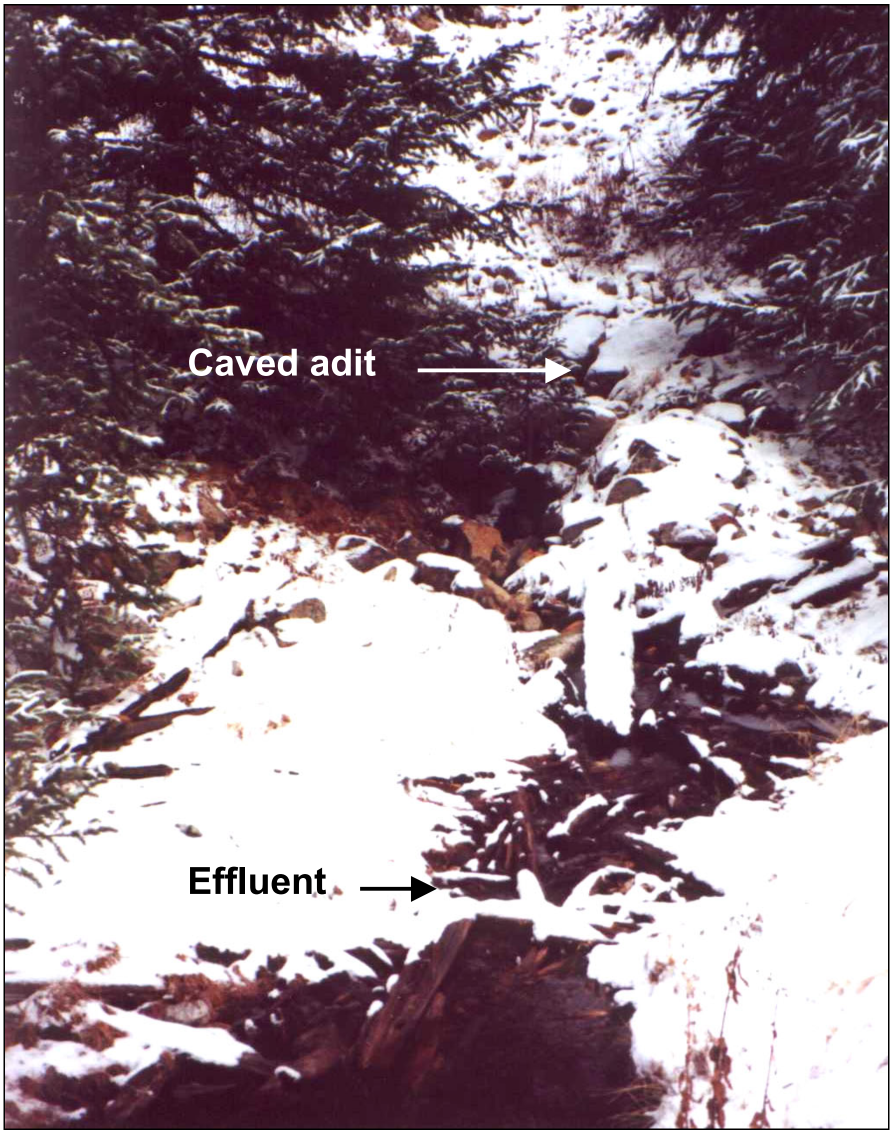


Figure 42. Effluent on the snowy bench of dump #205, "Middle Mary Murphy" area.

Dump #200 contains about 25,000 cubic yards and is the largest waste-rock pile in Pomeroy Gulch. Because adit #100 was a crosscut, dump #200 is a mixture of country rock and vein material containing quartz, pyrite, and sphalerite. (See Benson and others, 1997, p. 20.)

Dump #201 contains about 1,500 cubic yards and contains quartz vein fragments with pyrite and sphalerite (Benson and others, 1997, p. 20). This material was trammed from higher levels of the Mary Murphy Mine, suggesting that it is probably more mineralized than most waste-rock piles. Usually miners did not take the time and expense of tramming barren waste rock. Dump #200 may be a stockpile of subeconomic ore.

In October 1999, effluent sample MH-10 was collected near caved adit #105. Flow was 10 gpm, and the effluent had 7.11 pH and 143 µS/cm conductivity. The water was clear, with no apparent degradation. This mine drainage exceeded stream standards for zinc and cadmium, but all of the other tested parameters fell within standards (Table 5).

Waste-rock pile #205 consists of about 200 cubic yards of mostly light-brown and yellow fines and sand. Fresh and partly weathered pyrite, galena, and sphalerite occurred on some of the larger fragments. In October 1999, composite dump sample MWR-9 was collected (Table 6). Results indicated highly mineralized rock containing almost 1% lead, and high concentrations of iron, zinc, and manganese. Copper and arsenic were also elevated compared to other samples from Pomeroy Gulch. Neutralization and acid-generating potential were slightly elevated but nearly equal. The net acid-base potential was +1.0 tons $CaCO_3$/1,000 tons, and the paste pH was 6.29.

In August 1995 a 10-gpm spring near the toe of dump #205 had 7.4 pH and <50 µS/cm conductivity (Benson and others, 1997, p. 20). This spring was tested in October 1999 and had 7.09 pH and 151 µS/cm conductivity. The position of the spring nearly at stream level and the test parameters suggest that the spring consists of a mixture of adit #105 effluent that has percolated through dump #205, and water from the alluvial aquifer of Pomeroy Gulch.

Sample MH-6 was collected from Pomeroy Gulch just upstream of the culvert that passes under the Pomeroy Gulch road, upstream of features #105/205 and downstream of the Mary Murphy 1400-level and associated waste-rock piles #200 and #201 (Figure 2). The stream flowed at a rate of about 250 gpm and had 6.43 pH and 132 µS/cm conductivity. The sample exceeded standards in zinc and cadmium concentrations (Table 5).

Sample MH-11 was collected from Pomeroy Gulch downstream of dump #205, the lowest mine feature in Pomeroy Gulch that was investigated for this study. The sample included the effects of all of the sites in Pomeroy Gulch that are described in this report. Flow was about 250 gpm, pH was 7.07, conductivity was 151 µS/cm, and the sample exceeded standards for zinc and cadmium. Sample MH-11 was similar in composition to sample MH-6, suggesting a negligible impact to Pomeroy Gulch by effluent and seepage from features #105/205.

In contrast to features #105/205, effluent from adit #100 apparently has a significant effect on Pomeroy Gulch. Sample MH-5, which was collected upstream of the Mary Murphy 1400-level and some much smaller mines, was within standards for all of the analyzed parameters. Between sample sites MH-5 and MH-6, water quality measurably declined. Zinc concentration increased about seven fold. Cadmium also increased significantly. Effluent from the 1400-level adit is the most likely cause of the degradation between sample sites MH-5 and MH-6.

IRON CHEST MINE

The "Iron Chest Mine" inventory area (382/4280-1) is on the north side of Chrysolite Mountain about 0.75 of a mile east of Romley (Figure 2) and 2 miles south of St. Elmo. An old, extremely rough 4WD road accesses the area from County Road 162 near St. Elmo. Currently the 4WD road is used mainly by hikers and is too rocky for most 4WD vehicles. CGS assigned an EDR of 3 to shaft #102. Shaft #102 is not the Iron Chest Mine, but is probably either the Tressa C. or the Mollie Mine. The shaft is in an area where the Tressa C. and Mollie Lode claims overlap. Descriptions of the mine workings associated with the Tressa C. and Mollie Lodes suggest that this shaft is most likely the Tressa C. The Iron Chest Mine is to the south and higher up the slope (Figure 24).

MINING HISTORY

The Tressa C. was located in 1881 and produced about $60,000 worth of ore, all prior to its patent date of 1893. Limited mining was done from the middle 1890's to 1902, but no additional production was recorded. In 1914, Mary Murphy Gold Mining Company bought the Tressa C., and any subsequent production was combined with that of the Mary Murphy.

The Mollie Lode was located in 1878 and produced about 150 tons of ore prior to its patent date of 1884. The mine has no other recorded production, although some lessees sent a trial shipment to a St. Elmo mill in 1917. Later in 1917, Mary Murphy Gold Mining Company leased the mine, and any subsequent production was combined with the company's total production.

Tressa C. Mine

1881. The Rays, L. Garish, and T. Hanline located the Tressa C. Lode claim in August (bk. 15, p. 437). In October, several small lots of ore were shipped for mill tests, and assays averaged 4 oz/ton gold and 36 oz/ton silver (*Denver Republican*, October 24, 1881, p. 1).

1882. In September, a 5-foot-wide zone with a value of $100/ton in silver was exposed in a 35-foot-deep shaft. Another assay revealed a value of only $30/ton, and mining the mineralized zone was not profitable. Except for assessment work, the mine was not worked. In November, Nat Wilson, James Wilson, and J.B. Sellers acquired a lease and bond on the Tressa C., and two shifts began work. One sample assayed 410 oz/ton silver and 11 oz/ton gold. (See *Rocky Mountain News*, September 13, 1882, p. 1; November 29, 1882, p. 2; April 22, 1883, p. 9.) Sometime during the year, 14 workers were drifting on a vein in both directions from the shaft. John Gottlander was hired to connect the south drift to the surface. (See Burchard, 1883, p. 418.)

1883. In January, a 15-inch zone of high-grade ore and a large volume of low-grade ore were exposed in a drift. A 2,500-lb shipment to the Iron City smelter near St. Elmo returned $267/ton. Shipments continued in February, and sale of the property was negotiated. A 20-inch-thick high-grade ore zone was exposed early in March. At the bottom of the shaft, a 70-foot-long drift to the south followed a rich mineralized zone. A 23-foot-long crosscut east from this drift exposed another vein with an 8- to 12-inch-thick ore shoot. Values averaged $267/ton for high-grade ore and $90/ton for second-grade ore. The northern drift from the shaft was within 10 feet of intersecting an inclined adit dug from the surface. Later in March, the net value of a 98-ton shipment of high-grade ore to Denver was $102/ton, and additional ore was stockpiled. Wilson and Sellers intended to use the profits to pay for additional mine development. By April, two levels at the bottom of a 45-foot-deep shaft were 45 feet and 100 feet long, and a 100-foot-long crosscut connected to the north drift for drainage purposes. Profits from 30 tons of ore were $140 to $267/ton for the best ore and $40 to $90/ton for the second-class ore. (See *Rocky Mountain News*, January 3, p. 2; January 11, p. 7; February 14, p. 3; March 2, p. 2; March 20, p. 2; March 30, p. 2; April 22, p. 9, 1883.)

By May, the shaft was reportedly 75 feet deep and exposed a continuous ore zone from the surface. Ore grade was improving with depth. A 40-ton stockpile had an estimated value of $500/ton. The first-class ore at the bottom of the shaft was valued at $700/ton, but one sample assayed 50 oz/ton gold and was worth $1,000/ton just for the gold. Large shipments of ore were made during the summer months. (See *Rocky Mountain News*, May 10, p. 3; August 11, p. 3, 1883; *Denver Republican*, May 16, 1883, p. 6.)

R.O. Wheeler and N.B. Wright (Richmond Mining and Smelting Company) purchased the mine for $75,000 in September. Developed ore reserves were worth at least $150,000. Superintendent George Bryan directed ten workers that were pumping water from the lower shaft and preparing to install new machinery. Charles Higgins was contracted to sink a 50-foot-deep, three-compartment shaft. In October, assays on one lot of ore were about 12 oz/ton gold and 15 oz/ton silver, and one specimen carried 52 oz/ton gold. By November, hoisting and pumping machinery was in place, and two shifts operated. The Gottlander brothers were hired to sink the working shaft 50 feet to a depth of 124 feet and the old shaft 85 feet to a depth of 127 feet below the tunnel level. Plans included connecting the shafts, and completion time was estimated at about six weeks. Significant volumes of ore were produced during the expansion of the older shaft. (See *Rocky Mountain News*, September 5, p. 3; September 24, p. 7; October 18, p. 3; November 12, p. 6; December 18, p. 2; December 25, p. 7, 1883.)

By the end of the year, underground development totaled about 370 feet and included a 170-foot-long incline connected to the shaft 50 feet below the surface and a 30-foot-long upper south drift. The upper north drift was 35 feet long; the lower north drift was 43 feet long; and the lower south drift was 18 feet long. The upper level was 25 feet below the surface, and the lower level was 50 feet below the upper level. Ore sold during the year returned $3,300. (See Burchard, 1884, p. 256–258.) In their summary of 1883, Corregan and Lingane (1883, p. 112) reported that mill runs of sorted ore averaged 2 oz/ton gold and 27 oz/ton silver.

1884. In January, the old shaft was producing ore. Bryan remained the superintendent of the Tressa C. Mine and Richmond Mining and Smelting Company. Gottlander's contract for extending the shafts was completed in February. In March, the Gottlander brothers started a crosscut from the new shaft and stoped in the old workings. A stockpile assaying up to 200 oz/ton gold was ready to ship. The value of ore shipped in April was "considerably over $5,000." (See *Rocky Mountain News*, January 10, p. 3; January 15, p. 6; February 1, p. 3; March 25, p. 2; May 21, p. 6, 1884.) R. Wheeler sold his interest in the Tressa C. to E. Wright (bk. 34, p. 485).

By June, large ore bodies were exposed in every heading, and 40 people worked at the mine. About 6 tons/day of ore were shipped. A 5-foot-wide vein of high-grade gold ore was exposed in the lower south drift, and a horse-powered whim was added to the old shaft to hoist rock and water. Operators planned to extend the old shaft 30 feet below the level of the lower south drift. This would place the bottom of the old shaft at the same depth as the lower drift from the new shaft. Once the workings were connected, one steam-powered hoisting plant could drain the entire mine. A small amount of rich gold ore produced during development work was shipped in August. Large-scale production was expected to begin at the end of August. By early September, 250 tons of gold ore awaited smelting at St. Elmo. (See *Rocky Mountain News*, June 23, p. 6; August 2, p. 6; September 3, p. 6, 1884.)

In Burchard's (1885, p. 188–189) summary of 1884, it was reported that 45 employees worked at the mine, which was owned by Richmond Company. A contract for an additional 200 feet of development had been let. Annual production was 236 tons of ore worth $14,134.

1885. Ownership of the mine was in litigation (*Rocky Mountain News*, February 19, 1885, p. 6). The ownership dispute was evidently resolved, because in July, St. Elmo Mining and Smelting Company leased the Tressa C. to J. Wilson (bk. 38, p. 355), and E. Wright sold interest in the claim to J. Wilson, N. Wilson, and J. Sellers (bk. 36, p. 194).

1888. Ore sold was worth $2,134 in gold and $288 in silver (Munson, 1889, p. 104).

1889. Production was worth $4,040 in gold and $2,172 in silver (Smith, 1890, p. 146).

1890. A relocation certificate was filed in June. In July, Mineral Survey No. 6470 was conducted on the Tressa C., owned by Wright and others. A 300-foot-long adit and three shafts (10-, 52-, and 135-foot deep) were shown (Figure 43). A 135-foot-deep shaft had two winzes (60- and 125-feet deep) and 300 feet of drifts. (See Mineral Survey No. 6470, BLM files.) Production was worth $31,000 in gold, $4,267 in silver, and $2,392 in lead (Smith, 1891, p. 130).

1891-1903. B. Shear acquired interest in the Tressa C. from the Wilson family in September 1891 (bk. 58, p. 469) and from Wright in December 1892 (bk. 58, p. 469). The claim was patented in 1893 (USFS records). In the middle 1890's, Pawnee Mining Company (Shear-president) leased the dump to F. Frank. From the late 1890's to at least 1902, Pawnee Mining and Milling Company leased the mine to Buena Vista Smelting and Refining Company. (See bk. 79, p. 176.) It is not known if either lessee conducted mining operations. Dunbar (1902, p. 184) reported that in 1902, Pawnee Mining and Milling Company operated the mine with 25 workers and steam power. The associated mill had 20 stamps, but the location of the mill is not reported. A lawsuit awarded the Bullock family interest in the Tressa C. (bk. 164, p. 96).

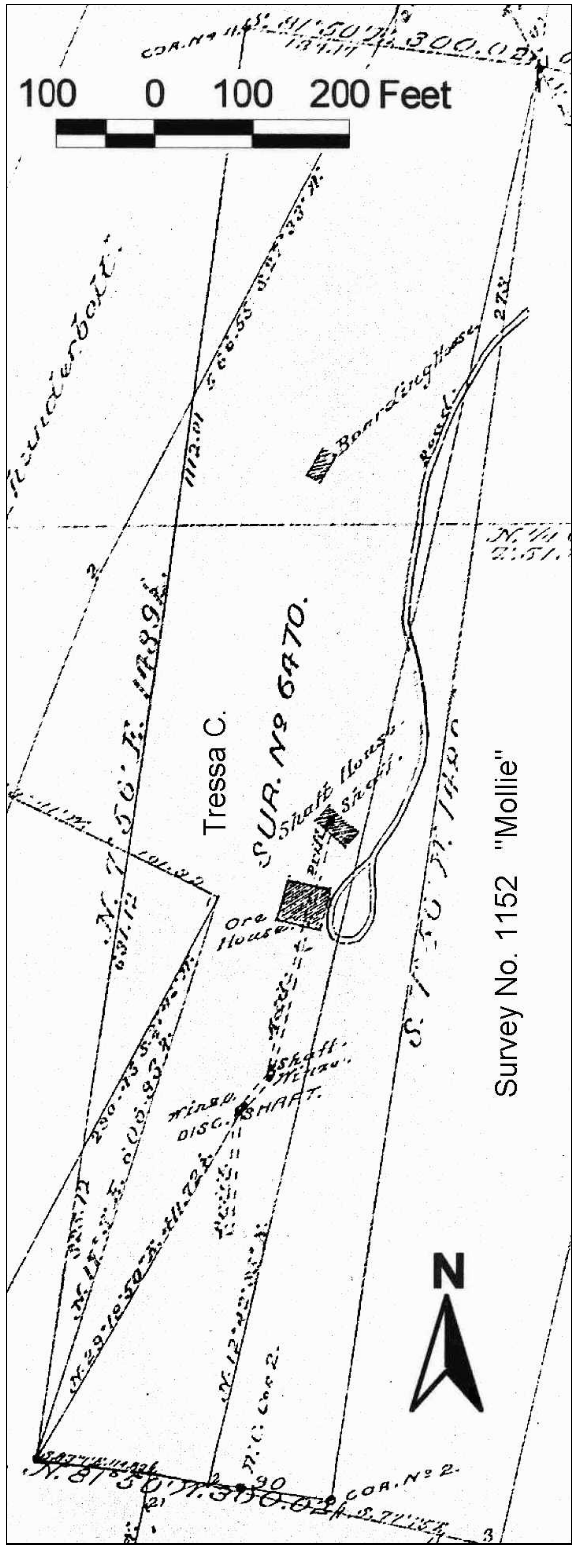


Figure 43. Mineral Survey No. 6470 of the Tressa C. Lode (modified, scale is approximate).

1912. A lawsuit awarded the Bullock family interest in the Tressa C. (bk. 164, p. 96).

1914. Mary Murphy Gold Mining Company bought the claim from Shear and the Bullock family (bk. 139, p. 83; bk. 164, p. 515).

1916. The Tressa C. Lode was included in a list of mining claims owned by Mary Murphy Gold Mining Company (Operators Annual Report for 1916—Mary Murphy Gold Mining Co., January 31, 1917, CBM). Presumably, from this time forward any work or production at the Tressa C. was included with the Mary Murphy Mine reports.

1950. The Tressa C. shaft and adit were not accessible, but the shaft was reportedly about 400 feet deep (Dings and Robinson, 1957, plate 1; p. 104).

1974. Hercules Powder Company won a $32,000 lawsuit against Mary Murphy Gold Mining Company, and Mary Murphy Gold Mining then sold the Tressa C. to H. Hackathorn. (bk. 391, p. 943; bk. 452, p. 220). Beth Gallegos, heir to Hackathorn estate, was willed the Tressa C. (bk. 535, p. 652). Beth Gallegos owned the Tressa C. Lode in 1999.

Mollie Mine

1878. F. LaGrave and N. Valle located the Mollie Lode (bk. 11, p. 277).

1880. LaGrave purchased some of Valle's share of the claim in June (bk. 9, p. 53). In September, 26 tons of "pay ore" (value less than $150/ton), 10 tons of ore averaging $211/ton, 2 tons averaging $350/ton, and 4 tons averaging $175/ton were shipped from the Mollie Mine under the supervision of J. Montee. Additional ore was stockpiled on the dump, awaiting completion of a wagon road. (See *Rocky Mountain News*, October 6, 1880, p. 6.) In December, Mineral Survey No. 1152 was conducted, and a 55-foot-long adit and three open cuts (35, 50, and 60 feet long) were surveyed on the claim. No shafts or roads were shown. (See Mineral Survey No. 1152, BLM files.) If shaft #102 of the "Iron Chest Mine" inventory area lies on the Mollie Lode, it was started sometime after the mineral survey.

1881. Ore was shipped from the Mollie in August. An open cut exposed a 107-foot-wide vein, reportedly an extension of the Mary Murphy vein. About 75 tons of ore produced from the open cut contained 4 to 13 oz/ton gold and 30 to 75 oz/ton silver. One specimen showing free gold assayed at $51,000/ton, but the average over a 100-foot-wide segment was 1 oz/ton gold. Plans were made to build a tram from the Mollie and Murphy Mines down to the railroad. (See *Rocky Mountain News*, August 24, p. 6; November 25, p. 6, 1881; *Denver Republican*, October 24, 1881, p. 1; Burchard, 1882, p. 365–366.)

1882. Ore was shipped to the Niagara smelter near St. Elmo. Assays ranged from $300 to $1,000/ton in silver and gold from a 7-foot-wide ore shoot. (See *Rocky Mountain News*, November 20, p. 6; November 30, p. 6, 1882.) The Mollie Mine was included in negotiations with an English company considering purchasing the Mary Murphy Mine, but LaGrave and Valle were listed as the owners or managers (Burchard, 1883, p. 417, 568).

1883. The Montee brothers were preparing to work on the Mollie and nearby Ticker and Pioneer Lodes in March. The owners believed that ore reserves were sufficient to operate continuously throughout the summer. (See *Rocky Mountain News*, March 22, p. 2; April 12, p. 3, 1883.) A 25-foot-wide ore zone was exposed in the mine, and some shipments were made during the summer (*Denver Republican*, May 16, p. 6; August 11, 1883, p. 3).

In the year-end summary, it was reported that LaGrave and Valle still owned the Molly Mine. The quartz vein varied from 4- to 30-feet wide and contained galena, pyrite, and sulphurets (silver sulfides). Mill runs of sorted ore averaged 1.5 oz/ton gold and 40 oz/ton silver. Developments included a 15-foot-long tunnel, 20-foot-long drift, and a 40-foot-deep winze. (See Corregan and Lingane, 1883, p. 103.) Burchard's summary (1884, p. 257) describes outcrops of free milling ore containing 4 to 13 oz/ton gold and 30 to 65 oz/ton silver in a 100-foot-wide vein.

1884. LaGrave and Valle received a patent for the Mollie Lode (bk. 46, p. 156).

1885. The Mollie and adjacent Pioneer Mines were sold for $55,000 to J. Campbell and W. Allen. Plans were formulated to run an access tunnel from the Union Pacific Railroad about a mile south of St. Elmo. The planned tunnel would intersect the vein at a depth of about 2,000 feet. (See *Rocky Mountain News*, November 27, 1885, p. 1; bk. 46, p. 307, 314.)

1886. Campbell acquired Allen's share in June (bk. 46, p. 307, 314), and in December, Lady Murphy Mining and Smelting Company acquired Campbell's share.

1890's. Lady Murphy Mining and Smelting leased the Mollie Mine to Pawnee Mining Company (Shear, president) during part of this decade (bk. 46, p. 522).

1904. Buena Vista Smelting and Refining Company leased the Mollie from Lady Murphy Mining and Smelting Company (Campbell, president) (bk. 175, p. 480).

1915. Grant Mining Company (R. Grant, president), C. Honey, and others subleased the mine (courthouse records).

1917. The "association of miners and others from St. Elmo" (probably Grant, Honey, and others) discontinued their lease after receiving poor results on ore processed at a new custom mill in St. Elmo. Later in the year, Mary Murphy Gold Mining Company acquired 10-year lease on the Mollie and Pioneer Lodes from Lady Murphy Mining Company. Work started on the northern extension of the Mary Murphy 1400-level adit, which was projected to pass through the Pioneer Lode to the Mollie Lode. (See Henderson, 1920, p. 812.) During the lease, work and production at the Mollie Mine was lumped with information regarding the Mary Murphy Mine. It is not known how much work or production Mary Murphy Gold Mining Company did within the boundary of the Mollie Lode, but the Mollie was evidently never operated as a separate entity after the acquisition.

1971. G. Mandill and J. Cobb (shareholders of the defunct Lady Murphy Mining and Smelting Company of St. Louis, Missouri) sold the Mollie claim. to Joseph Dodge, the owner of record in July 2000 (bk. 376, p. 206).

GEOLOGY

A northeast-trending vein in Mount Princeton quartz monzonite is near shaft #102 of the "Iron Chest Mine" inventory area (Figure 24). Pyrite, sphalerite, galena, chalcopyrite, smithsonite, malachite, chrysocolla, quartz, silicified Mount Princeton quartz monzonite, and manganese staining occur on the Tressa C. dump. Although no vein was exposed at the surface, presumably the Tressa C. produced from an extension of the Nelson vein, one of the five main veins worked in the Mary Murphy Mine. (See Dings and Robinson, 1957, plate 1, p. 104.)

SITE DESCRIPTION

Because the site lies entirely on private land and has no surface discharge to NFS land, field investigations were not conducted during this study. The site description and hazard characteristics of shaft #102 are taken from Benson and others (1997, p. 23) and from USFS-AMLIP inventory form 382/4280-1. On the inventory map, the shaft was plotted on the northern slope of Chrysolite Mountain (Figure 2), above a shaft that is shown on the topographic map. Caved shaft #102 was filled with water but was not discharging in August 1995.

WASTE AND HAZARD CHARACTERISTICS

In 1995, standing water in the shaft was tested and had 3.3 pH and 100 µS/cm conductivity. The water had a greenish hue. No water was draining, and evidence of previous surface discharges was not noted. (See Benson and others, 1997, p. 23.)

Standing water in the Tressa C. Shaft was sampled by Colorado Division of Public Health and Environment (CDPHE) in 1994. The acidic water was extremely degraded and exceeded State standards in concentrations of cadmium, copper, zinc, aluminum, iron, lead, and manganese. Zinc and manganese values were both more than 40 mg/L. (See CDPHE, 1998, appendix 6.) The high acidity and metal concentrations suggest the water had a long residence time to react with the quartz-sulfide vein exposed in the shaft.

Standing water suggests that the shaft is not directly connected to lower mine openings that would drain it. It is possible that lower connections with other workings are nearly blocked by caved-in rock, but that some shaft water is percolating through to lower levels. However, the historical literature does not mention any subsurface connection of the Tressa C. with the Mary Murphy or other mines.

Shaft water may enter ground water through fractures and veins, but the volume is probably minimal. In addition, the northeast-trending orientation of the largest veins and fractures would tend to steer any contaminated ground water associated with the shaft onto neighboring private land, not onto NFS land.

SHAFT BOULEVARD

The "Shaft Boulevard" inventory area (382/4282-1) is on the north side of Chrysolite Mountain, about 1.5 miles south of St. Elmo (Figure 44). Access to this area is by the same trail/4WD road that accesses the "Iron Chest Mine" inventory area. Waste-rock pile #200 is associated with caved shaft #100 and was assigned an EDR of 2 (significant environmental degradation). The St. Elmo PBS map shows shaft #100 as a prospect located on NFS land near the southeast corner of the patented Red Cloud Lode. Mineral Survey No. 4655 (BLM files) indicates that this shaft probably lies within the Red Cloud Lode (Figure 45). Part of dump #200 may extend onto NFS land, and this area should be surveyed.

MINING HISTORY

No production is recorded from this mine. Any unrecorded production was probably small and occurred prior to the patent date of 1890. No mining or development activity is recorded for the property after 1890, and the county acquired the claim on at least two occasions because of delinquent taxes.

1880. Henry O'Neill located the Red Cloud Lode (bk. 15, p. 118).

1881. O'Neill sold interest in the claim to S. Feamster and H. Baker (bk. 18, p. 196–197).

1883. O'Neill and Baker filed an amended location notice on the Red Cloud Lode in October (bk. 41, p. 131). H. Baker sold interest in the claim to Ellen Baker in November (bk. 34, p. 248). By early December, the Red Cloud Shaft was 70 feet deep and exposed a 2-foot-thick quartz vein with fine-grained chalcopyrite, pyrite, and minor galena (*Rocky Mountain News*, December 6, 1883, p. 2).

1884. Early in the year, a 14-foot-wide vein was exposed at the bottom an 80-foot-deep shaft. A 4-foot-wide ore shoot within the vein was valued at $87.50/ton. In May, four miners worked the claim and expected to ship ore in the near future. In December, the Red Cloud Shaft was dewatered, a whim house was under construction, and shaft sinking was planned to resume shortly. (See *Rocky Mountain News*, January 10, p. 3; May 15, p. 2; December, 9, p. 6, 1884.) Burchard (1885, p. 190) reported that by the end of the year the Red Cloud Shaft was 98 feet deep, and an ore zone was exposed 8 feet from the bottom.

1885. H. Baker struck a rich ore body at a depth of 110 feet in February. It was speculated that the Red Cloud vein was an extension of the Gold Field vein. Ellen Baker sold interest in the mine to Louis Yackey in April (bk. 39, p. 130). Drifting on a "good body of ore" on the 150-foot level began in May. (See *Rocky Mountain News*, February 19, p. 6; June 1, p. 6, 1885.)

1886. Marc Souliguy and J. Valcort worked for Yackey and O'Neill at the Red Cloud Mine (bk. 47, p. 89).

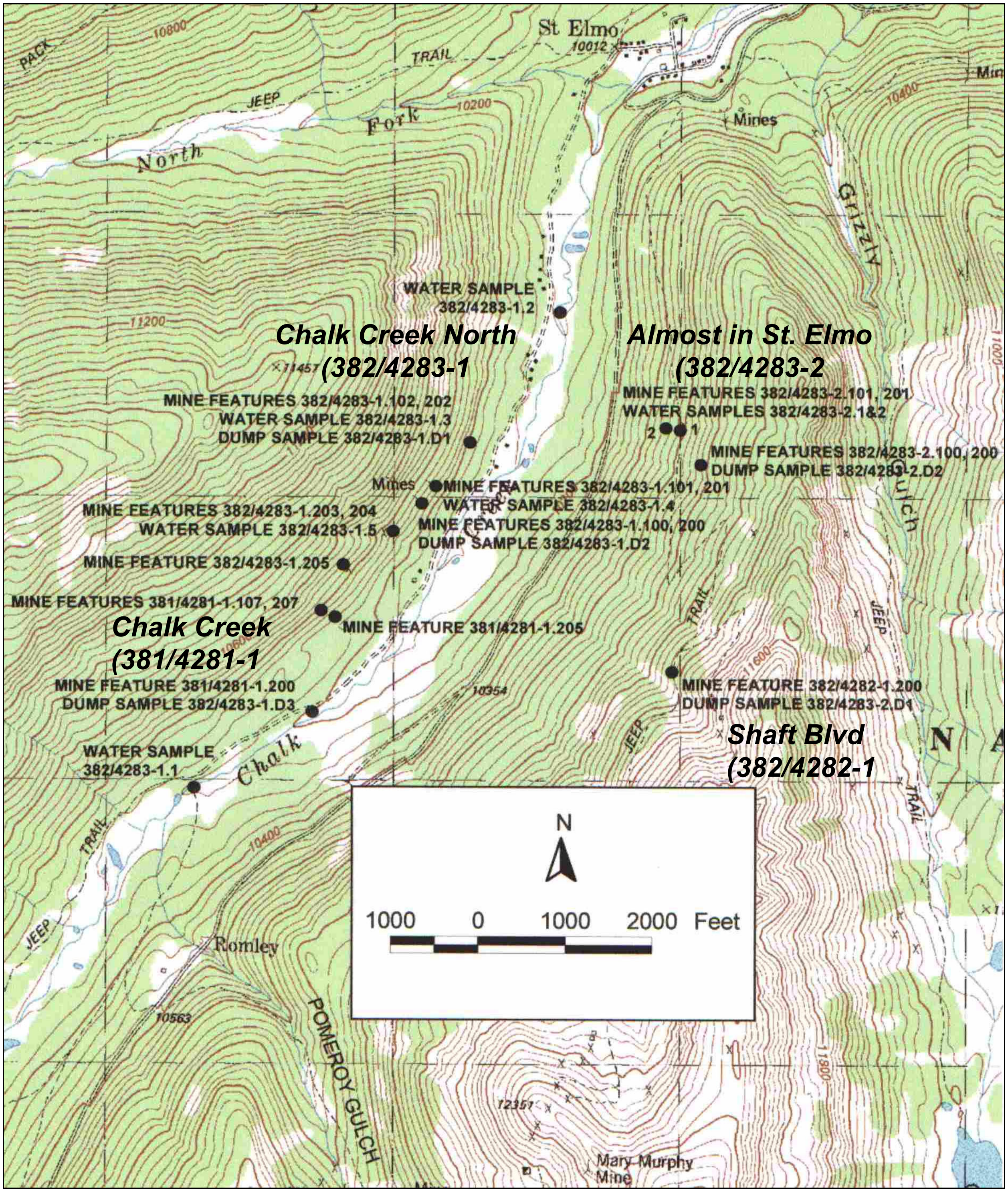


Figure 44. Map of sample sites and selected mine features in the northern part of the Chalk Creek mining district.

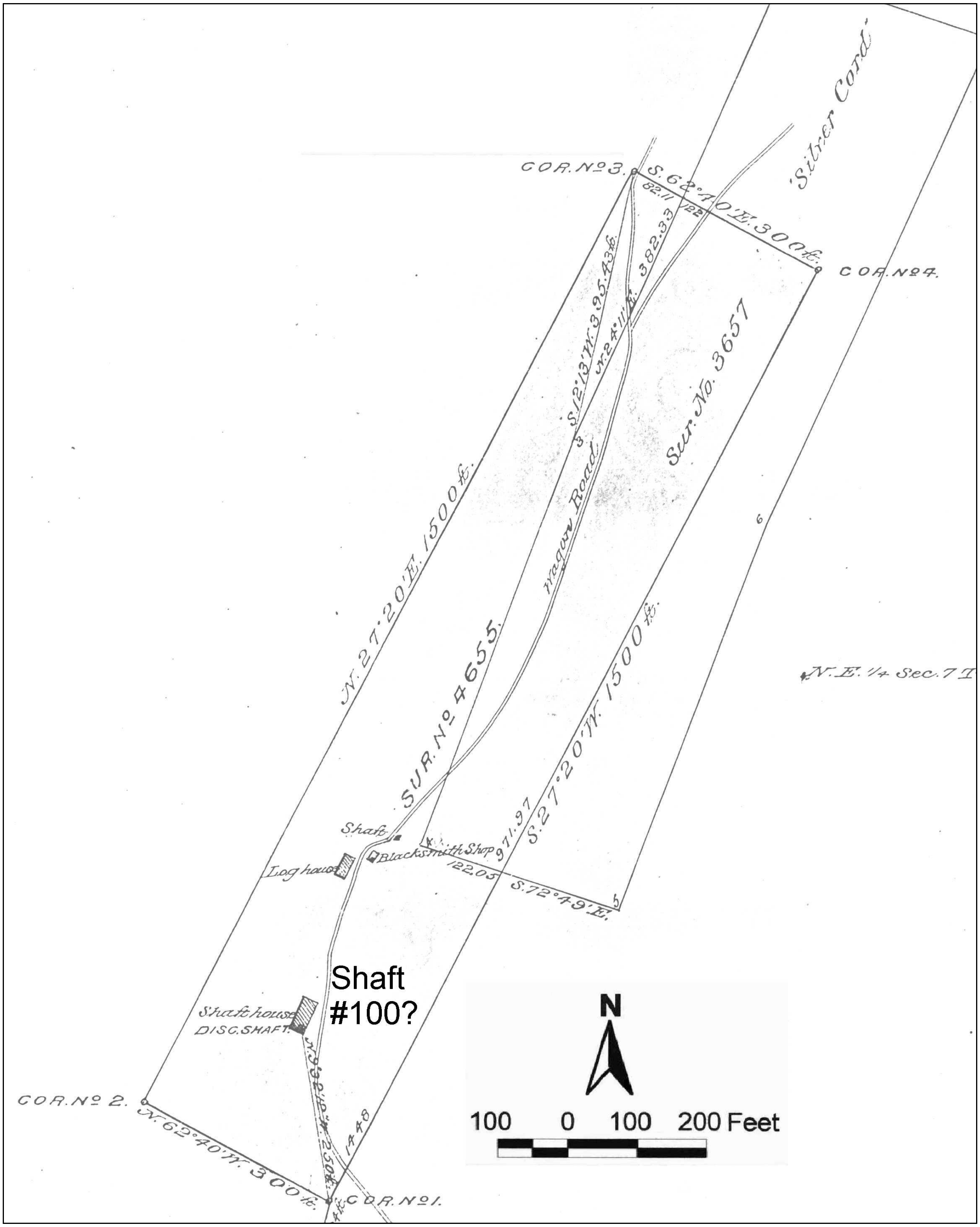


Figure 45. Mineral Survey No. 4655 of the Red Cloud Lode (modified; scale is approximate).

1887. In June, Mineral Survey No. 4655 was conducted on the Red Cloud Lode, owned by O'Neill and Yackey. The discovery shaft, presumably shaft #100 of the "Shaft Boulevard" inventory area, was shown near the center line of the claim about 200 feet north of the southern border (Figure 45). Another shaft was surveyed about 250 feet north of the discovery shaft near a log house and blacksmith shop (Mineral Survey No. 4655, BLM files). In July, S. Feamster sold interest in the claim to Yackey (bk. 36, p. 575), and in October, Yackey and O'Neill sold the southwestern 0.2 acres of the claim to Joseph Montee (bk. 58, p. 58.). The portion of the claim that was sold probably did not include shaft #100 and associated dump #200.

1888. Yackey and O'Neill made a lease and purchase agreement with Thomas Doak for the Red Cloud Lode. Doak incorporated as Red Cloud Mining Company. (See bk. 54, p. 175–180.)

1890. In May, Yackey and O'Neill made a lease and purchase agreement with L. Jenkins and W. Jones (bk. 10, p. 13; bk. 68, p. 106). Yackey and O'Neill were granted a patent for the Red Cloud Lode in July (bk. 57, p. 5; bk. 62, p. 97).

1900. The owners apparently failed to pay taxes on the claim, because George Johnson bought 50% of the Red Cloud Lode from the county (bk. 102, p. 288).

1916. Montee sold the southwestern 0.2-acre subdivision of the Red Cloud Lode to Mary Murphy Gold Mining Company (bk. 152, p. 174).

1918–1925. Five heirs were named in the estate of George Johnson for his 50% of the Red Cloud Lode (bk. 184, p. 168). The estate sold its share to Roy Stark in 1922 (bk. 157, p. 357). Stark bought the other 50% of the claim from the county at auction in 1921 (bk. 188, p. 127). By the end of 1925, Stark owned all but the 0.2 acre subdivision of the claim.

1939. Mary Murphy Gold Mining Company and Continental Trust Company (bond holder) regained ownership of the 0.2 acre tract of the Red Cloud Lode. The companies had owed money to Hercules Powder Company, but apparently the debt was repaid. (See bk. 232, p. 111.)

1944. Stark probably failed to pay taxes, because Chaffee County owned all but the 0.2-acre tract of the Red Cloud Lode (bk. 237, p. 212).

1948. George Fisher (trustee for Mary Murphy Gold Mining Company) leased the 0.2-acre tract of the Red Cloud Lode to the Burlesons (bk. 267, p. 164).

1950. The Burlesons subleased the tract to Henry and John Carey (bk. 267, p. 169).

1957. Burleson agreed to sublease, with an option to buy, the 0.2-acre tract to Minerals Production Company of California (bk. 301, p. 255).

1958. Fischer (trustee for Mary Murphy Gold Mining Company) leased the 0.2-acre tract for another 5 years to W. Burleson. Burleson subleased to Minerals Production Company of California (bk. 301, p. 261, 269).

1974. Carpenter (trustee for Mary Murphy Gold Mining Company) sold the 0.2-acre tract of the Red Cloud Lode to H.A. Hackathorn (bk. 391, p. 943).

1968. Joe Dodge bought the large segment of the Red Cloud Lode from the county (bk. 361, p. 866). He deeded the property to his company, Pikes Peak Minerals, Ltd. (bk. 362, p. 300).

1982. A.B. Trautwein (president of Land and Minerals Reclamation, Inc.) acquired the 0.2-acre tract of the Red Cloud Lode from the estate of H.A. and Ruth Hackathorn, and deeded the parcel to A.B. and A.H. Trautwein. The tract was included in a lease agreement with Omni Resource Development Corporation. (See bk. 452, p. 220.)

1990. Joe and Thelma Dodge created the Juniper Trust for Patrick Dodge, the owner of the larger segment of the Red Cloud Lode as of May 1999 (bk. 514, p. 78–83).

1999. In May, the owners of the 0.2-acre tract of the Red Cloud Lode were A.H. Trautwein, A.B. Trautwein, Beth Hackathorn Gallegos, and the estate of H.A. Hackathorn (bk. 535, p. 652).

GEOLOGY

Dings and Robinson (1957, plate 1) show a shaft (probably feature #100) at the end of a northeast-striking, vertical vein hosted in Mount Princeton quartz monzonite (Figure 24). Pyrite, sphalerite, galena, and quartz occur on the dump. The vein varied in width, but was at least 2 feet thick and comprised quartz with fine-grained chalcopyrite, pyrite, and minor galena (*Rocky Mountain News*, December 6, 1883, p. 2).

SITE DESCRIPTION

The feature of environmental concern in this inventory area is moderate-size dump #200, perched slightly below treeline on the ridge south of St. Elmo and east of Chalk Creek (Figure 46). The dump originated from caved shaft #100 that lies just below the old Iron Chest Mine access road. Dump #200 extends a significant distance down a steep slope but is not thick (Figure 47). It was dry when inventoried in 1995 and when sampled in June 1999. The waste rock is located about 3,000 feet horizontally and 900 feet vertically from Chalk Creek.

WASTE AND HAZARD CHARACTERISTICS

During the inventory in 1995, waste-rock pile #200 was estimated to contain 1,500 cubic yards of material. A tree mortality zone and staining near the toe were also described. (See Benson and others, 1997, p. 24.) During this investigation, the volume was estimated at about 1,000 cubic yards. Figure 47 suggests that vegetation below the dump is healthy, and the only dead trees are those that were partly buried with waste rock. The oversteepened, but well cemented face of the dump is almost completely barren of vegetation and is potentially unstable. Most of the dump is

Figure 46. View of dump #200 of the "Shaft Boulevard" inventory area.

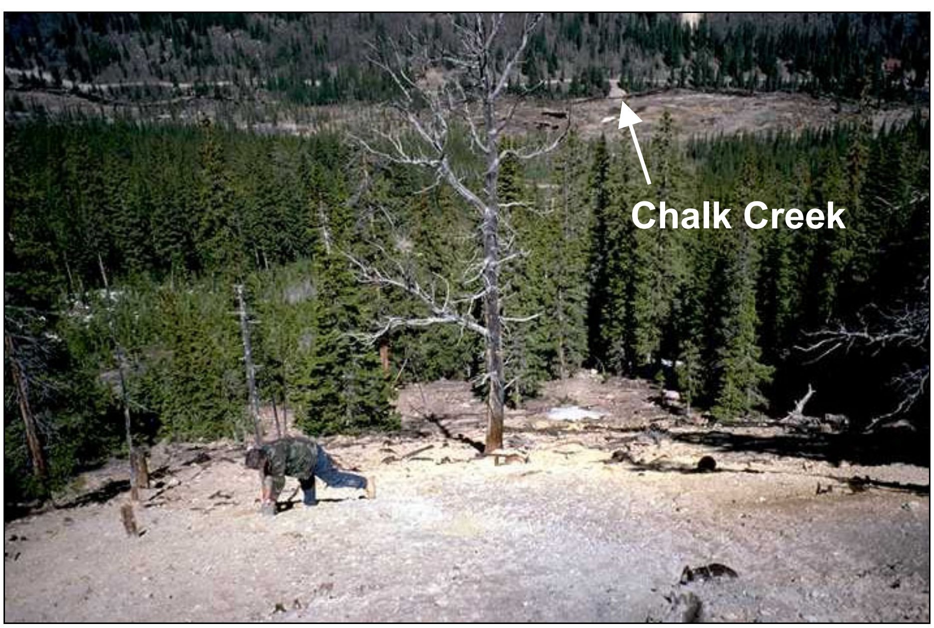


Figure 47. The steep face of dump #200 of the "Shaft Boulevard" inventory area.

sand- and gravel-size material with moderate to abundant pyrite. Composite dump sample 382/4283-1.D1 was collected and showed concentrations of lead and zinc of more than 0.1% (Table 8). Silver, gold, manganese, and copper were elevated. The sample had high potential acidity and virtually no neutralization potential, and the net acid-base potential was -35.2 tons $CaCO_3$/1,000 tons. Paste pH was 4.09.

Table 8. Analytical results for waste-rock samples from the Chalk Creek watershed, downstream of Pomeroy Gulch. [Blank spaces indicate the parameter was not analyzed. The inventory area and feature number are followed by the sample number in parentheses.]

Parameter	Chalk Creek North-382/4283-1.202 (382/4283-1.D1)	Chalk Creek North-382/4283-1.200 (382/4283-1.D2)	Chalk Creek-381/4281-1.200 (382/4283-1.D3)	Shaft Blvd-382/4282-1.200 (382/4283-2.D1)	Almost in St. Elmo-382/4283-2.200 (382/4283-2.D2)
pH	**8.14**	**4.49**	**4.30**	**4.09**	**3.94**
Neutralization potential (tons $CaCO_3$/1,000 tons)	12.9	<0.1	<0.1	<0.1	<0.1
Potential acidity (tons $CaCO_3$/1,000 tons)	10.3	25.3	21.9	35.2	167
Net acid-base potential (tons $CaCO_3$/1,000 tons)	2.6	-25.3	-21.9	-35.2	-167
Al_2O_3 (%)	8.95	5.71	9.05	5.89	5.55
CaO (%)	1.75	0.58	0.33	0.06	0.37
Fe_2O_3 (%)	6.18	5.22	6.48	7.38	15.91
K_2O (%)	3.01	1.80	3.85	2.65	2.58
MgO (%)	1.12	0.39	0.55	0.50	0.44
Na_2O (%)	1.13	0.50	0.41	0.27	0.64
Sulfur (%)	0.95	1.71	2.69	1.80	9.73
Antimony (ppm)	2	2	3	6	13
Arsenic (ppm)	14	11	83	61	75
Beryllium (ppm)	1	1	2	1	1
Boron (ppm)	<1	<1	<1	<1	<1
Cadmium (ppm)	0.9	<5	13.9	6.5	2.0
Cobalt (ppm)	10	5	8	6	9
Copper (ppm)	378	92	320	306	282
Gold (ppm)	0.044	0.053	0.097	0.141	0.429
Lead (ppm)	378	282	4,224	6,911	1,437
Lithium (ppm)	14	9	9	21	11
Manganese (ppm)	854	317	722	418	345
Mercury (ppm)	0.68	0.28	0.26	1.06	0.43
Molybdenum (ppm)	9	12	11	23	15
Nickel (ppm)	10	12	40	6	6
Phosphorus (ppm)	571	233	180	285	251
Silver (ppm)	16.2	12.4	48.6	34.6	119.2
Strontium (ppm)	571	233	180	285	75
Vanadium (ppm)	80	69	60	69	47
Zinc (ppm)	226	112	3,233	1,602	446

ALMOST IN ST. ELMO

The “Almost in St. Elmo” inventory area (382/4283-2) is on the north side of Chrysolite Mountain about 0.75 of a mile from St. Elmo (Figure 44). The access road/trail is the same one used for the “Shaft Boulevard” and “Iron Chest Mine” inventory areas and is very rocky and rough. CGS assigned EDRs of 3 or worse to adits #100 and #101 and associated waste-rock piles #200 and #201. Scant historical information was available regarding either mine.

Adit #100 was probably on the Gold Dust Lode. The St. Elmo PBS map shows that the claim is patented, however, Chaffee County courthouse records indicate that the Gold Dust Lode was not patented. Mineral Survey No. 20032 shows an adit (probably feature #100) on the Gold Dust Lode (Figure 48). The mine extends under the Fair Play Lode, a patented mining claim. An accurate survey would confirm ownership and location of mine features.

Adit #101 and associated waste-rock pile #201 are probably on the Dorothy H. Lode, a patented mining claim. Mineral Survey No. 14072 for the Dorothy H. Lode shows that the adit extended under the Bessie L. Lode (Figure 49).

MINING HISTORY

None of the mines described in this section had recorded production. The size of the dumps and the lack of historical information suggest that any unrecorded production was small. Adit #100 was probably excavated between 1899 and 1919, and adit #101 was probably completed prior to 1900.

Gold Dust Lode

1883. Pat McGowan located the Gold Dust Lode (bk. 26, p. 205).

1896. Doyle, Hurley, and Rovegno relocated the claim (bk. 42, p. 433).

1919. Charles Hyde, Patrick Hurley, and John Rovegno amended the location in September (bk. 165, p. 75), and in November, Mineral Survey No. 20032 was conducted. A 450-foot-long adit (probably adit #100) was on the northwest side of the claim (Figure 48). The adit extended eastward under the Fair Play Lode (Mineral Survey No. 13361) and abruptly turned to the north-northeast. The change in direction probably represents the intersection of the adit with a north-northeast-trending vein.

1921. According to U.S. Forest Service records, the Gold Dust Lode was patented in 1921. However, no ownership records were found in the Chaffee County courthouse, and the claim is not shown as private land on the county plats in the assessor’s office.

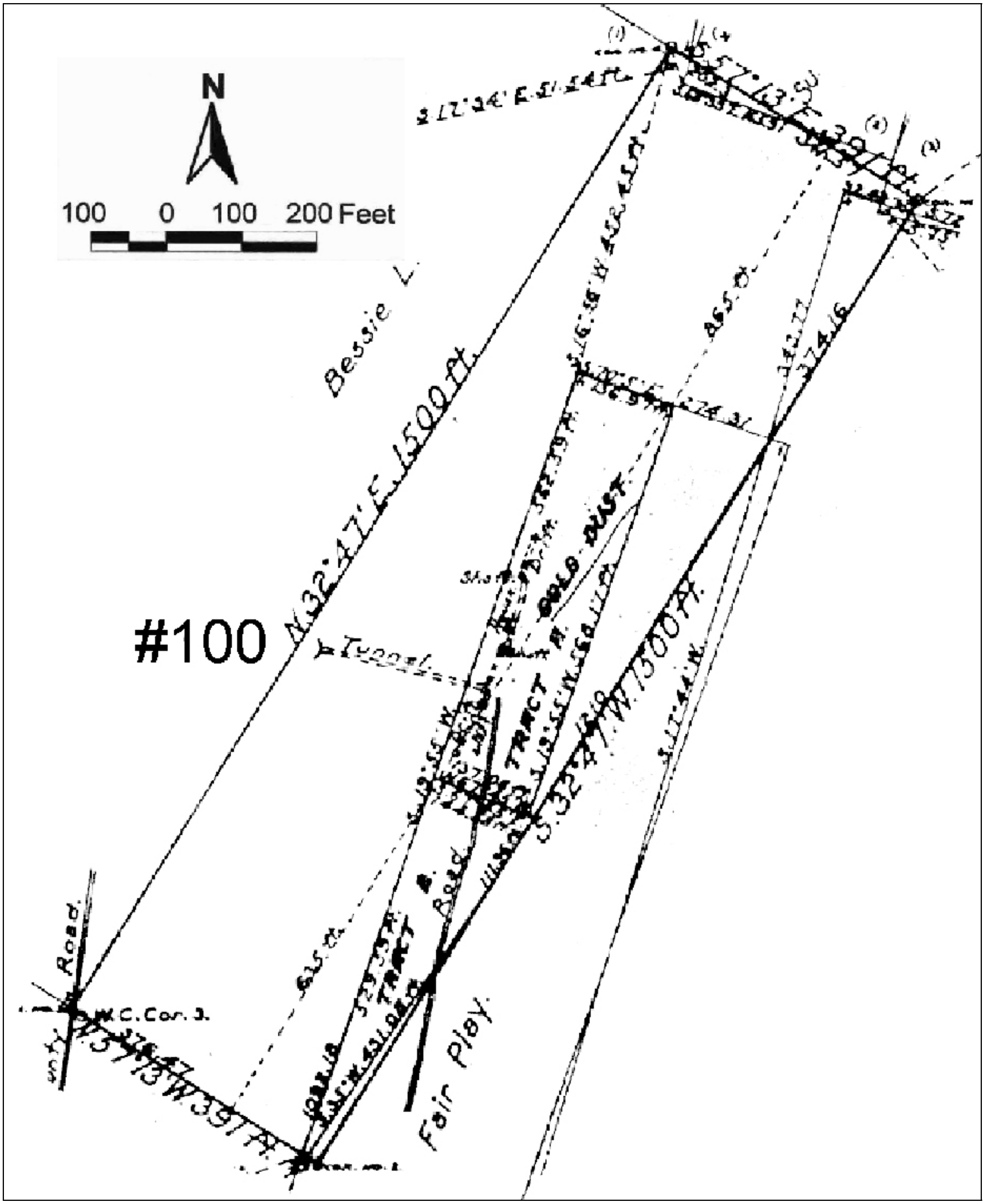


Figure 48. Mineral Survey No. 20032 of the Gold Dust Lode (modified; scale is approximate).

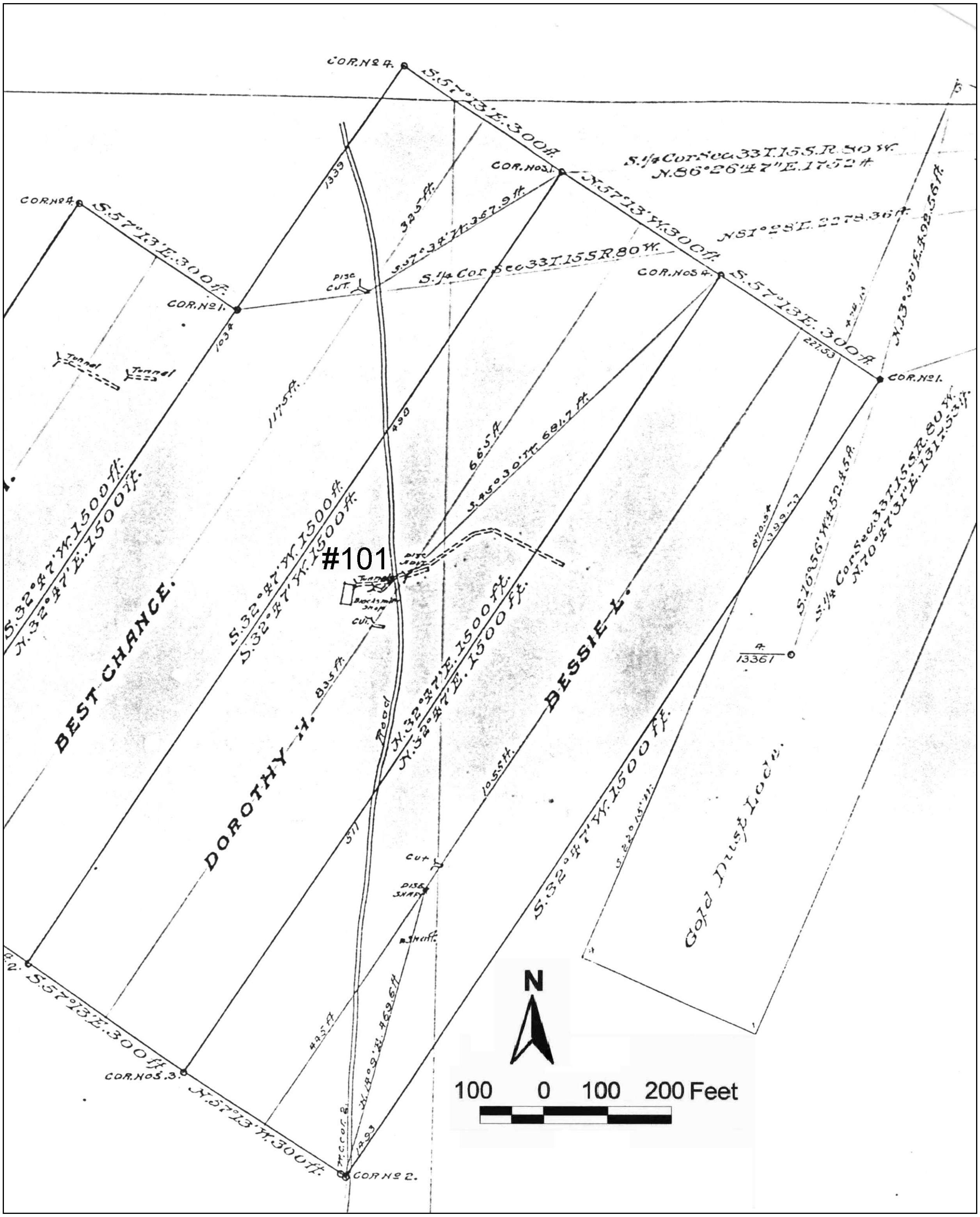


Figure 49. Part of Mineral Survey No. 14072 of the Bessie L. and Dorothy H. Lodes (modified; scale is approximate).

1922. W.J. Von Wetering was awarded some or all of Hyde's interest in the Gold Dust and other claims (bk. 1, p. 342).

No additional information was discovered regarding this claim.

Fair Play Lode

1882–1884. In 1882 the Fairplay was on a list of mines in the Chalk Creek mining district that either had produced or were producing (Burchard, 1883, p. 567). This information was either not correct, referred to a different mine with a similar name, or was an earlier location on the same area, because the Fair Play Lode claim was not located until August 1884. Alphonse Blanchard was the locator (bk. 41, p. 242).

1887–1888. Blanchard and John Valcourt worked on the Fair Play (bk. 35, p. 456; bk. 47, p. 149).

1893. Blanchard and Valcourt sold interest in the Fair Play Lode to Max Dagenais in February (bk. 58, p. 481). Blanchard sold interest in the Fair Play and nearby Gold Field Lode to Valcourt in March (bk. 100, p. 6). Blanchard sold interest in the Fair Play to Dagenais in May (bk. 79, p. 209), and Valcourt sold interest to Dagenais in December (bk. 79, p. 247).

1894. Dagenais sold interest back to Valcourt in July (bk. 79, p. 367).

1895. Myron Littlefield, George Johnson, and Valcourt worked on the Fair Play (bk. 47, p. 315).

1897. Valcourt agreed to lease the claim to B. Morley in July (bk. 28, p. 218). It is unknown if the transaction was completed. Valcourt worked on the Fair Play Lode in November (bk. 47, p. 359), then sold some of his interest to Blanchard in December (bk. 58, p. 609).

1899. Valcourt and Blanchard amended the location of the Fair Play Lode in October (bk. 106, p. 306). In November, Mineral Survey No. 13361 was conducted on the Fair Play and Gold Field Lodes. About six shafts were surveyed on the two claims (Figure 50). The relative position of the Fair Play and Gold Dust Lodes on Mineral Survey No. 13361 differs from Mineral Survey No. 20032 of the Gold Dust Lode (Figure 48), perhaps reflecting the relocation of the Gold Dust Lode after the survey of the Fair Play. In addition, no crosscut adit is shown on the Fair Play survey, suggesting that adit #100 was excavated sometime between 1899 and the Gold Dust survey in 1919.

1900. Valcourt and Blanchard sold about 0.5 acre of the Fair Play Lode to P. Hurlek, John Doyle, John ReVagno, and John Erickson in May (bk. 112, p. 235).

1901. The Fair Play and Gold Field Lodes were patented (USFS records).

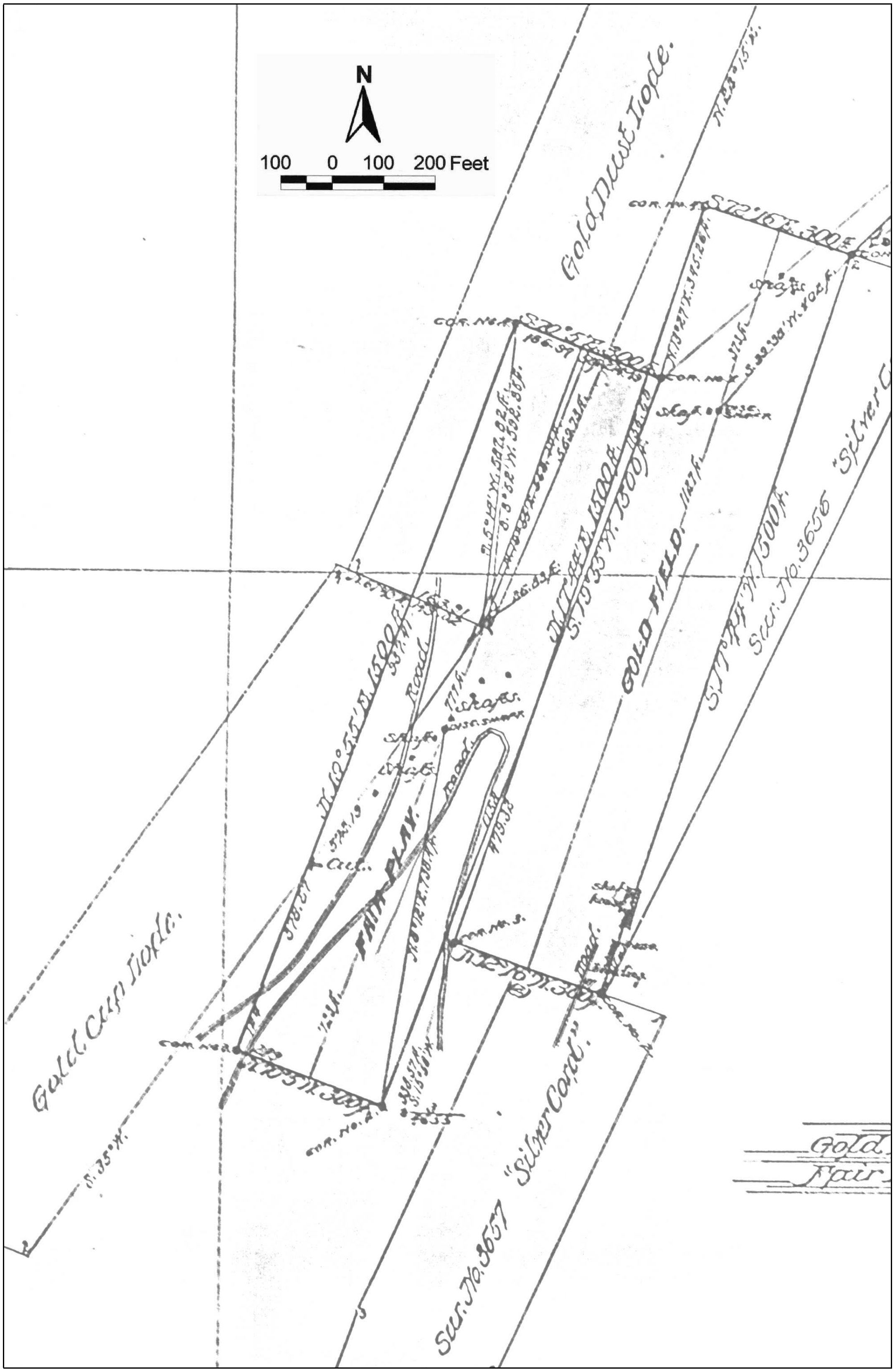


Figure 50. Mineral Survey No. 13361 of the Fair Play and Gold Field Lodes (scale is approximate).

1902–1916. Valcourt sold interest in the Fair Play and Gold Field Lodes to Dagenais in April 1902 (bk. 112, p. 366), and in August, Blanchard sold his interest in the claims to Minni Durocher (bk. 112, p. 403). Durocher sold some interest in the claims back to Blanchard in May 1905 (bk. 127, p. 206). Blanchard sold his interest in the Fair Play and Gold Field Lodes to Fred Durocher in July 1907 (bk. 127, p. 400). Dagenais sold his share of the claims to Durocher in 1916 (bk. 142, p. 56).

1952–1999. Fred Durocher died in 1952, and family members inherited the Fair Play and Gold Field Lodes (bk. 273, p. 319). Walt, Margaret, and Lillian Durocher owned the claims in 1966 (bk. 350, p. 265). In the early 1990's, Margaret E. and Frances A. Durocher inherited the claims from Walt and Lillian Durocher (bk. 530, p. 3, 5, 6, 8). The Durochers owned the claims as of May 1999 (courthouse records).

Dorothy H. and Bessie L. Lodes

1898. Charles Hyde and Daniel Clark located the Dorothy H. Lode on December 1 (bk. 105, p. 355). On December 28, William Poyser acquired part interest of the claim (bk. 100, p. 568).

1899. Emma L. Launder, Hyde, and Clark located the Bessie L. Lode in June (bk. 105, p. 490). Hyde and Clark amended the location of the Dorothy H. Lode the same day (bk. 106, p. 285). Launder sold her interest in the Bessie L. Lode to Hyde (bk. 113, p. 14), and Hyde was listed as the sole owner of the Bessie L. by October (bk. 113, p. 26).

1900. Hyde acquired Poyser's share of the Dorothy H. Lode in March (bk. 115, p. 95). In June, Mineral Survey No. 14072 was conducted on the Bessie L., Dorothy H., Best Chance, and Iron Lodes. The survey showed the portal of a 300-foot-long adit (probably adit #101) near the center of the Dorothy H. Lode. The adit extended eastward under the Bessie L. Lode (Figure 49). Hyde acquired Daniel and Amelia Clark's interest in the Dorothy H. Lode in October (bk. 113, p. 26).

1901. A patent was issued to Hyde for the Dorothy H. and Bessie L. Lodes (bk. 50, p. 80).

1922. A court decision awarded W.J. Von Wetering some or all of Hyde's interest in the Gold Dust, Bessie L., and Dorothy H. Lodes in April (bk. 1, p. 342).

1923. Von Wetering's claims, including the Dorothy H. and Bessie L. Lodes, were sold in a sheriff's sale to A.J. Stark in March (bk. 177, p. 19).

1948–1999. Chaffee County sold the Dorothy H. and Bessie L. Lodes to Bill Mehos in January 1948 (bk. 255, p. 171). Evidently the sale was not finalized, and the claims reverted to Chaffee County in February (bk. 237, p. 131). Mehos must have resolved the problem with Chaffee County, because he was the owner of the claims when he sold them to John G. Mehos in June 1972 (bk. 378, p. 581). Mehos owned the Dorothy H. and Bessie L. Lodes as of May 1999 (courthouse records).

GEOLOGY

An adit (probably feature #101) on a steeply dipping, east-trending vein and another adit (probably feature #100) to the southeast are shown on the geologic map (Figure 24). The abundant pyrite on dump #200 and the abrupt change in direction of the adit as shown on Figure 48 suggest that adit #100 intersected a north-trending vein on the Fair Play Lode. Mount Princeton quartz monzonite is the host rock, and pyrite, sphalerite, galena, and quartz were found on the dumps of both workings (Dings and Robinson, 1957, plate 1).

SITE DESCRIPTION

The site is on the east side of Chalk Creek, about midway between the creek and the ridge crest, and about a mile south of St. Elmo (Figure 44). Features #100/200 and #101/201 are the adits and associated waste-rock piles of environmental concern in this inventory area.

Subsequent to a heavy snowpack in 1995, water was discharging from adit #100 at an estimated rate of 15 gpm. The effluent flowed down the south margin of the dump before seeping into the ground about 100 feet from the portal. The effluent channel was coated with thick orange precipitate and had local areas with white salt deposits. (See Benson and others, 1997, p. 26–27; USFS-AMLIP inventory form 382/4283-2.) In June 1999 the portal of adit #100 was partly open, but too dangerous to enter. Water was dammed inside the adit, but was out of reach from the portal. Water was not draining, but the iron-stained channel suggested that effluent intermittently flows down the trench in front of the adit and alongside the southern toe of dump #200 (Figures 51, 52, 53).

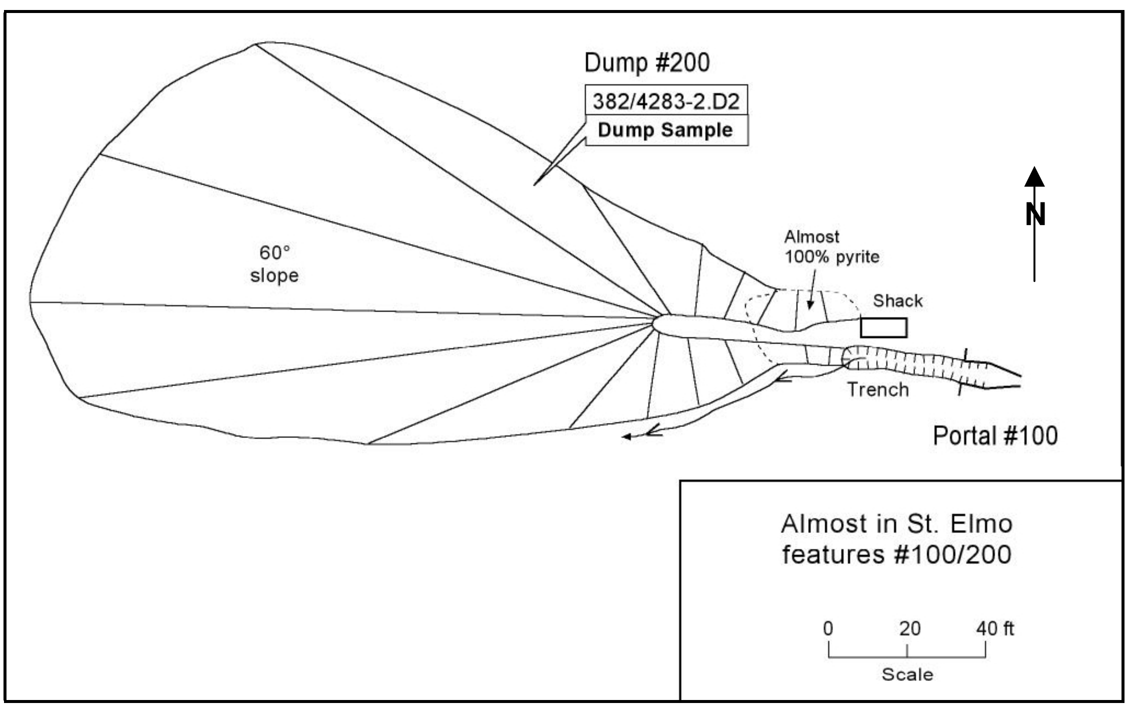


Figure 51. Map of adit #100 and dump #200 in the "Almost in St. Elmo" inventory area.

Figure 52. Mostly caved portal and iron-stained, dry effluent channel at adit #100, “Almost in St. Elmo area.

Waste-rock pile #200 was long and narrow at the adit level, with a long and steep face (Figures 54, 55). The dump’s steep slopes were eroding via sheet wash and gullies that have transported some of the waste rock downhill. Ruins of a shack or cabin were at the adit level near the portal. Pyrite-rich material was piled near the cabin ruins.

Figure 53. Iron-stained, dry effluent channel on southern side of dump #200.

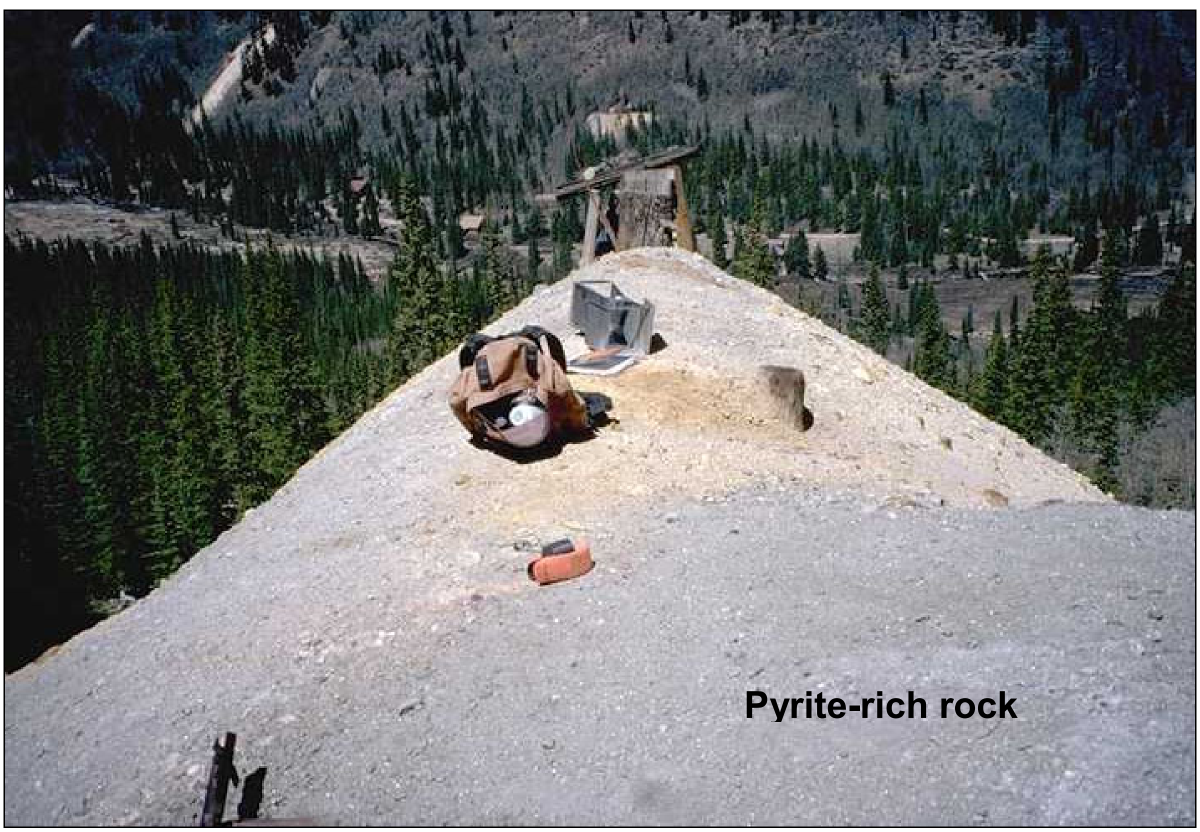


Figure 54. Long, narrow bench and pyrite-rich material on dump #200.

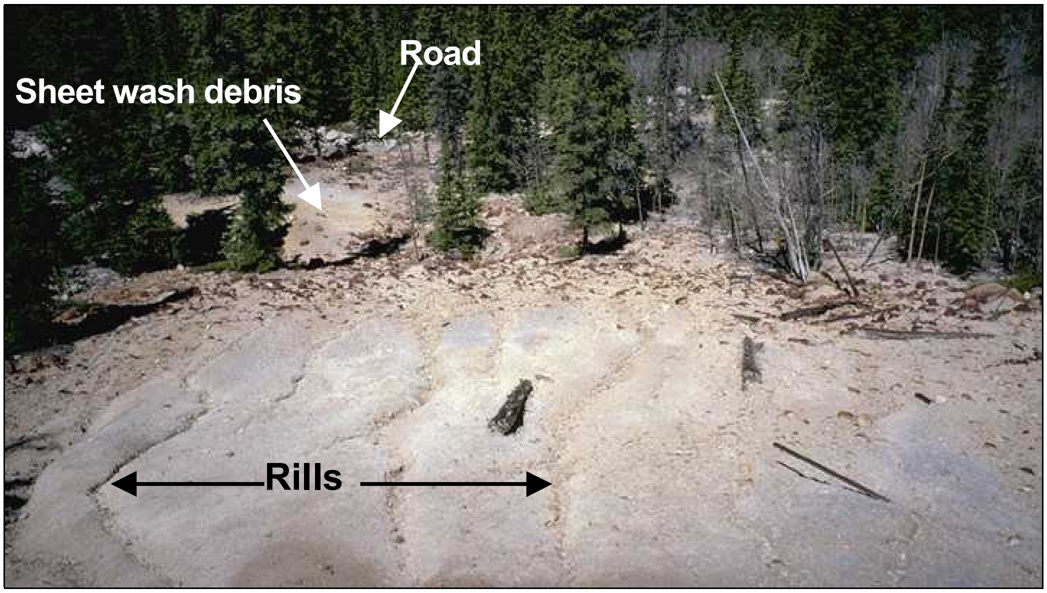


Figure 55. Face and toe of dump #200, “Almost in St. Elmo inventory area.

Adit #101 was caved and a moderate volume of water was draining during the field examination in June 1999 (Figure 56). The effluent ran across the bench of dump #201 and down the face in a braided channel (Figure 57). The mine drainage flowed at the surface for at least 100 feet downstream of dump #201, but it is not known if surface flow reaches Chalk Creek.

WASTE AND HAZARD CHARACTERISTICS

During the 1995 inventory, effluent from adit #100 flowed at an estimated rate of 15 gpm and had pH of 5.1 and conductivity of 200 µS/cm. Just prior to disappearing into the ground about 100 feet from the portal, the effluent had pH of 4.0 and conductivity of 300 µS/cm. (See Benson and others, 1997, p. 26–27.) There was no flow during the investigation in June 1999, and the water pooled inside the adit was not accessible for testing or sampling. Moderate amounts of iron staining in the intermittent effluent channel suggest poor water quality during discharge events (Figures 51, 52).

Waste-rock pile #200 was estimated to contain 800 cubic yards of material (Benson and others, 1997, p. 27). Pyrite was abundant, and part of the dump near the portal consisted almost entirely of crushed pyrite, mostly fine-grained (Figures 50, 52, 53). Iron-stained boulders and eroded waste rock extend beyond the toe of the dump (Figure 55), and transported waste rock extends down to the access road. Below the road, the effects of the mine site are less obvious. The access road seems to act as a catchment/diversion to some extent. Composite dump sample 382/4283-2.D2 contained lead concentration of greater than 0.1%, Fe_2O_3 of almost 16%, and sulfur of almost 10% (Table 8). The iron and sulfur concentrations were the highest of any dump sample collected during this study. Arsenic, copper, gold, manganese, silver, and zinc concentrations were also elevated. The sample had no neutralization potential and extremely high potential acidity. The net acid-base potential was -167 tons $CaCO_3$/1,000 tons, and the paste pH was 3.94. This was the most acidic waste-rock sample collected for this study.

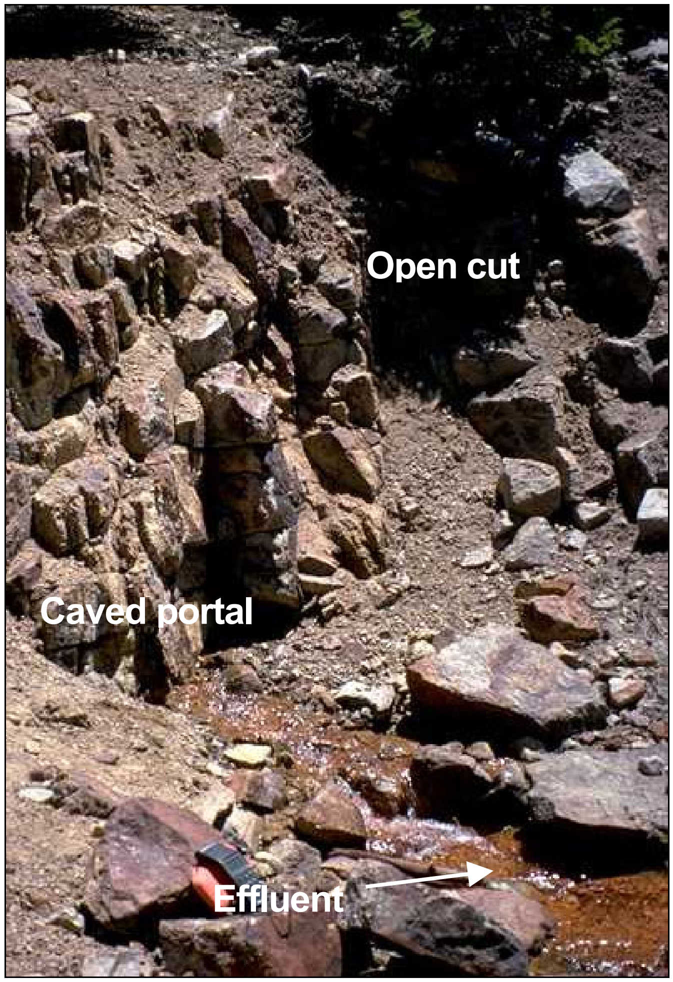


Figure 56. Caved adit #101 and effluent, "Almost in St. Elmo" area.

Figure 57. Effluent flowing across the face of dump #201, "Almost in St. Elmo" area.

During the July 1995 inventory, effluent tested near the portal of adit #101 was flowing at about 25 gpm and had 7.1 pH and 400 µS/cm. Effluent tested near the toe of dump #201 during the inventory revealed similar parameters. When sampled about 2 weeks later in August, flow near the portal was estimated at 20 gpm, and the water had 6.45 pH and 600 µS/cm conductivity. The sample exceeded State standards in cadmium (8 µg/L), manganese (3,000 µg/L), zinc (3,500 µg/L), and total iron (3,600 µg/L). Sulfate equaled the standard of 250 mg/L. (See Benson and others, 1997, p. 27–28).

In June 1999 water samples were collected near the portal and below the toe of dump #201. At the portal, effluent was flowing at a measured rate of 20.3 gpm and had pH of 7.00 and conductivity of 490 µS/cm. Abundant orange, yellow, and red precipitate lined the channel, and grass was growing in the shallow areas. Older precipitate that had weathered into dark brown powder flanked the active effluent channel. Similar to the 1995 sample, effluent exceeded standards in cadmium, manganese, zinc, and total recoverable iron. In 1999, fluoride and dissolved iron also exceeded standards (sample 382/4283-2.1, Table 9).

Below the toe of dump #201, effluent flowed at a measured rate of 12.4 gpm and had pH of 7.38 and conductivity of 501 µS/cm. The water was slightly murky, with abundant red-yellow precipitate in the channel. This precipitate was black below the surface. The effluent channel consisted mainly of cobbles and boulders; apparently the fines had washed away because of the steep gradient. For most parameters, this sample was similar to the portal sample. Total iron nearly doubled, but dissolved iron nearly disappeared, suggesting formation of iron precipitate as the effluent crosses the dump and reacts with oxygen. Dissolved zinc also decreased significantly; however, total zinc remained about constant, suggesting the suspended solids contained appreciable zinc (sample 382/4283-2.2, Table 9).

The decrease in the measured flow from near the portal to the toe indicates that about one-third of the effluent seeps into the dump and enters ground water on this steep mountain slope. It is likely that some degradation of the effluent occurs as it seeps through dump #201. Waste-rock pile #201 was estimated to contain 500 cubic yards (Benson and others, 1997, p. 27) of yellow and red, iron-stained material with moderate amounts of pyrite (Figure 57). Because of its relatively small size, no sample was collected from this pile.

Table 9. Analytical data for water samples from the east side of Chalk Creek, downstream of Pomeroy Gulch.

Sample	12-02-382/4283-2.1, ALMOST IN ST. ELMO (6/7/99)				12-02-382/4283-2.2, ALMOST IN ST. ELMO (6/7/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	20.3				12.4			
pH (standard units)	7.00				7.38			
Conductivity (µS/cm)	490.0				501.0			
Alkalinity (mg/L CaCO3)	100.00				110.00			
Hardness (mg/L CaCO3)	225	None	N/A		225	None	N/A	
Aluminum (trec) (µg/L)	69	None	N/A	7.6	130	None	N/A	8.8
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	1,700	1,000.0	1.7	188.1	3,300	1,000.0	3.3	223.1
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	2,600	2,000.0	1.3	287.7	2,700	2,000.0	1.4	182.5
Aluminum (µg/L)	< 50	87.0	Below standard	N/A	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	7.7	2.1	3.6	0.9	5.9	2.1	2.8	0.4
Calcium (mg/L CaCO3)	210	None	N/A	23,237.6	210	None	N/A	14,194.4
Chloride (mg/L)	3.0	250.0	Below standard	332.0	1.0	250.0	Below standard	67.6
Chromium (µg/L)	< 10	11.0	Below standard	N/A	< 10	11.0	Below standard	N/A
Copper (µg/L)	9.0	23.6	Below standard	1.0	< 4.0	23.7	Below standard	N/A
Fluoride (mg/L)	4.30	2.0	2.2	475.8	4.30	2.0	2.2	290.6
Iron (µg/L)	530	300.0	1.8	58.6	< 10	300.0	Below standard	N/A
Lead (µg/L)	< 1.0	12.3	Below standard	N/A	< 1.0	12.3	Below standard	N/A
Magnesium (mg/L)	3.60	None	N/A	398.4	3.70	None	N/A	250.1
Manganese (µg/L)	1,900	50.0	38.0	210.2	1,500	50.0	30.0	101.4
Nickel (µg/L)	< 20	176.9	Below standard	N/A	< 20	177.1	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A	< 1.0	None	N/A	N/A
Silicon (mg/L)	6.1	None	N/A	675.0	6.2	None	N/A	419.1
Silver (µg/L)	< 0.2	0.3	Below standard	N/A	< 0.2	0.3	Below standard	N/A
Sodium (mg/L)	2.70	None	N/A	298.8	2.80	None	N/A	189.3
Sulfate (mg/L)	150	250.0	Below standard	16,598.3	130	250.0	Below standard	8,787.0
Zinc (µg/L)	2,600	210.5	12.4	287.7	2,000	210.8	9.5	135.2

CHALK CREEK

The "Chalk Creek" inventory area (381/4281-1) is on the west side of Chalk Creek about 1.5 miles south of St. Elmo (Figure 44). CGS assigned EDRs of 3 or worse to adit #107 and waste-rock piles #200, 205, and 207. Almost no historical information was available regarding these small mines. Waste-rock pile #200 came from shaft #100 located near the northwest corner of the North Pekin Lode (Mineral Survey No. 5382). A surveyed corner for the northwest corner of North Pekin Lode was located during the field examination. It was determined that features #100/200 are on NFS land about 35 feet northeast of the northwest corner of the North Pekin Lode. Shaft #100 may have been excavated on the unpatented Chalk Creek Lode claim. Other mines in this inventory area are also on NFS land.

Information from old newspapers suggests that the inventory area is located on the southeastern side of "Barren Mountain". "Barren Mountain" is not labeled on the St. Elmo or Cumberland Pass topographic maps, but it is the prominent northeast-trending ridge that is southwest of St. Elmo and west of Chalk Creek. Most of the lode claims/mines on "Barren Mountain" were vaguely described and could not be accurately plotted, and may be mines in the "Chalk Creek" inventory area.

MINING HISTORY

Several small mines were active on Barren Mountain in the 1880's. Unfortunately, the location descriptions for these old mines are too vague to determine if they are mines described in this report. None of the Barren Mountain mines were large producers, and most activity apparently ended at about the time of the silver crash in 1893.

Chalk Creek Lode

The exact location of the Chalk Creek Mine was not determined, but the description closely matches the location of shaft #100. The mine was "close to Chalk Creek, some distance from the foot" of Barren Mountain (*Rocky Mountain News*, November 12, 1882, p. 7). No other shafts were inventoried close to Chalk Creek near Barren Mountain.

1881. In April, J.P. Babbitt and Sam E. Saxton located the Chalk Creek Lode claim. Later in the year Charles Abbott, Emily Abbott, and Henry Augerman acquired interest in the claim. (See bk. 15, p. 263; bk. 1, p. 244; bk. 19, p. 401; bk. 3, p. 589.)

1882. Several wagonloads of ore were shipped from the Chalk Creek Mine in November. In December the owners turned down a $20,000 cash offer for the mine. A large body of mineralized quartz was exposed in a 40-foot-deep shaft. Several tons of ore were sorted and awaited shipping. (See *Rocky Mountain News*, November 12, p. 7; December 28, p. 3, 1882.) Babbitt, Saxton, Emily Abbott, Henry Logan, Eliza Logan, V.C. Gunnell, C.B. Wilson, E.A Mattoon, J.E Cole, Alex Reil, and W.M. Detzald all owned interest in the claim at some time during the year. (See bk. 15, p. 263; bk. 1, p. 244; bk. 19, p. 401; bk. 3, p. 589; bk. 25, p. 394–396, 482; bk. 24, p. 444; bk. 34, p. 258.)

1883. In January, the entire bottom of a 50-foot-deep shaft exposed mineralized quartz. A group from Leadville bonded the Chalk Creek Lode for $60,000. (See *Rocky Mountain News*, January 26, 1883, p. 3.) C.B. Wilson, Eliza Logan, Gunnell, Augerman, Babbitt, and Saxton relocated the Chalk Creek Lode (bk. 26, p. 79). Cole, Wilson, Mattoon, and others leased the claim until August. A 5-foot-wide fissure vein was exposed in a 20-foot-deep shaft. A zone of galena and quartz occurred in an 18-inch-thick layer in the footwall and in a 6-inch layer in the hanging wall. Samples assayed from 30% to 60% lead and about 60 oz/ton silver. (See Corregan and Lingane, 1883, p. 97.) The depths of the shafts reported by the newspaper and by Corregan and Lingane (1883) are considerably different.

1884. Dietzald quitclaimed interest in the Chalk Creek Lode to Louis Multhopp (bk. 36, p. 52).

1885. Dietzald willed interest in the claim to C.R. Deitzald (bk. 54, p. 269).

1886. Saxton quitclaimed interest in the Chalk Creek Lode to Louis Multhopp (bk. 36, p. 352).

1893. Multhopp acquired a mining deed for the claim from Dietzald (bk. 79, p. 182).

1906. W.M. Scott acquired a mining deed from Multhopp (bk. 127, p. 310).

1909. W.M. Burbridge acquired a mining deed for the claim from Multhopp (bk. 127, p. 516). No additional information regarding this claim was discovered.

Claim Blocks

H.A. Hackathorn located the Widow #1-10 lode claims in 1974. The claim block covered the “Chalk Creek” and “Chalk Creek North” inventory areas, and the claims had a general northwest trend. Land and Metals Reclamation Company, Inc. filed an “intent to hold” for the Widow claims in 1979. R.I. Hackathorn and A.B. Trautwein relocated the claims in 1988. In 1991, BLM closed the case on the claim block. (See mining claim files, BLM.)

Omni Resources and Development Corporation (William Miller, agent) located the Melissa #1-13 lode claims in 1981. This claim block also covered the “Chalk Creek” and “Chalk Creek North” inventory areas, but these claims had a general northeast trend. (See bk. 446, p. 925–966; mining claim files, BLM.) These claims overlapped much of the Widow claim block, but were oriented almost perpendicular.

In 1982 Inglesrud Corporation (William Milam Jr., vice-president and general counsel) located the Family #1-5 lode claims. This claim block was vaguely described, but apparently covered parts of the “Chalk Creek” and “Chalk Creek North” inventory areas. (See bk. 453, p. 605, 607, 609, 611, 689; mining claim files, BLM.)

BLM closed the cases on the Melissa and Family claim blocks in 1993 (mining claim files, BLM).

GEOLOGY

The mines of the “Chalk Creek” inventory area were excavated in Mount Princeton quartz monzonite below and near a contact with Mount Aetna quartz monzonite (Figure 24). Shaft #100 explored a north-south-trending vein. Adits #105 and #107 are near the intersection of a northwest-trending and a west-trending vein. (See Dings and Robinson, 1957, plate 1, p. 103.) Vein fragments on all of the dumps contain quartz and pyrite. Dump #200 had galena and sphalerite in some pieces.

SITE DESCRIPTION

Features of concern in this inventory area lie on the lower slopes of the ridge on the west side of Chalk Creek, slightly downstream from its confluence with Pomeroy Gulch. Features #200, #205, and #107/207 were investigated during this study (Figure 44). Because of the steep, uniform slopes and dense vegetation in this area, accurate map locations were difficult to determine. Map locations for features #105/205 and #107/207 are slightly different than the locations shown on inventory maps. Figure 58 shows the workings in relation to each other, on the western side of Chalk Creek.

Feature #200 is a small, yellow waste-rock pile on the banks of Chalk Creek, almost directly opposite the reclamation project at the Golf Tunnel. The dump is associated with flooded shaft #100, and the remains of a small headframe still stand (Figure 59).

Waste-rock pile #205 is associated with caved adit #105. During the inventory in July 1995, a small trickle of water emerged from the caved adit and soaked into the dump (Benson and others, 1997, p. 20). During this investigation in June 1999, no water was emerging from the adit, but the soil was damp near the caved portal.

Partly caved adit #107 and associated waste-rock pile #207 are on the slope above and slightly west-northwest of #205. The adit had standing water, and water continually drips slowly into the pool of water dammed behind debris at the portal. A small amount of mine water was discharging, but the flow rate was too low to measure. In July 1995, the effluent trickled across the bench and about halfway down the face of dump #207 before soaking into the ground (Benson and others, 1997, p. 21). In June 1999 the mine water seeped into the bench, never reaching the face of the waste-rock pile.

Figure 58. Photographs of some of the features of the "Chalk Creek" and "Chalk Creek North" inventory areas.

Figure 59. Dump #200 and headframe ruins in the "Chalk Creek" inventory area.

WASTE AND HAZARD CHARACTERISTICS

Waste-rock pile #200 was estimated to contain 65 cubic yards of material (Benson and others, 1997, p. 21). Part of the dump was in contact with Chalk Creek. Yellow and gray sand-size material predominated, but cobble-size vein fragments also occurred. Pyrite and weathered pyrite were abundant. Galena and sphalerite occurred on some vein fragments. A composite dump sample contained lead and zinc concentrations of greater than 0.3% (sample 382/4283-1.D3, Table 8). Copper and arsenic concentrations were elevated. The sample had no measurable neutralization potential, and the potential acidity was high. The net acid-base potential was -21.9 tons $CaCO_3$/1,000 tons, and the paste pH was 4.30.

Waste-rock pile #205 contained about 350 cubic yards of material (Benson and others, 1997, p. 21) and comprised mostly yellow and orange sand-size material. Unmineralized or weakly mineralized monzonite composed most of the cobble-size fragments. Fresh pyrite was sparse. This isolated dump was apparently only weakly mineralized and is on a slope with no active stream nearby. Evidence of severe erosion is absent, and the seepage from adit #105 could not be tested or sampled because of its low volume. Dump #205 does not appear to represent a serious environmental problem in the Chalk Creek watershed.

Open adit #107 had a pool of water inside the partly blocked portal when inventoried in July 1995. Water was dripping into the pool along the pyritized fault zone the adit was driven on. Effluent with pH of 5.2 and conductivity of 200 µS/cm flowed from the adit at a rate of less than 1 gpm. Grass was growing in the shallow effluent channel, which was lined with red-orange precipitate. The effluent flowed partway down the face of dump #207 before seeping in. (See Benson and others, 1997, p. 21.) When examined in June 1999, a trickle of water seeping through the blockage at the portal disappeared on the bench of dump #207. Water pooled inside adit #107 had 7.35 pH and 302 µS/cm conductivity. Just before disappearing into the bench of dump #207 the water had 6.35 pH and 346 µS/cm. The flow rate was too low to measure.

Waste-rock pile #207 contained about 150 cubic yards of mostly orange, sand-size material. Vein fragments containing massive pyrite were strewn on the dump surface. (See Benson and others, 1997, p. 21.) Dump #207 is isolated and contains a moderate amount of mineralized material. An insignificant volume of possibly degraded water from adit #107 soaks into it, however, the pile is on a steep slope with no active stream nearby, and evidence of severe erosion was absent. Features #107/207 do not appear to represent serious environmental problems in the Chalk Creek watershed.

CHALK CREEK NORTH

The "Chalk Creek North" inventory area (382/4283-1) is on the western side of Chalk Creek about a mile south of St. Elmo (Figure 44). Adits #100, 101, and 102 and their associated waste-rock piles #200, 201, and 202; and waste-rock piles #203, 204, and 205 associated with other adits in this inventory area, were assigned EDRs of 3 or worse by CGS. Features #'103, 104, and 105 were apparently located incorrectly on the inventory maps, and the locations plotted on Figure 44 are more accurate. All these mine features are on NFS land except possibly feature #102/202, the St. Elmo Queen. The St. Elmo Queen may be on private land within the townsite of St. Elmo, formerly known as Forest City. Private land within the townsite was not shown on the St. Elmo PBS map, and accurate surveys in this area are needed. Rothchild Tunnel could be an earlier name for St. Elmo Queen or one of the other adits in this inventory area.

MINING HISTORY

Dings and Robinson (1957, p. 103, plate 1) labeled an adit corresponding to adit #102 as the St. Elmo Queen (Figure 24). Mr. Stone, a nearby property owner, reported that in the past, adit #102 had a concrete archway with "Gold Queen" carved into it (oral communication, 1999). Mr. Stone and an adjacent landowner thought Gold Queen referred to the mine name, however, it may have referred to Gold Queen Mining Company. Pieces of the archway were noted during this field examination, but the section with the inscription was missing. Information regarding the Gold Queen and Rothchild Tunnel is included in this section because these may be older names for the St. Elmo Queen.

St. Elmo Queen

This mine was located and was quite active in the early 1880s. A gap in the historical records suggests that the mine was mostly idle and sporadically operated after 1884. The St. Elmo Queen Mine had 20 tons of recorded production, which was done in 1932. Any previous production was unrecorded and probably similar in magnitude. The St. Elmo Queen was mostly a crosscut that apparently intersected narrow or weakly mineralized veins with subeconomic mineral values.

1880. W.S. McFarland and F.W. Pope located the Florida Girl, McFarland, and Silver Bell Lode claims (bk. 10, p. 355; 497; bk. 13, p. 210).

1881. In August, John G. Hendrickson and McFarland staked the 120-foot by 3,000-foot Rothchild Tunnel Site claim on the eastern side of Barren Mountain. Reportedly, this claim was west of the south end line of the townsite of St. Elmo (Forest City) and had a N. 15° W. bearing. The tunnel site was located to develop veins on the Florida Girl, McFarland, and Silver Bell Lodes. Work started on the claim late in the year. (See bk. 16, p. 297.)

1882. McFarland quitclaimed interest in the Silver Bell Lode to Matthew G. Davenport in January (bk. 21, p. 513). By September, the Rothchild Tunnel was 106 feet long (*Rocky Mountain News*, September 13, 1882, p. 1), and in November, McFarland quitclaimed interest in the Rothchild Tunnel Site claim and McFarland and Florida Girl Lodes to Hendrickson and G.S. Baker (bk. 25, p. 442, 461).

1883. In March, John M. Davenport and Isaac Cutright completed work on a second contract in the Rothchild Tunnel. A 4-foot-wide mineralized zone with quartz and abundant pyrite and chalcopyrite was exposed in the adit. Later in March, another mineralized zone was discovered in the mine. The ore, valued at $75/ton, assayed 0.5 oz/ton gold, 16.1 oz/ton silver, and 24% copper. The owners were optimistic that the mine would be profitable because it was located low on the mountain and close to town, minimizing shipping costs. (See *Rocky Mountain News*, March 2, p. 2; March 7, p. 2, March 20, p. 2; March 22, p. 2, 1883.) In a year-end summary of the mine, McFarland, Thomas Boyle, and others were listed as owners of the Rothchild Tunnel. The adit was 106 feet long and was expected to intersect the “main lead” in 94 more feet. Smaller veins exposed underground assayed from 40% to 60% lead and 20 to 30 oz/ton silver. (See Corregan and Lingane, 1883, p. 97.)

1884. In February, “some good mineral” was exposed in the Rothchild Tunnel (*Rocky Mountain News*, February 14, 1884, p. 3). In October, McFarland, Davenport, and Boyle relocated the Rothchild Tunnel Site claim. At least $2,000 had been spent developing the mine. McFarland, Davenport, and Boyle also amended the locations for the McFarland and Silver Bell Lode claims in October. Bearings from the Silver Bell Lode toward Mt. Princeton (N. 57° 52’ E.) and Mt. Chrysolite (S. 26° 24’ E.) place the claim in the vicinity of the “Chalk Creek North” inventory area. (See bk. 41, p. 492, 494–495.)

1904. According to the *Mining Reporter* (June 16, 1904, v. 49, p. 616), Gold Queen Mining Company (D.H. Martin, president; William Miller, secretary) was driving a tunnel 0.5 mile west of St. Elmo in June. The tunnel was 360 feet long, and the company planned to lengthen it an additional 300 feet in order to intersect three veins discovered by surface prospecting.

1914. Gold Queen Mining Company had completed 800 feet of tunnel. The last 100 feet of the adit cut several mineralized stringers, suggesting that the main ore body was within 100 feet. The adit was located "a short distance above the town of St. Elmo". (See CBM, 1914, p. 32.)

1932. About 16 oz of gold, 198 oz of silver, and 1,789 lbs of lead were recovered from a 20-ton shipment from the St. Elmo Queen.

1950. The mine was inaccessible when examined by Dings and Robinson (1957, p. 103.)

The literature search and field investigation suggest that the Rothchild Tunnel, the crosscut driven by Gold Queen Mining Company, and the St. Elmo Queen Mine may be different names for the same mine (adit #102). However, this supposition could not be confirmed.

Other Claims

C.H Swanton located the Old Discovery Mill Site for Mary Murphy Gold Mining Company in July 1914. A claim map (Figure 60) indicated that the claim probably covered mine features #100/200 and 101/201 of the "Chalk Creek North" inventory area (mining claim files, BLM; bk. 104, p. 428). It is likely that mining activities at adits #100 and 101 predated activities on the Old Discovery Mill Site.

In 1981, Land and Metals Reclamation Company acquired the Old Discovery Mill Site and some of the other claims previously associated with Mary Murphy Gold Mining Company. Land and Metals Reclamation transferred these properties to A.B. and A.H. Trautwein and Ruth Hackathorn in 1982. Hackathorn and Trautwein relocated the Old Discovery Mill Site in 1988, and in 1994 BLM closed the case on this claim. (See bk. 452, p. 220; mining claim files, BLM.)

Beginning in the mid-1970s the Widow, Melissa, and Family unpatented claim blocks were located over part of the "Chalk Creek North" inventory area. No known production resulted. These claims are discussed in slightly more detail in the "Chalk Creek" section of this report.

GEOLOGY

Mines in the "Chalk Creek North" inventory area are hosted by Mount Princeton quartz monzonite below and near a contact with Mount Aetna quartz monzonite (Figure 24). Pyrite, sphalerite, galena, chalcopyrite, quartz, calcite, and silicified Mount Princeton quartz monzonite were identified on the dump of the St. Elmo Queen. Ore from the St. Elmo Queen yielded gold, silver, and lead values. (See Dings and Robinson, 1957, plate 1, p. 103.) Many of these same minerals were also reported in old newspaper accounts of the mines on Barren Mountain.

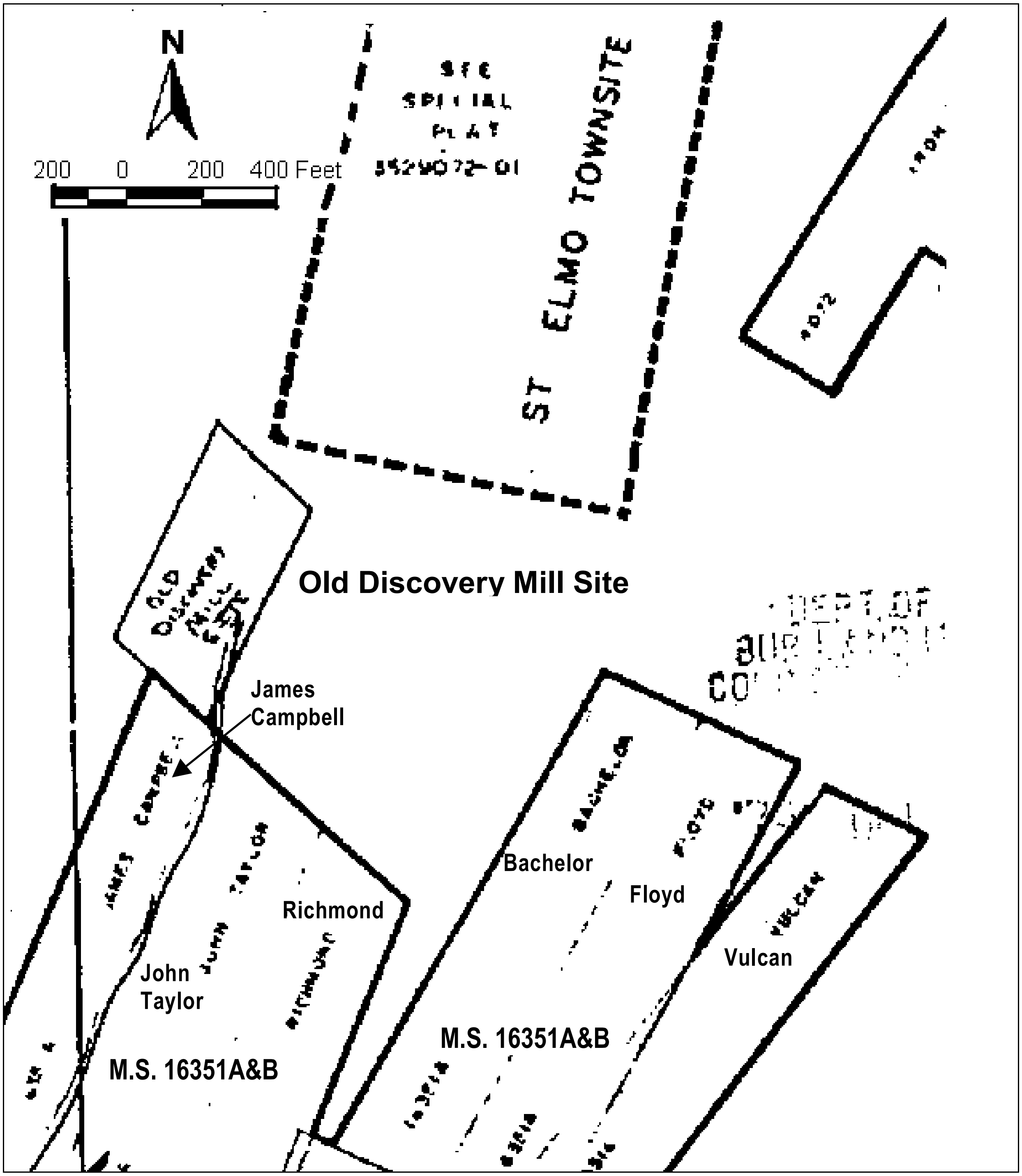


Figure 60. Location map of the Old Discovery Mill Site (modified from BLM mining claim files; scale is approximate).

SITE DESCRIPTION

Features of concern in this inventory area lie on the lower slopes of the ridge on the west side of Chalk Creek, slightly south of St. Elmo. Features #100/200, 101/201, 102/202, 203, 204, and 205 were investigated during this study (Figure 44). Because of the steep, uniform slopes and dense vegetation in this area, accurate map locations were difficult to determine. Map locations for features #203, 204, and 205 are slightly different than the locations shown on inventory maps. Figure 58 shows the workings in relation to each other.

Proceeding from north to south along an old mine road/trail, feature #102 is a caved adit discharging a moderate volume of water. The effluent is depositing abundant red precipitate. In June 1999 the effluent was flowing alongside an old cabin on the bench of dump #202 (Figure 61). After crossing the trail, the effluent soaked into the bench. No seeps were visible below dump #202.

Feature #101 is an open adit with a pool of water immediately inside the portal. The water was dammed by debris that had caved above the portal. A small volume of water discharged from the pool via a shallow ditch that was excavated through the debris. The ditch had minor white precipitate in it. The effluent crossed the bench of dump #201 and flowed about 10 feet down the face before soaking into the waste rock. Rills down the entire face of the dump suggest that effluent flows are periodically higher (Benson and others, 1997, p. 24–25).

Feature #100 is a partly open adit with standing water immediately inside the portal. Water was not discharging in June 1999, but the top of dump #200 was slightly damp. Dump #200 is the largest and most noticeable mine feature on the slope of this mountain (Figure 58). The remains of an ore hopper are perched on this steep, long, and thin waste-rock pile (Figure 62).

Feature #203 is a small waste-rock pile associated with caved adit #103. Feature #204 is an even smaller waste-rock pile associated with prospect/caved adit #104. Adit #104 lies above adit #103, and both are in a natural gully. These features were slightly mislocated during the inventory, which was done when the aspens were leafed out and visibility on this heavily vegetated slope was restricted. Features #103/203 and #104/204 are actually in the gully where features #105/205 were plotted originally. The corrected locations are shown on Figure 44.

Water emerges from feature #104, flows down the face of dump #204 and across the bench of dump #203 (Figure 63). In June 1999 the water soaked into dump #203 about 20 feet below the bench and emerged again at the toe.

Dump #205 is associated with caved adit #105. These features are located to the south and slightly higher on the slope than features #103/203 (Figure 58). The location of dump #205 is probably incorrect on the original inventory map, and a modified location is shown on Figure 44. Near the caved portal, the dump surface is slightly moist, suggesting a minor amount of seepage from adit #105. Adit #105 was not draining in June 1999 and was not draining during the exceptionally wet spring and summer of 1995 when this area was inventoried (Benson and others, 1997, p. 26).

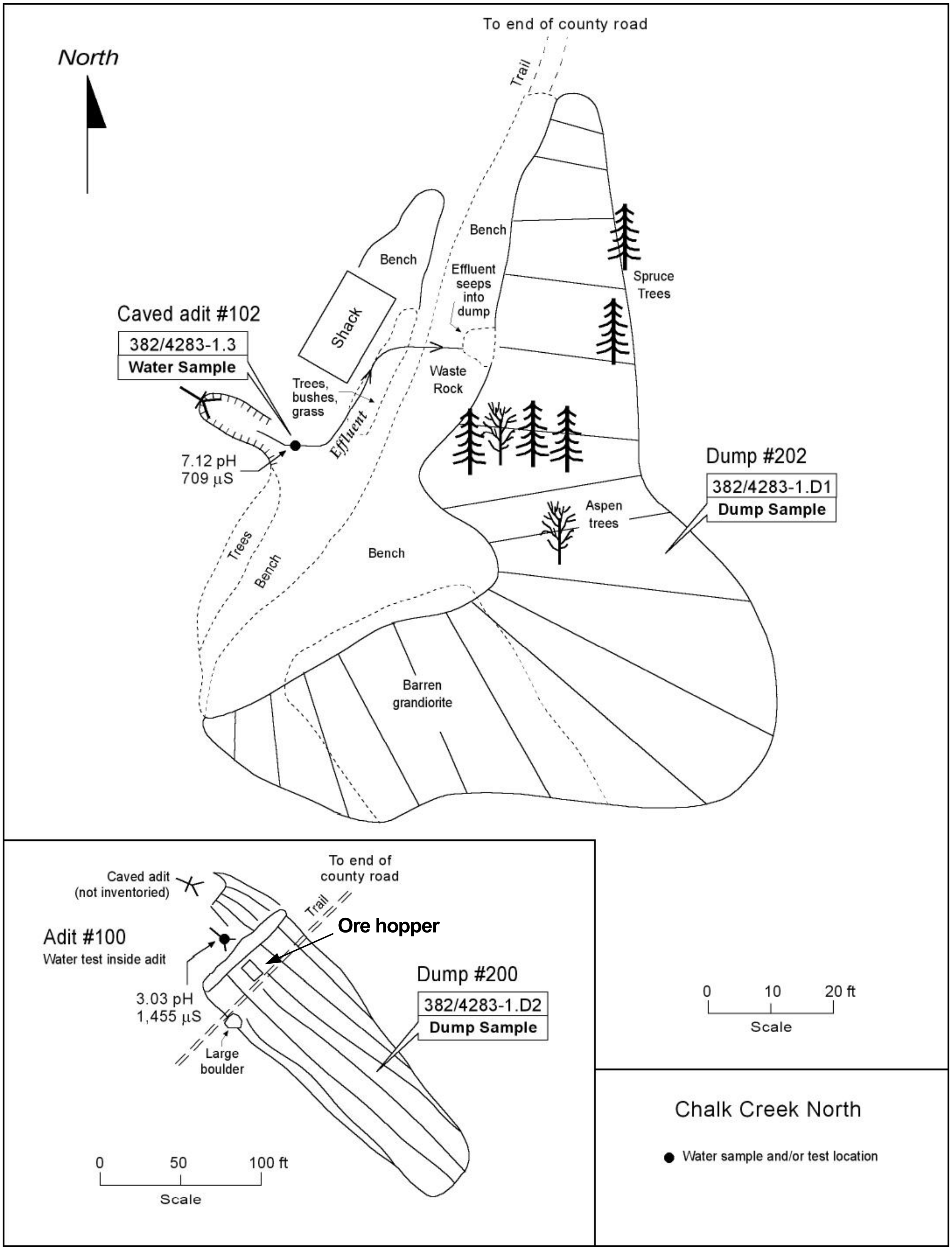


Figure 61. Maps of dumps #200 and #202 of the "Chalk Creek North" inventory area.

Figure 62. Dump #200 and ore hopper ruins in the "Chalk Creek North" inventory area.

Figure 63. Water flowing down the face of dump #204 of the "Chalk Creek North" inventory area.

WASTE AND HAZARD CHARACTERISTICS

Water samples were collected near the portal of adit #102 during the abandoned mine inventory in 1995 and during this investigation in 1999. In 1995, flow was estimated at 11 gpm, pH was 7.4, and conductivity was 600 µS/cm. The sample exceeded State standards in concentrations of manganese (1,200 µg/L) and iron (430 µg/L). Sulfate (240 mg/L) and zinc (120 µg/L) were elevated but within standards. Hardness (390 mg/L) and alkalinity (140 mg/L) were also high. (See Benson and others, 1997, p. 25–26.) In 1999 the effluent was flowing at a measured rate of 7.5 gpm and had pH of 7.12 and conductivity of 709 µS/cm. Abundant orange-red precipitate lined the channel, and grass and filamentous algae were growing in the water. This water was similar to the sample collected in 1995 (sample 382/4283-1.3, Table 10). The effluent soaked into the dump and did not reach Chalk Creek at the surface.

Waste-rock pile #202 was estimated to contain 1,700 cubic yards of material (Benson and others, 1997, p. 25). Yellow, mineralized sand-size material predominated, but the southwest part of the dump comprised cobble-size blocks of apparently unmineralized granodiorite country rock (Figure 61). Pyrite was sparse, and traces of malachite, rhodochrosite, and oxidized galena occurred. A composite dump sample was collected from the yellow-stained material on the northeast part of dump #202, purposely excluding the apparently barren country rock (sample 382/4283-D1, Table 8). Results suggest only weakly mineralized waste-rock with concentrations of manganese, copper, lead, and zinc of less than 0.1%. The sample had moderate values for both potential acidity and neutralization potential. The net acid-base potential was +2.6 tons $CaCO_3$/1,000 tons, and the paste pH was quite alkaline at 8.14. The neutral pH of the effluent and the weakly mineralized nature of the waste rock suggest low potential for significant degradation of water that seeps into dump #202.

Water inside adit #101 was tested during the inventory in 1995. Flow was estimated at less than 1 gpm, pH was 7.1, and conductivity was 400 µS/cm (Benson and others, 1997, p. 24–25). In 1999, sample 382/4283-1.4 (Table 10) was collected from the pool inside the adit. Discharge was about 0.5 gpm, pH was 6.95, and conductivity was 586 µS/cm. This water exceeded State standards in concentrations of manganese (960 µg/L), total iron (1,700 µg/L), zinc (1,200 µg/L), copper (71.0 µg/L), and cadmium (1.3 µg/L). Sulfate (200 mg/L) was elevated but within standards. All of the effluent infiltrated into the face of dump #201.

Waste-rock pile #201 was estimated to contain 150 cubic yards of material. Most of the dump is apparently barren or weakly mineralized granitic rock, although the finer fraction is reddish orange and is probably oxidized, weakly mineralized material. Rills in the dump suggest moderate amounts of erosion during storms or when flow from the adit increases. (See Benson and others, 1997, p. 25.) Because of the small volume and weakly mineralized nature of the pile, waste-rock samples were not collected from dump #201.

Adit #100 was partly caved, but extends at least 20 feet underground. Pooled water just inside the portal had 3.03 pH and 1,455 µS/cm conductivity when tested in June 1999. Red precipitate coated the bottom of the pool, but no water was discharging.

Waste-rock pile #200 was estimated to contain 1,500 cubic yards of material during the inventory (Benson and others, 1997, p. 24), however, because the dump is spread so thinly down the steep slope (Figure 62), the actual volume is probably closer to 1,000 cubic yards. The volume estimate includes waste rock from a small, caved adit above adit #100 because this dump overlaps dump #200 (Figure 61). At the surface, the waste rock was yellow, gray, tan, and light brown. Pyrite was abundant, and traces of chalcopyrite and bornite occurred. Beneath the surface, yellow sand-size material predominated, and pyrite was absent. The less-oxidized material at the surface of the dump may represent the last phase of mining, when primary pyrite-bearing ore was encountered. Pyritic ore was more difficult to process and lower in grade than oxidized ore near the surface. Mining often ceased when pyritic ore was encountered.

Table 10. Analytical data for water samples from Chalk Creek and from the west side of Chalk Creek, downstream of Pomeroy Gulch.

Sample	12-02-382/4283-1.1, CHALK CREEK NORTH (6/5/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	16,000.0			
pH (standard units)	7.02			
Conductivity (µS/cm)	52.0			
Alkalinity (mg/L $CaCO_3$)	14.50			
Hardness (mg/L $CaCO_3$)	20	None	N/A	
Aluminum (trec) (µg/L)	56	None	N/A	4,884.1
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	100	1,000.0	Below standard	8,721.6
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	33	2,000.0	Below standard	2,878.1
Aluminum (µg/L)	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	< 0.3	0.3	Below standard	N/A
Calcium (mg/L $CaCO_3$)	17	None	N/A	1,482,672.0
Chloride (mg/L)	< 1.0	250.0	Below standard	N/A
Chromium (µg/L)	< 10	11.0	Below standard	N/A
Copper (µg/L)	< 4.0	2.9	Not detected	N/A
Fluoride (mg/L)	< 0.10	2.0	Below standard	N/A
Iron (µg/L)	57	300.0	Below standard	4,971.3
Lead (µg/L)	< 1.0	0.4	Not detected	N/A
Magnesium (mg/L)	0.63	None	N/A	54,946.1
Manganese (µg/L)	4	50.0	Below standard	348.9
Nickel (µg/L)	< 20	27.7	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A
Silicon (mg/L)	2.5	None	N/A	218,040.0
Silver (µg/L)	< 0.2	0.0	Not detected	N/A
Sodium (mg/L)	0.96	None	N/A	83,727.4
Sulfate (mg/L)	9	250.0	Below standard	784,944.0
Zinc (µg/L)	33	26.6	1.2	2,878.1

Table 10. Analytical data for water samples from Chalk Creek and from the west side of Chalk Creek, downstream of Pomeroy Gulch—continued.

Sample	12-02-382/4283-1.2, CHALK CREEK NORTH (6/5/99)				12-02-382/4283-1.3, CHALK CREEK NORTH (6/6/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	16,000.0				7.5			
pH (standard units)	7.07				7.12			
Conductivity (µS/cm)	59.0				709.0			
Alkalinity (mg/L CaCO3)	13.50				77.00			
Hardness (mg/L CaCO3)	23	None	N/A		340	None	N/A	
Aluminum (trec) (µg/L)	53	None	N/A	4,622.4	< 50	None	N/A	N/A
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	89	1,000.0	Below standard	7,762.2	990	1,000.0	Below standard	40.5
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	170	2,000.0	Below standard	14,826.7	140	2,000.0	Below standard	5.7
Aluminum (µg/L)	< 50	87.0	Below standard	N/A	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	0.6	0.4	1.7	52.3	< 0.3	3.0	Below standard	N/A
Calcium (mg/L CaCO3)	20	None	N/A	1,744,320.0	310	None	N/A	12,673.6
Chloride (mg/L)	< 1.0	250.0	Below standard	N/A	< 2.0	250.0	Below standard	N/A
Chromium (µg/L)	< 10	11.0	Below standard	N/A	< 10	11.0	Below standard	N/A
Copper (µg/L)	< 4.0	3.4	Not detected	N/A	< 4.0	33.6	Below standard	N/A
Fluoride (mg/L)	0.19	2.0	Below standard	16,571.0	0.71	2.0	Below standard	29.0
Iron (µg/L)	48	300.0	Below standard	4,186.4	920	300.0	3.1	37.6
Lead (µg/L)	< 1.0	0.5	Not detected	N/A	< 1.0	22.0	Below standard	N/A
Magnesium (mg/L)	0.72	None	N/A	62,795.5	7.20	None	N/A	294.4
Manganese (µg/L)	6	50.0	Below standard	523.3	1,100	50.0	22.0	45.0
Nickel (µg/L)	< 20	31.2	Below standard	N/A	< 20	242.0	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A	< 1.0	None	N/A	N/A
Silicon (mg/L)	2.5	None	N/A	218,040.0	8.2	None	N/A	335.2
Silver (µg/L)	< 0.2	0.0	Not detected	N/A	< 0.2	0.6	Below standard	N/A
Sodium (mg/L)	1.00	None	N/A	87,216.0	5.20	None	N/A	212.6
Sulfate (mg/L)	11	250.0	Below standard	959,376.0	180	250.0	Below standard	7,358.9
Zinc (µg/L)	160	30.5	5.3	13,954.6	130	298.6	Below standard	5.3

Table 10. Analytical data for water samples from Chalk Creek and from the west side of Chalk Creek, downstream of Pomeroy Gulch—continued.

Sample	12-02-382/4283-1.4, CHALK CREEK NORTH (6/6/99)				12-02-382/4283-1.5, CHALK CREEK NORTH (6/6/99)			
Parameter	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)	Concentration/ measurement	Standard	Factor above standard	Load (grams/day)
Flow (gpm)	0.5				10.0			
pH (standard units)	6.95				7.52			
Conductivity (µS/cm)	586.0				208.0			
Alkalinity (mg/L CaCO3)	55.00				60.00			
Hardness (mg/L CaCO3)	273	None	N/A		90	None	N/A	
Aluminum (trec) (µg/L)	640	None	N/A	1.7	< 50	None	N/A	N/A
Antimony (trec) (µg/L)	< 1.0	6.0	Below standard	N/A	< 1.0	6.0	Below standard	N/A
Arsenic (trec) (µg/L)	< 1.0	10.0	Below standard	N/A	< 1.0	10.0	Below standard	N/A
Iron (trec) (µg/L)	1,700	1,000.0	1.7	4.6	53	1,000.0	Below standard	2.9
Thallium (µg/L)	< 1.0	0.5	Not detected	N/A	< 1.0	0.5	Not detected	N/A
Zinc (trec) (µg/L)	1,300	2,000.0	Below standard	3.5	19	2,000.0	Below standard	1.0
Aluminum (µg/L)	< 50	87.0	Below standard	N/A	< 50	87.0	Below standard	N/A
Cadmium (µg/L)	6.2	2.5	2.5	0.0	< 0.3	1.0	Below standard	N/A
Calcium (mg/L CaCO3)	240	None	N/A	654.1	76	None	N/A	4,142.8
Chloride (mg/L)	< 5.0	250.0	Below standard	N/A	2.0	250.0	Below standard	109.0
Chromium (µg/L)	< 10	11.0	Below standard	N/A	< 10	11.0	Below standard	N/A
Copper (µg/L)	71.0	27.9	2.5	0.2	8.0	10.8	Below standard	0.4
Fluoride (mg/L)	1.60	2.0	Below standard	4.4	0.56	2.0	Below standard	30.5
Iron (µg/L)	13	300.0	Below standard	0.0	13	300.0	Below standard	0.7
Lead (µg/L)	< 1.0	16.2	Below standard	N/A	< 1.0	3.3	Below standard	N/A
Magnesium (mg/L)	8.10	None	N/A	22.1	3.30	None	N/A	179.9
Manganese (µg/L)	960	50.0	19.2	2.6	< 4	50.0	Below standard	N/A
Nickel (µg/L)	< 20	205.2	Below standard	N/A	< 20	87.9	Below standard	N/A
Potassium (mg/L)	< 1.0	None	N/A	N/A	< 1.0	None	N/A	N/A
Silicon (mg/L)	13.0	None	N/A	35.4	6.0	None	N/A	327.1
Silver (µg/L)	< 0.2	0.4	Below standard	N/A	< 0.2	0.1	Not detected	N/A
Sodium (mg/L)	4.10	None	N/A	11.2	3.60	None	N/A	196.2
Sulfate (mg/L)	200	250.0	Below standard	545.1	32	250.0	Below standard	1,744.3
Zinc (µg/L)	1,200	248.4	4.8	3.3	17	96.5	Below standard	0.9

Composite sample 382/4283-1.D2 was collected from dump #200 (Table 8). Results suggest only weakly mineralized waste-rock with concentrations of manganese, copper, lead, and zinc of less than 0.05%. The sample had no measurable neutralization potential and high potential acidity. Net acid-base potential was -25.3 tons $CaCO_3$/1,000 tons, and paste pH was 4.49.

Dump #204 contained an estimated 120 cubic yards of material with moderate amounts of pyrite. Immediately below dump #204, dump #203 contained about 250 cubic yards of oxidized, yellow, sand-size material. (See Benson and others, 1997, p. 26; Figure 64.) At dump #203, pyrite was abundant, and minor amounts of chalcopyrite and sphalerite occurred.

Figure 64. Face of dump #203 of the "Chalk Creek North" inventory area. Water emerges in the thick brush just below the toe.

When tested in July 1995, water flowing at about 10 gpm across the bench of dump #203 had 7.35 pH and 100 µS/cm conductivity. When tested in June 1999, water emerging from caved adit/prospect #104 had 7.53 pH and 201 µS/cm conductivity. After flowing across the face of dump #204 (Figure 63) this water had 7.54 pH and 204 µS/cm conductivity. After crossing the top and part of the face of dump #203 and emerging at the toe of #203, this water had 7.52 pH and 208 µS/cm conductivity. Test results suggest little chemical change in the water from when it emerges at feature #104 to where it exits the toe of dump #203, despite the presence of sulfides on both dumps.

In June 1999 water sample 382/4283-1.5 was collected below the toe of dump #203. The water appeared clean, and spongy black and green moss was abundant. Willows thrived within and adjacent to the channel. At the sample site the water was flowing at a measured rate of 10 gpm and had pH of 7.52 and conductivity of 208 µS/cm. The sample was within standards for all of the analyzed parameters (Table 10). The small size of dump #204, the placement of caved adit/prospect #104 in a natural ravine, and the low metal content of the effluent suggest that the water emerging from #104 is mostly ground water from the alluvial aquifer beneath the ravine. The excavation at feature #104 evidently intersected the water table, allowing the water to the surface.

Waste-rock pile #205 is about 100 cubic yards of yellow, mostly sand-size material (Benson and others, 1997, p. 26). Sparse to moderate amounts of pyrite and oxidized pyrite are on the surface of the dump. A few rills cut the dump face, indicative of seasonal runoff. In June 1999 the top of dump #205 was slightly moist, probably from seepage from caved adit #105. Adit #105 was not draining in June 1999, and it was not draining during the relatively wet spring and summer of 1995 (Benson and others, 1997, p. 26). This isolated waste-rock pile is apparently only weakly mineralized and is on a slope with no active stream nearby. Evidence of severe erosion is absent, and the moisture associated with adit #105 could not be tested or sampled because of its low volume. Dump #205 does not appear to be a serious environmental problem in the Chalk Creek watershed.

In order to bracket the “Chalk Creek”, “Chalk Creek North”, “Almost in St. Elmo”, and “Shaft Boulevard” inventory areas, water samples were collected from Chalk Creek slightly downstream of Pomeroy Gulch and slightly upstream of St. Elmo (samples 382/4283-1.1 and 382/4283-1.2, respectively, Figure 44). The upstream sample slightly exceeded State standards in zinc concentration, and the stream was carrying a zinc load of about 6 lb/day. All of the other tested parameters fell within standards (Table 10). In the downstream sample, zinc concentration increased about fivefold, and the load increased to more than 30 lb/day. Cadmium concentration also exceeded State standards. Unfortunately, this stream reach also includes the effects of the Golf Tunnel and Iron Chest mill tailings. These sites are the major sources of zinc in the Chalk Creek drainage basin, and remediation measures have been attempted and continue at both sites (CDPHE, 1998, p. 5). Visual examination and sample results suggest that the sites downstream of Pomeroy Gulch investigated during this study probably have no significant impact on Chalk Creek, especially compared to the Golf Tunnel and the Iron Chest tailings area.

MIGRATION PATHWAYS

The primary metals of concern in Chalk Creek are zinc and cadmium because of their effect on aquatic life. Fish kills at the hatchery about 15 miles downstream drew attention to the problem in the mid-1980s. Tracer studies by the U.S. Geological Survey indicated that drainage from the Golf Tunnel and seeps from reclaimed tailings adjacent to the Golf Tunnel contributed 72% of the zinc load to Chalk Creek near St. Elmo. A ground water plume near the reclaimed “Iron Chest Tailings” area added 14%. Bedrock fractures that transport contaminated mine water furnished 8%. About 6% came from upstream of the Golf Tunnel. (See CDPHE, 1998, p. 5.)

Ground Water Pathway

Twenty-eight wells for domestic use are known in the St. Elmo area, including those in the Forest City townsite along Chalk Creek adjacent to and south of St. Elmo. The permitted wells are 20 to 120 feet deep, and water levels range from 6 to 60 feet below the surface. (See URS, 1999, p. 12.) Additional unregistered wells probably exist in these historic townsites.

Alluvial ground water and ground water associated with bedrock fractures are contaminated with manganese, zinc, and cadmium in this area. Much of the contamination has been attributed to shallow, open fracture flow of effluent from the Golf Tunnel and seepage from associated reclaimed tailings. The "Iron Chest Tailings" removal area, along Chalk Creek north of the Golf Tunnel, where tailings were nearly completely removed and added to the tailings pile at the Golf Tunnel, is also a metals source for the alluvial aquifer. In addition, deep, slow-flow fracture systems are contaminated with metals by water originating from some of the upper mine workings. (See URS, 1999, p. 9–12; CDPHE, 1998, p. 5.)

Although contaminated ground water is a concern in the St. Elmo area, most sites described in this report contribute little to the overall metal loads in ground water. As such, the ground water pathway is not an apparent risk to the public at most of the sites described in this report. An important exception to this generalization may be ground water associated with workings at the Mary Murphy 1400-level.

Surface Water Pathway

St. Elmo does not have a public water supply, and no surface water intakes are known on Chalk Creek (URS, 1999, p. 13). Four NFS campgrounds lie along or near Chalk Creek within 10 miles of this study area, and a few campers may draw drinking water from the creek.

Riparian habitat and intermittent wetlands occur along the length of Chalk Creek. The watershed contains habitat suitable for Federally listed endangered peregrine falcons and Uncompahgre fritillary butterflies, and threatened bald eagles and Mexican spotted owls. The State-listed Penland alpine fen mustard may also live in this area. (See URS, 1999, p. 13.)

Chalk Creek is a recreational fishery containing brown, brook, and rainbow trout. The Colorado Division of Wildlife operates the Chalk Cliffs trout hatchery about 15 miles downstream of this study area. In 1985 and 1986, about 80% of the trout fingerlings died within 48 hours of exposure at the hatchery. Toxicity tests by EPA indicated that metal concentrations in Chalk Creek were "severely" toxic during spring runoff. A study by Colorado Division of Wildlife in fall of 1987 and spring of 1988 suggested that elevated zinc and cadmium concentrations eliminated young brown trout and caused reduced size in the more mature browns for about 12 miles downstream of the mining district. (See URS, 1999, p. 13–14.)

Although contaminated surface water is a concern in the Chalk Creek watershed, most sites described in this report contribute little to surface water metal loads. Discharges from the Mary Murphy 1400-level, the Stonewall Tunnel, and adit #101 of the “Almost in St. Elmo” inventory area are exceptions to this generalization. Some of the acidic and mineralized waste-rock piles may contribute metals during spring runoff and during precipitation events. With a few exceptions, the surface water pathway is not a significant concern for sites described in this report.

Soil Exposure Pathway

No one lives within 200 feet of any of the mine features described in this report. According to 1990 census data, 58 people live in and near St. Elmo, which is about 0.75 mile north of the northernmost mine feature discussed in this report. One person lives in this area year-round. (See URS, 1999, p. 11–12.) The home of the year-round resident and a few summer cabins are within about 500 feet of adit #102 of the “Chalk Creek North” inventory area. Sites alongside the old railroad grade and other 4WD roads are frequently visited by tourists during the summer months. Sites further from the road are seldom visited.

Samples collected from selected waste-rock piles indicate that most of the dumps are weakly to moderately mineralized. Because exposures to the public are brief, and waste rock is not extremely mineralized, the soil pathway poses little risk to the public.

Air Exposure Pathway

With the exception of the northernmost sites, most of the mine features examined during this study are more than a mile from the nearest resident. No one works full time at any of these sites, although remediation work and research are done intermittently at the Mary Murphy 1400-level.

In general, waste-rock piles examined for this study are composed of sand-size and larger material and show no evidence of wind erosion. Because exposures to the public are brief, and waste rock is not easily airborne or extremely mineralized, the air pathway poses little risk to the public.

SUMMARY AND CONCLUSIONS

A summary of all the mine features examined for this study is shown on Table 11. The most important sites are discussed in more detail in the following paragraphs.

Mines contributing the most metals to Chalk Creek are not included in this study. Sites such as the Golf Tunnel, the “Iron Chest tailings area,” and tailings near Romley have been reclaimed or are in the reclamation process. Tracer studies by the U.S. Geological Survey show that at least 86% of the zinc load in Chalk Creek near St. Elmo originates from those sites (CDPHE, 1998, p. 5). Numerous environmental studies have been done regarding the more significant sites, and monitoring and reclamation efforts continue.

Most of the mines examined during this study do not pose serious environmental concerns, especially when compared to the Golf Tunnel area. Generally the sites are small and isolated. Where present, mine effluent usually has neutral pH, but metal concentrations vary widely from site to site. Wherever practical, effluent should be diverted away from waste-rock piles to minimize contact with mineralized material. This could probably be accomplished with hand tools at the more inaccessible sites. Significant reclamation efforts at most of the smaller mines would require road building, possibly causing more short-term environmental damage than allowing natural reclamation to continue.

In upper Chalk Creek the most damaging mine is the Stonewall Tunnel in the “Chalk Creek Headwaters” inventory area. Mine effluent greatly increases the metal load in relatively pristine Chalk Creek. The site is reasonably flat, easily accessible, and may be a suitable location to construct a passive remediation water-treatment system.

The Mary Murphy 1400-level (adit #100 of the “Middle Mary Murphy” inventory area) is a major contributor of zinc, cadmium, and manganese to Pomeroy Gulch. Water samples indicate that zinc load increases by a factor of about 7 in the stream reach that includes the Mary Murphy 1400-level and several other much smaller mines (samples MH-5, MH-6, Table 5). Sulfate and cadmium loads also increase substantially. This area is currently the focus of extensive research and remediation efforts by several cooperating State and Federal agencies.

Tracer studies indicate that 6% of the zinc load in Chalk Creek near St. Elmo can be attributed to areas upstream of the Golf Tunnel (CDPHE, 1998, p. 5). Most of that 6% probably comes from the Mary Murphy 1400-level adit, although the Stonewall Tunnel is a significant loading source.

Effluent from adit #101 of the “Almost in St. Elmo” inventory area, which is downstream of the Golf Tunnel, carries moderate loads of zinc and manganese. It is not known if surface flow reaches Chalk Creek. Significant natural attenuation is probably achieved before the mine water reaches either the alluvial aquifer or the surface of Chalk Creek, which is about 1,500 feet away. The effluent stream should be tested and sampled where it soaks into the ground or enters Chalk Creek to determine if natural attenuation is occurring.

Zinc and manganese are two of the most difficult elements to remove from mine effluent because they remain in solution even at relatively neutral pHs. Perhaps continuing research and mitigation efforts at the Golf Tunnel and Mary Murphy 1400-level will reveal suitable methods for removing zinc and manganese from the neutral pH waters that predominate in the Chalk Creek mining district.

Dump #200 of the “Shaft Boulevard”, dump #200 of the “Almost in St. Elmo”, and dump #200 of the “Chalk Creek North” inventory areas are all relatively large, steep, mineralized, and very acidic. Large waste-rock piles with steep faces are difficult to reclaim. Where possible, construction of berms below the dump toe may be an appropriate method of containing eroded waste rock close to the mine site. This method of sediment control was inadvertently demonstrated at the “Almost in St. Elmo” site, where much of the material eroded from dump #200 was deposited in the access road/trail below.

Other possible methods for reclaiming these waste-rock piles include covering them with soil or other materials, or removing them and placing the waste rock in an engineered repository. Unfortunately, covering steep dump faces with soil or other material is usually not practical because they are often at the angle of repose or steeper. Erosion-control products such as geotextiles may be effective at reducing erosion and fostering revegetation. Regrading these dumps to gentler slopes before applying the cover material could be effective, but would require the use of heavy equipment. Utilizing large equipment would require major improvements to the old mine roads/trails that access these mines.

Removal is an option, but these sizable dumps would require large equipment to reach down from the bench and pull waste rock up. Major road/trail improvements would be necessary. Conceivably, these dumps could be removed from below, starting at the toe and working upward. Except for the “Almost in St. Elmo” site, the dump toes have no current access, and new roads would be required. Even at the “Almost in St. Elmo” site, significant road improvements would be needed. A suitable and nearby repository for the waste rock would have to be located.

Dump #200 of the “Chalk Creek” inventory area rests on the banks of Chalk Creek adjacent to a road and would be easy to pull back from the stream or remove.

These dumps have not been quantitatively identified as metal loading sources to Chalk Creek. Some metals are transported from these piles during snowmelt and precipitation events, but the overall loading from these sites is intermittent and insignificant compared to the Golf Tunnel area and the “Iron Chest Tailings” removal area.

Chalk Creek is one of the oldest mining districts in Colorado. Any reclamation plan for mines in this area should consider the historic value of these landmarks, including the waste-rock piles.

Table 11. Summary of the environmental settings of mine features examined during this study. (Sites are listed in the order they are discussed in the report.)

Inventory area name Inventory number.feature number(s)	Water quality	Waste rock	Comments
Chalk Creek Headwaters 381/4275-1.100/200 (Stonewall Mine)	36 gpm of adit effluent has 6.5 pH; exceeds standards in Cu, Cd, Fe, Mn, Zn; adds >1 lb/day of Zn and Fe to upper Chalk Creek.	1,300 cubic yards; contains >0.7% Pb, >0.5% Zn, >0.1% Mn; net acid-base potential = +77.2 tons $CaCO_3$/1,000 tons; paste pH = 7.88; dump has seeps and is in contact with Chalk Creek.	Effluent from this site has a significant impact on upper Chalk Creek, adding virtually all of the zinc and manganese load, and about 50% of the iron load in this stream reach. Dump #200 is mineralized, but may not be highly reactive and has an alkaline composition. This mine is easily accessible and is in gentle terrain; it may be one of the most suitable sites for passive remediation or other mitigation measures for the adit effluent. Dump contact with Chalk Creek should be eliminated.
Chalk Creek Headwaters 381/4275-1.103 (Kentucky Mine)	No adit effluent in 1999, and only 2 gpm discharge with 5.7 pH in 1995.	Not evaluated.	Adit is on private land and is not an apparent environmental problem.
East Hancock 381/4277-1.104/204 (Old Quail)	1 gpm of adit effluent has 7.03 pH; exceeds standards in Zn, Pb; sulfate and Cu are elevated but within standards; virtually no loading from this site; some effluent soaks into dump.	400 cubic yards; contains >0.6% Pb, >0.4% Zn; net acid-base potential = -3.0 tons $CaCO_3$/1,000 tons; paste pH = 5.17; small area of dump is moist from adit effluent.	Adit and dump are on private land and are not an apparent environmental problem.
Hancock Road 381/4278-1.100/200/201 (Flora Bell)	58 gpm of adit effluent has 6.94 pH; exceeds standards in Mn (drinking water, <u>not</u> aquatic life); below the site effluent quality improved to pH 7.78 and Mn reduced by about 50%; virtually no loading from this site.	5,000 cubic yards (combined dumps #200 and #201); lower dump (#201) is the most mineralized and contains >0.1% Pb, >0.1% Zn; net acid-base potential = -4.2 tons $CaCO_3$/1,000 tons; paste pH = 5.36.	The dumps are easily accessible and could be removed. They are not highly mineralized and are not extremely reactive; the historic value of this site for visitors may outweigh minor environmental impacts from runoff from the dumps. Quality of the effluent improves within the site, which is not a significant metals source for Chalk Creek.
West Pomeroy Gulch 382/4278-1.100/200	Standing water in adit has 6.40 pH, 203 µS/cm conductivity; no parameters exceed standards.	80 cubic yards; dry, no nearby stream, naturally revegetating, weakly mineralized.	No apparent environmental problem.
West Pomeroy Gulch 382/4278-1.201	Dump is located in wetland that was dry in 1999.	250 cubic yards; contains >0.3% Zn; net acid-base potential = -3.4 tons $CaCO_3$/1,000 tons; paste pH = 6.10.	Dump is dry, is not highly mineralized, and is not extremely reactive. Wetland appears healthy. No apparent environmental problem.

Table 11. Summary of the environmental settings of mine features examined during this study—continued.

Inventory area name Inventory number.feature number(s)	Water quality	Waste rock	Comments
West Pomeroy Gulch 382/4278-1.202	Dump is located in wetland that was dry in 1999; dump seeps tested in 1995 had pH of 4.8 to 5.8; no seeps in 1999.	1,000 cubic yards; contains <0.1% Pb, Zn; net acid-base potential = -1.8 tons $CaCO_3$/1,000 tons; paste pH = 5.88.	Dump is not highly mineralized and is not extremely reactive. Wetland appears healthy. No apparent environmental problem.
Middle Pomeroy Gulch 382/4279-1.201	2 gpm spring below dump #201 has 6.02 pH; no parameters exceed standards; dump is located in wetland in Pomeroy Gulch floodplain.	700 cubic yards; contains <0.1% Pb, Zn, Mn; net acid-base potential = -4.3 tons $CaCO_3$/1,000 tons; paste pH = 5.27.	This dump is easily accessible and could be removed, but removal would disturb the wetland. Dump is not highly mineralized and is not extremely reactive. No apparent environmental problem.
Middle Pomeroy Gulch 382/4279-1.202	1.2 gpm of adit #102 effluent has 6.32 pH; slightly exceeds drinking-water (not aquatic-life) standard in Mn; 2 gpm spring at toe of dump #202 has 6.04 pH; Zn slightly exceeds standards; dump is located in wetland in Pomeroy Gulch floodplain.	1,100 cubic yards; contains <0.1% Pb, Zn, Mn; net acid-base potential = +22.8 tons $CaCO_3$/1,000 tons; paste pH = 6.65; part of dump toes into Pomeroy Gulch.	This dump is moderately accessible during low flow and could be removed, but removal would disturb the wetland. Dump is not highly mineralized and has alkaline composition. No apparent environmental problem.
Above Camptown 381/4279-1.200	Standing water in adit #100 had 6.3 pH in 1995.	100 cubic yards; dry, no nearby stream, naturally revegetating, weakly mineralized.	No apparent environmental problem.
Above Camptown 381/4279-1.201 (Stanley)	Standing water in shaft #101 has 6.12 pH; exceeds standards in Mn (drinking water), Zn, Pb; no indications of surface discharge.	150 cubic yards; contains >2% Pb, >2% Zn, >0.3% Mn >0.1% Cu, high Au, Ag, Hg; net acid-base potential = +12.4 tons $CaCO_3$/1,000 tons; paste pH = 5.61.	Land ownership is questionable and surveys are needed. Dump is highly mineralized, approaching ore grade, but has small tonnage, and access is difficult. Dump is dry and not close to a stream. No apparent significant environmental problem.
Above Camptown 381/4279-1.202 (Little Bonanza)	No water close to the surface.	235 cubic yards; contains >0.9% Pb, >2% Zn; high Au, Ag, Hg; net acid-base potential = +1.1 tons $CaCO_3$/1,000 tons; paste pH = 6.01.	Land ownership is questionable and surveys are needed. Dump is highly mineralized, approaching ore grade, but has small tonnage, and access is difficult. Dump is dry and not close to a stream. No apparent significant environmental problem.
Above Camptown 381/4279-1.204 (Big Bonanza)	Standing water in shaft #104 has 7.10 pH; exceeds standards in Mn; no indications of surface discharge.	450 cubic yards; contains >0.1% Pb, >0.1% Mn; net acid-base potential = -0.4 tons $CaCO_3$/1,000 tons; paste pH = 5.89.	Land ownership is questionable and surveys are needed. Dump is not highly mineralized and is not extremely reactive. It is small, dry, and not close to a stream. No apparent significant environmental problem.

Table 11. Summary of the environmental settings of mine features examined during this study—continued.

Inventory area name Inventory number.feature number(s)	Water quality	Waste rock	Comments
Above Camptown 381/4279-1.206	Standing water in adit #106 in 1995; dry in 1999.	80 cubic yards; dry, no nearby stream, naturally revegetating, weakly mineralized.	No apparent environmental problem.
Camptown 381/4280-1.200 (Stanley Tunnel)	Seepage from adit #106 has 6.85 pH, 234 µS/cm conductivity; spring near toe of dump has 7.08 pH, 110 µS/cm conductivity.	1,200 cubic yards; contains >0.1% Mn; net acid-base potential = +10.3 tons $CaCO_3$/1,000 tons; paste pH = 7.61; dump is in contact with Pomeroy Gulch.	This dump is moderately accessible during low flow and could be removed or moved further from Pomeroy Gulch. Dump is not highly mineralized and has alkaline composition. No apparent environmental problem.
Middle Mary Murphy 381/4280-2.200 (1400-level)	About 50 gpm of adit #100 effluent has neutral pH and high Cd, Mn, Zn; probably the major metal-loading source to Pomeroy Gulch.	25,000 cubic yards; mixture of barren country rock and mineralized vein material.	Reclamation and remediation is currently in progress regarding adit effluent. Effluent should be channeled away from the dump. Dump is easily accessible and could be removed, but has historic value to visitors. This is part of the most environmentally damaging site examined for this study.
Middle Mary Murphy 381/4280-2.201 (tram terminal)	Adit #100 effluent skirts the edge of this pile.	1,500 cubic yards; probably highly mineralized because it was trammed from mines higher on the slope.	Effluent should be channeled away from this pile. Pile is easily accessible and could be removed, but has historic value to visitors. This is part of the most environmentally damaging site examined for this study.
Middle Mary Murphy 381/4280-2.205	10 gpm of adit #105 effluent has 7.11 pH, 143 µS/cm conductivity; slightly exceeds standards in Zn, Cd; 10 gpm spring near toe of dump has 7.09 pH, 151 µS/cm conductivity; virtually no loading from this site.	200 cubic yards; contains >0.8% Pb, >0.2% Zn, >0.1% Mn, 7% Fe_2O_3; net acid-base potential = +1.0 tons $CaCO_3$/1,000 tons; paste pH = 6.29; some effluent soaks into dump, which is in contact with Pomeroy Gulch.	Pomeroy Gulch water was nearly identical above and below this site, indicating no significant effect from the addition of the small volume of slightly degraded water from adit #105. Effluent should be channeled away from mineralized dump #205.
Iron Chest Mine 382/4280-1.102 (Tressa C.)	Standing water in shaft has 3.3 pH; exceeds standards in Al, Cu, Cd, Fe, Mn, Pb, Zn.	Not investigated.	Shaft #102 is on private land and shows no evidence of discharging. Any ground water contamination would probably follow the north-northeast-trending vein the shaft exposes, remaining on private land. No apparent degradation to NFS land.

Table 11. Summary of the environmental settings of mine features examined during this study—continued.

Inventory area name Inventory number.feature number(s)	Water quality	Waste rock	Comments
Shaft Boulevard 382/4282-1.200 (Red Cloud)	No surface or shaft water in 1999.	1,000 cubic yards; contains >0.6% Pb, >0.1% Zn, >7% Fe_2O_3; net acid-base potential = -35.2 tons $CaCO_3$/1,000 tons; paste pH = 4.09.	Site is probably on private land; survey is needed. Dump is mineralized and acidic, but is far from any stream. Its steep face reduces snow accumulation and the effects of snowmelt are minimized. This dump would be difficult to remove because current access is at the top and the face is long. It would be difficult to cover because of its steep face.
Almost in St. Elmo 382/4283-2.100/200 (Gold Dust)	Standing water in adit in 1999; dry, iron-stained effluent channel; in 1995, 15 gpm effluent had 5.1 pH, 200 µS/cm conductivity; pH dropped to 4.0, conductivity rose to 300 µS/cm before the effluent soaked into dump.	800 cubic yards; contains >0.1% Pb, >15% Fe_2O_3, >9% sulfur; net acid-base potential = -167 tons $CaCO_3$/1,000 tons; paste pH = 3.94; rills, gullies, sheet wash.	This site may be on private land. Some road repair would create easy access for dump removal or other remediation construction. Dump face is steep and would not be easy to cover in its current configuration. Dump and cabin ruins may have historical value to visitors, though this site is seldom visited because of the nearly undrivable access road.
Almost in St. Elmo 382/4283-2.101/201 (Dorothy H.)	20 gpm of adit effluent has 7.00 pH; exceeds standards in Cd, Fe, Mn, Zn, fluoride; about 2/3 lb/day Zn, 1/2 lb/day Mn come out of adit; at the base of dump #201 the same parameters exceed standards, but most of the concentrations are reduced.	500 cubic yards; moderate amount of pyrite; about 40% of effluent soaks into dump before reaching the toe.	Site may be on private land. Effluent carries moderately high Zn and Mn loads, but the effluent may not reach Chalk Creek at the surface. With some improvement to the access road, dump would be easy to remove. Most of the terrain is relatively steep, and water treatment would be difficult. Effluent should be directed off the dump at the very least.
Chalk Creek 381/4281-1.200	Dump is in contact with Chalk Creek.	65 cubic yards; contains >0.4% Pb, >0.3% Zn; net acid-base potential = -21.9 tons $CaCO_3$/1,000 tons; paste pH = 4.30.	This small dump is mineralized and very acidic and is being eroded by Chalk Creek. The site is easily accessed and the dump could be pulled away from Chalk Creek. The headframe on shaft #100 has historic value.
Chalk Creek 381/4281-1.205	No water associated with this site.	350 cubic yards; weakly mineralized; no significant erosion; dry and not close to streams.	No apparent environmental problem.

Table 11. Summary of the environmental settings of mine features examined during this study—continued.

Inventory area name Inventory number.feature number(s)	Water quality	Waste rock	Comments
Chalk Creek 381/4281-1.107/207	Pool of water in adit #107 has 7.35 pH, 302 µS/cm conductivity; a trickle of water escapes the adit and soaks into the bench of dump #207.	150 cubic yards; moderately mineralized; no significant erosion; dry and not close to streams.	No apparent environmental problem.
Chalk Creek North 382/4283-1.100/200	Standing water in adit has 3.03 pH, 1,455 µS/cm conductivity; low pH and high conductivity in this standing water probably results from long residence time for water-rock reactions to occur.	1,000 cubic yards; contains <0.1% Pb, Zn, Mn; net acid-base potential = -25.2 tons $CaCO_3$/1,000 tons; paste pH = 4.49; moderately mineralized but very acidic; steep, thin, and highly visible.	Site has no vehicular access. Dump is moderately mineralized and acidic, but is not close to any stream. Its steep face reduces snow accumulation and the effects of snowmelt are minimized. This dump would be difficult to remove because of lack of access. It would be difficult to cover because of its steep face.
Chalk Creek North 382/4283-1.101/201	0.5 gpm of adit effluent has 6.95 pH; exceeds standards in Cu, Cd, Fe, Mn, Zn; loading is minimal because of the low flow rate.	150 cubic yards; weakly mineralized; minor rills and sheetwash.	No vehicular access to this site. Small discharge of degraded water, but no apparent significant environmental problems.
Chalk Creek North 382/4283-1.102/202 (St. Elmo Queen)	7.5 gpm of adit effluent has 7.12 pH; exceeds standards in Fe, Mn; metal load at the portal is small and the entire effluent stream soaks into dump, never reaching Chalk Creek at the surface.	1,700 cubic yards; contains <0.1% Pb, Zn, Mn, Cu; net acid-base potential = +2.6 tons $CaCO_3$/1,000 tons; paste pH = 8.14; about 1/3 of dump is blocky, barren granitic rock (not included in sample).	This site may be on private land; a survey is needed. No vehicular access unless the old, overgrown road/trail is upgraded. Although neither the dump nor the mine drainage are highly mineralized, the effluent should be channeled to avoid contact with weakly mineralized, slightly alkaline dump #202.
Chalk Creek North 382/4283-1.203/204	10 gpm of effluent from caved adit/prospect #104 has 7.53 pH, 201 µS/cm conductivity. After crossing face of dump #204 effluent has 7.54 pH, 204 µS/cm conductivity. Partway down the face the effluent soaks into dump #203. Where it emerges below the toe of dump #203 the effluent has 7.52 pH, 208 µS/cm conductivity, and is within standards for all parameters.	Dump #203 = 250 cubic yards; dump #204 = 120 cubic yards; both moderately mineralized with pyrite.	Effluent is clean, despite its contact with moderately mineralized dumps #204 and #203. No apparent environmental problems at this site.
Chalk Creek North 382/4283-1.205	Moisture is seeping from adit #105, but the volume is too small to test.	100 cubic yards; weakly mineralized; minor erosion; top of dump is moist; no nearby stream.	No apparent environmental problems at this site.

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